CS-20-206
NC 21-008

NOTICE TO PROCEED

PROJECT: **BID NO. NC21-008**
Board of County Commissioners, Nassau County, FL (OWNER)
South Amelia Island Dredging & Beach Nourishment Project

DATE: May 26, 2021

TO: SJ Hamill Construction Co.

2008 Cherry Ln.

Charleston, SC 29405

As of the date posted above, you are hereby notified to commence work in accordance with the Agreement dated May 18, 2021, and you are to fully and satisfactorily complete the work to the point of Final Acceptance on, or before December 15, 2021.

ISSUED BY: Nassau County Board of County Commissioners

BY: _____
(Authorized Signature)

Megan K. Diehl, OMB Director
(TYPED NAME & TITLE)

ACCEPTANCE OF NOTICE TO PROCEED

Receipt of the above NOTICE TO PROCEED is hereby acknowledged this 27th day of May, 20 21.

SJ Hamill Construction Company, LLC
(CONTRACTOR)

_____
(SIGNATURE)

President
(TITLE)

CS-20-206

CM2992

2000 AGREEMENT
FOR
BID NO. NC21-008 SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT

This Agreement for the SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT is entered into by and between the Board of County Commissioners of Nassau County, Florida, a political subdivision of the State of Florida, sitting as the governing board of the South Amelia Island Shore Stabilization Association, Inc., a Municipal Services Benefit Unit, located at 96135 Nassau Place, Suite 1, Yulee, Florida, 32097 (hereinafter "County" or "Owner") and S.J. HAMILL CONSTRUCTION COMPANY, LLC, a South Carolina limited liability company, whose address is 2008 Cherry Lane, Charleston, South Carolina, 29405 (hereinafter "Contractor") as of the date appearing on the signature lines below.

ARTICLE 1 – WORK

1.01 Contractor shall complete all work as specified or indicated in the County's Invitation to Bid No. NC21-008 (hereinafter "ITB"), Contractor's bid submittal in response to the ITB, all Contract Documents as enumerated herein, the Technical Specifications and Drawings, and as otherwise directed by the County. The work (hereinafter "Work") is generally described as Nassau Sound hydraulic dredging and beach nourishment at Amelia Island or as more fully described in Article 2 of this Agreement.

ARTICLE 2 – THE PROJECT

2.01 The South Amelia Island Dredging & Beach Nourishment Project ("Project"), generally includes the hydraulic dredging, transport, placement, and shaping of approximately one million, eight hundred thousand (1,800,000) cubic yards of beach-quality sand from the approved Nassau Sound ebb shoal borrow area to the Atlantic ocean shoreline of the south end of Amelia Island in Nassau County, Florida.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Olsen Associates, Inc., of Jacksonville, Florida (Engineer).

3.02 The Owner has retained Engineer to act as Owner's representative, assume all duties and responsibilities related to the Project, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

All time limits for Substantial Completion and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

A. Contractor shall initiate dredging and beach fill operations for the Project and shall complete sand placement from the point of initial sand placement to the point of Substantial Completion within one hundred thirty-five (135) days. Initial sand placement is defined by the placement of 1,000 cubic yards of material on the beach from the Nassau Sound borrow area, measured in place within the prescribed beach fill pay template. Substantial Completion of the beach fill is defined by the placement and surveyed acceptance of the volumes established in the Contract Specifications and Drawings.
B. Final Acceptance is defined as the date when the construction of the project is complete in accordance with the Contract Documents so that the entire project can be utilized for the purposes for which it is intended and all monies due Contractor can be paid in the final Application for Payment.

4.02 *Contract Times*

The contract time for this project is a total of one-hundred thirty-five (135) calendar days from the County's issuance of the Notice to Proceed to reach Substantial Completion of the Project and one-hundred sixty-five (165) calendar days from the Notice To Proceed for Final Acceptance of the entire Project.

Completion of the Contract will have been achieved once Final Acceptance has been reached and all final documentation, including final application for payment, has been received and processed.

4.03 *Liquidated Damages*

Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and milestones not achieved within the times specified in Paragraphs 4.01 and 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal

proceeding the actual loss suffered by Owner if the Work is not completed on time. The parties confirm that, (i) the assessment of liquidated damages is reasonable and appropriate; (ii) the terms and the amount(s) of the liquidated damages stated below are reasonable; and (iii) the liquidated damages will be assessed as the County's remedy under such circumstances and not as a penalty. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

A. Substantial Completion: Contractor shall pay Owner Ten Thousand Dollars ($10,000.00) for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02 above for Substantial Completion of the Project until the Work is substantially complete.
B. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) to reach the point of Final Acceptance, Contractor shall pay Owner $10,000.00 for each day that expires after such time until the Work is completed and ready for final payment.
C. Liquidated damages for failing to timely attain Substantial Completion and Final Acceptance are not additive and will not be imposed concurrently.
D. This remedy is in addition to and supplements any and all other remedies to Owner as set forth in the Contract Documents or at law or in equity for damages other than delay.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. Total of Lump Sum Amounts and Unit Price Work (subject to final quantity adjustments), a contract sum of: fourteen million, five hundred and ninety seven thousand dollars ($14,597,000.00), pursuant to the following schedule of values.

Item No. & Description	Number of Units	Units	Unit Price	Subtotal
1. Mobilization / Demobilization	1	Job	$2,844,500.00	$2,844,500.00
2. Hydraulic Beach Fill	1,800,000.00	cubic yards	$6.49	$11,682,000.00
3. Turbidity monitoring	1	Job	$62,000.00	$62,000.00
4. Beach Tilling / Decompaction	1	Job	$8,500.00	$8,500.00
			Total Contract Amount	$14,597,000.00

B. The foregoing Total Contract Amount is approximate only, being herein above inserted for the purpose of establishing the face amount of bonds to be provided by the Contractor. Payment of work covered by unit price items will be made only on the basis of the actual quantities of work completed in place as authorized, and as measured and accepted as provided in the Contract Documents. As directed by the Owner, the final quantities actually placed and accepted for payment may vary from the quantities listed herein by ± twenty percent (20%). Contractor may not be entitled to any adjustment in unit prices or lump sum prices if quantities vary by ± twenty percent (20%), or less.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

Contractor shall submit Applications for Payment in accordance with Article 13 of the General Conditions and the determination of eligible payments described in the Specifications and Requirements. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

Prior to Substantial Completion, Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment in an amount equal to ninety percent (90%) of the Work completed (with the balance being retainage), less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided herein (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

6.03 *Final Payment*

Upon final completion and acceptance of the Work in accordance with the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer and as provided in said General Conditions.

ARTICLE 7 – CONTRACTOR'S REPRESENTATIONS

7.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items, including State and Federal permits for the work, identified in the Contract Documents.

B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and can and shall comply with all Federal, State, and local laws and regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Contract Documents, especially with respect to technical data in such reports and drawings, and (2) reports and drawings relating to hazardous environmental conditions, if any, at or adjacent to the Site that have been identified in the Contract Documents, especially with respect to technical data in such reports and drawings. Contractor acknowledges that the Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents, if any, with respect to physical conditions at or contiguous to the Work sites

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.
K. Contractor has had duly issued and executed all required Payment and Performance Bonds and Certificates of Insurance required by this Contract and the Contract Documents. Insurance requirements are set forth in the General Conditions.

ARTICLE 8 – CONTRACT DOCUMENTS

8.01 *Contents*

A. The Contract Documents consist of the following:
   1. This Agreement;
   2. The General Conditions attached hereto and incorporated by reference;
   3. All Bonds, Certificates of Insurance with endorsements, Notice of Award, and Notice to Proceed;
   4. Specifications as listed in the table of contents of the Project Manual;
   5. Plans (as defined in the General Conditions of the Contract) consisting of sixteen (16) sheets;
   6. Permits (as defined in the General Conditions of the Contract);
   7. Any and all Addenda (as defined in the General Conditions of the Contract, including Change Orders and Field Orders);
   8. The Invitation to Bid (ITB), Instructions to Bidders, and Contractor's Bid to the ITB; and
   9. Technical Appendices as listed in the table of contents of the Project Manual.
B. The documents listed in Paragraph 8.01.A are attached to this Agreement (except as expressly noted otherwise above).
C. The Contract Documents may only be amended, modified, or supplemented as provided for in the General Conditions.

ARTICLE 9 – MISCELLANEOUS

9.01 *Terms*

Terms used in this Agreement will have the meanings stated in the General Conditions.

9.02 *Assignment of Contract*

Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such

consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

9.03 *Successors and Assigns*

Contractor binds itself, its successors, assigns, and legal representatives to the Owner, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

9.04 *Choice of Law and Forum Selection*

The laws of the State of Florida shall govern all provisions of this Contract. Venue for any dispute shall be Nassau County, Florida.

9.05 *Contract Modifications or Amendments*
This Contract shall not be modified or amended except in writing with the same degree of formality with which this Agreement is executed.

9.06 *Waiver*

A waiver of any breach of any provision of this Contract shall not constitute or operate as a waiver of any other breach of such provision or of any other provisions, nor shall any failure to enforce any provision hereof operate as a waiver of such provision or of any other provisions.

9.07 *Severability*

Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

9.08 *Dispute Resolution*

The laws of the State of Florida shall govern all provisions of this Contract. In the event the parties to this Contract cannot resolve a difference with regard to any matter arising herefrom, the disputed matter will be referred to court-ordered mediation pursuant to Section 44.102, F.S. If no agreement is reached, any party may file a civil action and/or pursue all available remedies whether at law or equity. Venue for any dispute shall be Nassau County, Florida.

9.09 *Public Records*

Pursuant to applicable Florida law, the Contractor's records associated with this Contract may be subject to Florida's public records laws, Section 119.01, F.S., et seq, as amended

from time to time. The Contractor agrees to comply with Florida's public records law by keeping and maintaining public records required by the County in order to perform the Work. Upon request from the County's Custodian of Public Records, the Contractor shall provide the County with copies of or allow access to the requested public records at a cost that does not exceed the cost provided for under Chapter 119, Florida Statutes, or as otherwise provided for by Florida law. The Contractor shall ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the term of the Contract and following completion of the Contract if the Contractor does not transfer the records to the County. Upon completion of the Contract the Contractor shall transfer, at no cost, to the County all public records in possession of the Contractor or keep and maintain all public records required by the County to perform the Work. If the Contractor transfers all public records to the County upon completion of the Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the Contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the County, upon request from the County's custodian of public records, in a format that is compatible with the information technology systems of the County.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE COUNTY'S CUSTODIAN OF PUBLIC RECORDS AT RECORDS@NASSAUCOUNTYFL.COM.

9.10 *Contractor's Certifications*

Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 9.10:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

9.11 *Notice*

All notices required under this Contract shall be sent by e-mail, registered mail, or certified mail with receipt requested, and if sent to the Owner, shall be mailed:

To OWNER:

Taco Pope, County Manager
96135 Nassau Pl.
Suite 6
Yulee, FL 32097
(904) 321-5784 (fax)
tpope@nassaucountyfl.com

With copies to:

Brian Simmons, Procurement Manager
96135 Nassau Pl.
Suite 2
Yulee, FL 32097
procurement@nassaucountyfl.com

Albert E. Browder, Ph.D., P.E., D.CE
Olsen Associates, Inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 384-7368 (fax)
abrowder@olsen-associates.com

To CONTRACTOR:

Contractor's Contact _____

Contractor's Name _____

Contractor's Address _____

Contractor's E-Mail _____

Contractor's FAX # _____

[Signatures on next page.]

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement as of the day and year last written below. Owner and Contractor have signed this Agreement in two originals in counterpart. One counterpart each has been delivered to the County Purchasing Manager and the Contractor. All portions of the Contract Documents have been signed, initialed or identified by County and Contractor or identified by Engineer on their behalf.

ATTEST:
As to (NAME OF CONTRACTOR)

Signature

JORDAN ADAMS
(Print or Type Name)

VP
(Print or Type Title)

Date: 5/18/21

Seal:

CONTRACTOR
(NAME OF CONTRACTOR)

By: William Spielvogel

Its President
(Title of Authorized Representative)

President
(Print or Type Title)

Date: May 18, 2021

ATTEST:
As to Authenticity of the Chairman's Signature

~~John C. Crawford, County Clerk~~
John A. Crawford, Ex-Officio Clerk
Date 5/13/2021

Seal:

SAISSA GOVERNING BOARD:
Nassau County, Florida

By:
Thomas R. Ford, as its Chairman

Date: **May 10, 2021**

Review of Contract as to Form

By:
Michael S. Mullin, Esq., County Attorney

NOTICE OF AWARD
BID NO. NC21-008

DATE: May 10, 2021

TO: S.J. Hamill Construction Company, LLC

PROJECT: **Board of County Commissioners, Nassau County, FL (OWNER)**
South Amelia Island Dredging & Beach Nourishment Project

You are notified that your bid dated February 25, 2021, for the above Contract has been considered. You are the apparent successful bidder and will be awarded a contract for **BID NO. NC21-008 South Amelia Island Dredging & Beach Nourishment Project** upon fully conforming with the following requirements for award.

Within ten (10) days of the date of this Notice of Award, you must deliver to the OWNER the enclosed contract documents, fully executed, signed and witnessed, and a Certificate of Insurance as follows:

Two (2) originals - Contract Agreement
Two (2) originals - Performance Bond
Two (2) originals - Labor and Material Bond
Two (2) originals - Certificate of Insurance certifying compliance with all insurance requirements specified in the General Conditions

Within twenty-one (21) days after receipt of the above documents, the OWNER will return to you one (1) fully executed original of the Contract. You may obtain two additional free copies of plans and specifications upon request. You will be notified of the time and place for a preconstruction conference; your proposed work schedule must be delivered to the OWNER at that time.

Failure to deliver the aforementioned contract documents and insurance certificate within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited.

The Nassau County Board of County Commissioners (OWNER)

By: _____ Thomas R. Ford, Chairman
(Authorized Signature) (typed name & title)

ACCEPTANCE OF NOTICE OF AWARD

DATE: May 17, 2021

PROJECT: **Board of County Commissioners, Nassau County, FL (OWNER)**
South Amelia Island Dredging & Beach Nourishment Project

Receipt of the above NOTICE OF AWARD is hereby acknowledged this 17th day of May, 2021.

S.J. Hamill Construction Company, LLC
(CONTRACTOR)

(SIGNATURE)

NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
96135 Nassau Place, Suite 6
Yulee, Florida 32097

E-VERIFY FORM UNDER SECTION 448.095, FLORIDA STATUTES

Project Name: South Amelia Island Dredging and Beach Nourishment Project

Bid No./Contract No.: NC21-008

DEFINITIONS:

"Contractor" means a person or entity that has entered or is attempting to enter into a contract with a public employer to provide labor, supplies, or services to such employer in exchange for salary, wages, or other remuneration. "Contractor" includes, but is not limited to, a vendor or consultant.

"Subcontractor" means a person or entity that provides labor, supplies, or services to or for a contractor or another subcontractor in exchange for salary, wages, or other remuneration.

"E-Verify System" means an internet-based system operated by the United States Department of Homeland Security that allows participating employers to electronically verify the employment eligibility of newly hired employees.

Effective January 1, 2021, Contractors, shall register with and use the E-Verify System in order to verify the work authorization status of all newly hired employees. Contractor shall register for and utilize the U.S. Department of Homeland Security's E-Verify System to verify the employment eligibility of:

a) All persons employed by a Contractor to perform employment duties within Florida during the term of the contract; and

b) All persons (including subvendors/subconsultants/subcontractors) assigned by Contractor to perform work pursuant to the contract with Nassau County. The Contractor acknowledges and agrees that registration and use of the U.S. Department of Homeland Security's E-Verify System during the term of the contract is a condition of the contract with Nassau County; and

c) Should vendor become the successful Contractor awarded for the above-named project, by entering into the contract, the Contractor shall comply with the provisions of Section 448.095, Florida Statutes, "Employment Eligibility", as amended from time to time. This includes, but is not limited to, registration and utilization of the E-Verify System to verify the work authorization status of all newly hired employees. The Contractor shall also execute the attached affidavit (Exhibit "A") attesting that the Contractor does not employ, contract with, or subcontract with, an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of the contract; and

d) Contractor shall also require all subcontractors to execute the attached affidavit (Exhibit "B") attesting that the subcontractor does not employ, contract with, or subcontract with, an unauthorized alien. The Contractor shall maintain a copy of such affidavit for the duration of the contract.

CONTRACT TERMINATION:

a) If Nassau County has a good faith belief that a person or entity with which it is contracting has knowingly violated §448.09(1), Florida Statutes, the contract shall be terminated.

b) If Nassau County has a good faith belief that a subcontractor knowingly violated §448.095(2), but the Contractor otherwise complied with §448.095(2), Florida Statutes, shall promptly notify the Contractor and order the Contractor to immediately terminate the contract with the subcontractor.

c) A contract terminated under subparagraph a) or b) is not a breach of contract and may not be considered as such.

d) Any challenge to termination under this provision must be filed in the Circuit Court no later than twenty (20) calendar days after the date of termination.

e) If the contract is terminated for a violation of the Statute by the Contractor, the Contractor may not be awarded a public contract for a period of one (1) year after the date of termination.

EXHIBIT "A"

CONTRACTOR E-VERIFY AFFIDAVIT

I hereby certify that SJ Hamill Construction Company, LLC (Contractor Company Name) does not employ, contract with, or subcontract with an unauthorized alien, and is otherwise in full compliance with Section 448.095, Florida Statutes.

All employees hired on or after January 1, 2021 have had their work authorization status verified through the E-Verify system.

A true and correct copy of SJ Hamill Construction Company, LLC (Contractor Company Name) proof of registration in the E-Verify system is attached to this Affidavit.

Print Name: William D. Spielvogel

Date: 5/18/2021

STATE OF ~~FLORIDA~~ South Carolina

COUNTY OF Charleston

The foregoing instrument was acknowledged before me by means of ☒physical presence or ☐online notarization, this 5/18/21 (Date) by William Spielvogel (Name of Officer or Agent, Title of Officer or Agent) of SJ Hamill Construction Company, LLC (Name of Contractor Company Acknowledging), a South Carolina (State or Place of Incorporation) Corporation, on behalf of the Corporation. He/She is personally known to me or has produced _____ as identification.

Notary Public

Julie E. Kelly

Printed Name

My Commission Expires: 2/27/2028

Official Website of the Department of Homeland Security

E-Verify

Welcome **William Spielvogel** | Company **S J HAMILL** | User ID **WSPI4650**

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EXHIBIT "B"

SUBCONTRACTOR E-VERIFY AFFIDAVIT

I hereby certify that Marinex Construction of North Carolina, Inc. (Subcontractor Company Name) does not employ, contract with, or subcontract with an unauthorized alien, and is otherwise in full compliance with Section 448.095, Florida Statutes.

All employees hired on or after January 1, 2021 have had their work authorization status verified through the E-Verify system.

A true and correct copy of Marinex Construction of North Carolina Inc (Subcontractor Company Name) proof of registration in the E-Verify system is attached to this Affidavit.

_____

Print Name: Kelly J. Albers

Date: 5/18/2021

STATE OF ~~FLORIDA~~ South Carolina

COUNTY OF Charleston

The foregoing instrument was acknowledged before me by means of ☒physical presence or ☐online notarization, this 5/18/21 (Date) by Kelly J. Albers (Name of Officer or Agent, Title of Officer or Agent) of Marinex Construction of North Carolina Inc (Name of Contractor Company Acknowledging), a South Carolina (State or Place of Incorporation) Corporation, on behalf of the Corporation. He/She is personally known to me or has produced _____ as identification.

_____

Notary Public

Julie E. Kelly

Printed Name

My Commission Expires: 2/272028

E-Verify

Welcome
Julie Kelly

Company
Marinex Construction of North Carolina, Inc.

User ID
JKEL1198

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Nassau County Board of County Commissioners
on behalf of the
South Amelia Island Shore Stabilization – M.S.B.U.
96135 Nassau Place
Yulee, FL 32097

INVITATION FOR BIDS

#NC21-008

SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT

BID & CONTRACT DOCUMENTS
TECHNICAL SPECIFICATIONS & REQUIREMENTS

Issue Date: January 19, 2021

Project Engineer:
Olsen Associates, Inc.
2618 Herschel St.
Jacksonville, FL 32204
904.387.6114
Email: abrowder@olsen-associates.com

NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
Office of Management and Budget
96135 Nassau Place, Suite 2
Yulee, Florida 32097
Phone: (904) 530-6040
Email: procurement@nassaucountyfl.com

TO: All Proposers
FROM: J. Brian Simmons, Procurement Manager
SUBJECT: Addendum #4
Invitation to Bid, Number NC21-008
SAISSA Dredging and Beach Renourishment
February 19, 2021

REMINDER: This addendum must be acknowledged in your submittal.

Failure to comply may result in disqualification of your submittal.

This addendum is hereby incorporated into the solicitation documents of the project referenced above. The following items are clarifications, corrections, additions, deletions, and/or revisions to and shall take precedence over the original documents.

REVISIONS:

1. Form 1335: Equipment Schedule and Dredge Certification, Section 3000, 16.10

   The qualifications for acceptable dredge plant are hereby revised to be:

   Proposed dredge plant shall be ocean-certified by the American Bureau of Shipping and have a current Certificate of Inspection from the U.S. Coast Guard for operations seaward of the Boundary Line at the project site. Copies of these current inspections and certificates shall be provided at the time of bid.

   Other attendant floating equipment, such as booster barges, and other equipment not subject to U.S. Coast Guard inspection, shall provide the marine surveyor inspection report(s) described in the Instructions to Bidders and the Specifications.

CLARIFICATIONS:

Regarding permits and the permitting schedule, a copy of the DRAFT State permit from the Florida Department of Environmental Protection (FDEP) is included herein as an attachment. Following the mandatory 30-day advertisement period for that permit, the Final FDEP is expected by March 22, 2021. The corresponding USACE permit has been drafted, but a copy is not yet available for dissemination. It is expected that the USACE permit will be issued shortly after the FDEP permit, and will rely on pre-existing programmatic Biological Opinions, as suggested in Appendix A of the bid documents. Accordingly, the Notice of Award shall be issued upon receipt of the both permits. The Notice of Award date is thus set to be on or about March 29, 2021 (unchanged from Addendum #2).

Final FDEP Permit included herein in Appendix A, issued 19 March 2021.

ATTACHMENTS:

The DRAFT Joint Coastal Permit #0187721-013 from the Florida Department of Environmental Protection was issued on February 18, 2021. A copy of the DRAFT FDEP permit is attached. Particular attention is directed to the sea turtle and shorebird monitoring requirements, and the turbidity monitoring requirements.

NOTE: You are required to acknowledge receipt of this addendum in your submittal.

End of Addendum #4

NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
Office of Management and Budget
96135 Nassau Place, Suite 2
Yulee, Florida 32097
Phone: (904) 530-6040
Email: procurement@nassaucountyfl.com

TO: All Proposers
FROM: J. Brian Simmons, Procurement Manager
SUBJECT: Addendum #3 to Correct Addendum #2
Invitation to Bid, Number NC21-008
SAISSA Dredging and Beach Renourishment
February 17, 2021

REMINDER: This addendum must be acknowledged in your submittal.

Failure to comply may result in disqualification of your submittal.

This addendum is hereby incorporated into the solicitation documents of the project referenced above. The following items are clarifications, corrections, additions, deletions, and/or revisions to and shall take precedence over the original documents.

CHANGES IN TIMING:

1. Change to Number of Days for Sand Placement.
   Referring to Item 11 of the Specific Instructions to Bidders, the number of days from the initiation of sand placement to Substantial Completion is adjusted to 135 days.

NOTE: You are required to acknowledge receipt of this addendum in your submittal.

End of Addendum #3

NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
Office of Management and Budget
96135 Nassau Place, Suite 2
Yulee, Florida 32097
Phone: (904) 530-6040
Email: procurement@nassaucountyfl.com

TO: All Proposers
FROM: J. Brian Simmons, Procurement Manager
SUBJECT: Addendum #2
Invitation to Bid, Number NC21-008
SAISSA Dredging and Beach Renourishment
February 17, 2021

REMINDER: This addendum must be acknowledged in your submittal.

Failure to comply may result in disqualification of your submittal.

This addendum is hereby incorporated into the solicitation documents of the project referenced above. The following items are clarifications, corrections, additions, deletions, and/or revisions to and shall take precedence over the original documents.

QUESTIONS AND ANSWERS, INCLUDING PRE-BID CONFERENCE QUESTIONS:

1. Does the surveyor need to be a third party?
   No. The responsible surveyor must be licensed in the State of Florida and have demonstrable hydrographic surveying experience, as further described in the Contract Specifications.

2. What are the directions to the access point(s)?
   From Jacksonville, FL (south of site) - from I-95 take Exit #358A (Hecksher Drive, Route 105) eastbound. Route 105 transitions from Hecksher Drive to Florida Route A1A. Proceed to Little Talbot Island, to Big Talbot Island, to Nassau Sound Bridge, to Amelia Island. Project lies along the southern 3.6 miles of the island. 28 miles from exit #358A

   From Georgia (north of site) - from I-95, take Exit #373 (Callahan, Fernandina Beach) to Route 200 / FL A1A. Turn left (eastbound) on 200/A1A. Proceed 11.4 miles to Amelia Island Parkway, turn right on Amelia Island Parkway, proceed 6 miles southward to project area's northern limits (Burney Park).

   Specific access sites, from North to South project limits:

   North Access for viewing: Along FL A1A (aka 1st Coast Highway), turn eastbound on Burney Road to Burney Park parking area and walkover. Burney Park is at the north end of the fill limits at FDEP range marker R-59. The Lewis Street access is just north of Burney Road.

   Mid-project pedestrian access: Along FL A1A, 2.2 mile south of Burney Road, lies the South County Beach Access parking lot, immediately on the east side of A1A. Access footpath will lead to center of project limits between R-70 and R-71.

South-project access: Along FL A1A, 3.2 mile south of Burney Road, lies the entrance to the parking lots of Amelia Island State Park on the east side of A1A. Access footpath will lead to center of project limits between R-70 and R-71.

The Park entrance lies 0.25 miles north of the A1A bridge over Nassau Sound.

A public boat ramp lies on Big Talbot Island, just south of the A1A bridge on the west side of A1A.

3. Are dedicated security/safety personnel required?
   The Contractor is responsible for maintaining the security of the work area and excluding the public from the immediate work zone for safety. If the staffing level to maintain safety security is deemed insufficient by the Engineer or Engineer's Representative, the Contractor shall provide additional security as needed.

4. Is the cutter head allowed to disturb sediment below the 1-foot limit?
   Per item 26.5 of the Contract Specifications: it is acknowledged that sediment disturbance in the borrow area, including the side slope areas, may extend below the allowable post-dredge elevations shown on the Construction Plans, but shall be the minimum required to achieve the permitted final excavation depths, including the permitted side slope dimensions, shown on the drawings.

5. Will you provide a copy of the Pre-Bid Conference slide deck?
   Yes; it is included in this Addendum.

6. Where should the submerged pipe come ashore?
   As depicted in the Contract Drawings, no project-term shore-pipe shall be placed on the Amelia Island State Park property, and the submerged pipeline should come ashore in the vicinity of the detached breakwater just north of the Park boundary. It is acknowledged that shore-pipe must be extended onto Park property in the short-term to complete the southern end of the fill in Acceptance Section No. 1.

7. Do we plan to award the Base Bid or the Alternate?
   Owner desires to award the Base Bid.

8. What modifications might be made to the borrow area?
   The Owner and Engineer intend for the channel-like borrow area to be excavated along the entire length of the borrow area. As determined by the preconstruction survey, the overall width and/or the dredge elevation may be slightly narrowed or shallowed to achieve the desired project volume and leave the borrow area open for tidal flow. The first option will be to evaluate narrowing of the channel width. If needed, these changes shall be made by the Engineer with input from the Contractor in the development of the required dredge plan.

9. If a slump occurs during dredging, will it have to be corrected?
   No. The cutterhead of the dredge may excavate material up to the horizontal limits depicted in the plan views of the Contract Drawings. Accordingly, it is understood that some slumping of the borrow area sidewalls may subsequently occur just outside those limits.

10. If the beach fill pay volume needs to be modified, what changes in the fill dimensions will be made?
    If the fill pay volume needs to be modified, changes will be made in the cross-shore width of the fill berm. The alongshore length of the project will not be modified. Referring to the Contract Drawings, such adjustments will be made by narrowing or widening the upper berm width along the +10-ft NAVD88 elevation to adjust the fill volume of the section in a smooth and uniform alongshore manner.

11. What is the estimated project value?
    $18,000,000 for the Base Bid.

12. Does the dredge have to be US Coast Guard certified?
    Details for the required certification(s) of the dredge and affiliated equipment are provided in the Instructions to Bidders (Item/Form 1335). This includes instructions regarding floating plant that may not be subject to USCG certification. All bidders must provide references demonstration satisfactory experience in completing the work as specified.

13. Please provide templates for Alternate 1, should it be awarded.
    A template is not available as the Base Bid is anticipated to be the primary award. Further, any modifications would involve a uniform pull back on beach width across the board.

14. Contract Times states that Substantial Completion shall be within 170 days of NTP and Final Acceptance shall be within 200 days of NTP. Will Liquidated Damages be applied after Substantial Completion or Final Acceptance?
    As described in Section 4.03A of the Draft Agreement, liquidated damages shall apply after the Substantial Completion date. See adjustment in Substantial Completion date, below.

15. If unsuitable material is encountered is a preventative measure dredging at a shallower depth? If shallower dig depths are needed will the contractor be required to leave the required contract depth in those areas?
    Dredging at a shallower depth is an acceptable preventative measure. In such instance, the Contractor is not required to leave the required contract depth. If unsuitable materials are encountered, the Contractor shall immediately notify the Engineer of such occurrence, and a suitable adjustment shall be made the dredge plan. The Owner and Engineer intend for the channel-like borrow area to be excavated along the entire length of the borrow area.

16. Owner May Terminate For Convenience states that upon seven (7) days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. Can the written notice be extended to 30 days to allow the contractor additional time for planning purposes?
    Bidders can disregard Item 14.03 and shall consider it as if deleted from the original documents.

17. In the General Instructions to Bidders the owner stipulates that bond should be good for an additional one hundred and ninety days but has 90 days in parentheses. Do the bond need to be good for 90 days?
    Ninety (90) days is correct. One hundred and ninety is an error and shall be disregarded in lieu of the timeframe stated here.

18. Correction Period states the requirement for 1 year correction period for "any Work or materials found to be defective, incomplete, or not in accordance with the Contract Documents". Please confirm that this obligation is not applicable to any post-acceptance (i) beach erosion, or (ii) damage of the accepted Works by others.
    Correct.

19. Are we paid to the tolerance or prescribed grade?
    Payment shall be to the prescribed grade. Item 28.5 is hereby amended as follows: "A tolerance of five-tenths (0.5) of one (1) foot above the prescribed berm grade and slopes, above the wave zone (above -3.1 ft NAVD88), will be permitted in the final surface. Any material placed above the prescribed tolerance may be left in place at the discretion of the Engineer; however, this material will not be included in the pay quantities."

20. Can compensating slopes be utilized for material at the toe of fill?
    No application of compensating slopes will be applied to the calculation of pay fill volume. Please refer to Item 28.6 for an allowance for an adjustment to the seaward slope of the fill template.

21. Will we be required to contract for sea turtle nest monitoring?
    Yes. As described in the Contract Specifications and discussed at the pre-bid conference, The Contractor shall contract with the FWC-permitted sea turtle nest permit holder, Amelia Island Seat Turtle Watch (AISTW) to provide the required monitoring services. Contact information is provided in the pre-bid conference presentation. Similarly, the Contractor shall contract with a qualified shorebird monitoring service to provide those required services (reference Section 3400, Item 34.3).

22. Will the County extend the substantial and final completion dates by 45 days?
    Please see "Changes in Timing," below.

CHANGES IN TIMING:

1. Change to Notice of Award date.
   Based upon the current permitting scheduled, the Notice of Award is now intended to be issued on or after March 29, 2021.

2. Change to Substantial Complete Date and Final Acceptance Date.
   The date of Final Acceptance is hereby adjusted to be December 15, 2021. Referring to Item 11 of the Specific Instructions to Bidders, Anticipated Schedule, the date of Final Acceptance is adjusted as above.

3. Change to Number of Days for Sand Placement.
   Referring to Item 11 of the Specific Instructions to Bidders, the number of days from the initiation of sand placement to Substantial Completion is adjusted to 120 days.

ATTACHMENTS:

1. Slide presentation from Pre-Bid Conference.

NOTE: You are required to acknowledge receipt of this addendum in your submittal.

End of Addendum #2 **THIS IS THE FINAL ADDENDUM**

NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
Office of Management and Budget
96135 Nassau Place, Suite 2
Yulee, Florida 32097
Phone: (904) 530-6040
Email: procurement@nassaucountyfl.com

TO: All Proposers
FROM: J. Brian Simmons, Procurement Manager
SUBJECT: Addendum #1
Invitation to Bid, Number NC21-008
SAISSA Dredging and Beach Renourishment
January 27, 2021

REMINDER: This addendum must be acknowledged in your submittal.

Failure to comply may result in disqualification of your submittal.

This addendum is hereby incorporated into the solicitation documents of the project referenced above. The following items are clarifications, corrections, additions, deletions, and/or revisions to and shall take precedence over the original documents.

CLARIFICATION

The following is a clarification to Paragraph 10 ("Licenses") of Section 1110 ("Specific Instructions"):

All potential respondents are advised that, pursuant to the requirements of F.S. 489.131, contractors submitting a response must have a current, valid Florida license and must also include evidence of the same in their response in order for it to be considered. Respondents failing to do so may be disqualified.

ATTACHMENTS:

N/A

NOTE: You are required to acknowledge receipt of this addendum in your submittal.

End of Addendum #1

TABLE OF CONTENTS

SOUTH AMELIA ISLAND, NASSAU COUNTY, FLORIDA

INVITATION TO BID - OVERVIEW

The Nassau County, FL, Board of County Commissioners, acting as the head of the South Amelia Island Shore Stabilization – MSBU ("Owner"), is accepting sealed bids for:

SOLICITATION NO. NC21-008 - SOUTH AMELIA ISLAND
DREDGING & BEACH NOURISHMENT PROJECT

BID SUBMITTAL DUE DATE:

WEDNESDAY, FEBRUARY 24, 2021 AT 4:00 PM

Pursuant to General Statutes of Ordinance 2009-09, Nassau County, FL, Purchasing Policy, separate sealed Bids for the construction of a dredging and beach nourishment project for the Nassau County Board of County Commissioners will be received at the offices of John A. Crawford, Ex-Officio Clerk, Nassau County Judicial Annex, 76347 Veterans Way, Yulee, Florida 32097, on or before, but not later than 4:00 pm. (Nassau County time) on Feburary 24, 2021, and on February 25, 2021 at 10:00 am (Nassau County time), or shortly thereafter, bids will be publicly opened by the County. Any Bids received after 4:00 pm will be returned unopened.

Documents for this Invitation to Bid ("ITB") are available through DemandStar: www.demandstar.com and the County's Procurement Department, Mr. Brian Simmons, via email bsimmons@nassaucountyfl.com.

GENERAL PROJECT DESCRIPTION

The County is currently seeking sealed bids from dredging contractors to excavate, transport, place, and shape up to 1,800,000 cubic yards of beach-quality sand from an offshore borrow area located within the ebb shoal of Nassau Sound, off the south tip of Amelia Island, FL, along approximately 17,100 ft of the Atlantic Ocean shoreline of south Amelia Island along First Coast Highway (A1A), Nassau County, Florida, to renourish the South Amelia Island Shore Stabilization Project. The Successful Bidder (Contractor) shall provide all materials, equipment, and labor to complete the work described above, and shall perform or provide all pavement and property restoration (as applicable), surveys, environmental monitoring, safety and security measures, permit compliance, tilling and final grading to the requirements indicated in the Contract Drawings and Specifications.

Continued…

MINIMUM QUALIFICATIONS

The Successful Bidder must:

A: Provide a dredge (and booster if necessary) that meets the certification and/or inspection requirements listed herein, as documented in writing at the time of the bid.

B: Demonstrate the capability to excavate sand and place it on the project shorelines at a rate of at least 15,000 cy/day, on average, measured on the beach over the course of the Project.

C: Provide three references for beach nourishment dredging construction projects of similar size and scope constructed by the Bidder within the last five (5) years. Projects similar in size and scope shall be projects involving beach placement of dredged material along the open shorelines of the Atlantic Ocean or Gulf of Mexico. Reference information must be current with the name and telephone number of a responsible entity for each project cited.

NON-MANDATORY PRE-BID MEETING

A **NON-MANDATORY** pre-bid meeting is scheduled for Tuesday, February 9, 2021 at 10:00 a.m. Nassau County time via Microsoft Teams by going to:

https://rebrand.ly/74xat

COMMUNICATIONS AND INQUIRIES

Questions or information requests for clarification regarding this ITB must be submitted via email to procurement@nassaucountyfl.com no later than 4:00 p.m. Nassau County time, Friday, February 12, 2021. The last day for the County to issue any addenda is Tuesday, February 16, 2021 at 4:00 p.m. Nassau County time.

ITB DOCUMENTS INDEX

1100 GENERAL INSTRUCTIONS TO BIDDERS
BID NO. NC21-008

1. SUBMISSION OF BID

1.1 ITB documents are available through www.demandstar.com. The bidder's sealed bid must be received by the County Clerk's Office on or before Wednesday, February 24, 2021 by or before 4:00 PM Nassau County time according to the time clock at the County. A bidder may not submit a proposal via telephone, facsimile, electronic mail, or any other means except as provided for herein.

If the bidder elects to mail in its sealed bid, the bidder must allow sufficient time to ensure the County Clerk's receipt of the proposal by the bid due date and time. Regardless of the form of delivery, it is the bidder's responsibility to ensure that the bid arrives at the County Clerk's address (See Overview) no later than 4:00 p.m. Nassau County time on the bid due date.

Bids must be delivered in sealed envelopes with the following information clearly provided on the front of the envelope: bidder's name and address; "BID NO. NC21-008 SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT." The bids must be submitted with one (1) original marked "ORIGINAL", and one (1) electronic copy of the bid in .pdf format on a USB flash drive.

Submitted bids shall remain in effect for one hundred ninety (90) days after the bid opening and may not be withdrawn after the bid closes.

1.2 All bids shall be opened in public by the Clerk (or their designee) at the specified time and place.

1.3 A bidder may withdraw a bid any time prior to the public opening upon delivery of a written request to the Procurement Manager.

1.4 A bid must contain the signature of bidder's authorized representative in the space provided. All corrections made by bidder to its bid must be initialed by same. If the bid is made by a partnership, corporation, joint venture, or team, the name and address of the partnership or corporation or all members of the joint venture or team shall be shown together with the names and addresses of the partners or officers of all entities. If the bid is made by a partnership, it must be acknowledged by one of the partners; if made by a corporation, by one of the officers; if made by a joint venture or team, by one officer of each participating entity.

1.5 It is the responsibility of the bidder to ensure all bids are identical (original and digital). Bidders submitting bids found to be inconsistent are subject to disqualification.

1.6 The County assumes no responsibility for bids received after the advertised bid opening or at any office or location other than that specified herein, whether due to mail delays or other reasons outside the County's immediate control.

1.7 When any period of time is referred to in this ITB or the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day acknowledged as a County holiday, such day will be omitted from the computation. A calendar day of 24 hours measured from midnight to the next midnight will constitute a day.

1.8 All submitted material from a bidder will be subject to Florida's Public Records Law. Bidder acknowledges that all information contained within its bid is subject to disclosure under the

State of Florida's Public Records Law. No information should be labeled confidential unless exempted by Florida Statute. Pursuant to Section 119.071(1)(b)2., Florida Statutes (F.S.), bids may be exempt from public record for thirty (30) days after opening the bids or until such time as the County provides notice of an intended decision, whichever comes first. A list of bidders will be uploaded to www.DemandStar.com and posted on the County's public bulletin board. A copy will be furnished upon written request with an enclosed, stamped, self-addressed envelope. Non-exempt bid files may be examined during normal working hours by appointment. A list of bidders will not be provided by telephone.

1.9 A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, F.S., for CATEGORY TWO for a period of thirty-six (36) months from the date of being placed on the convicted vendor list.

1.10 Persons with disabilities requiring accommodations in order to participate in this program or activity should contact the office of the Ex-Officio Clerk to the Board of County Commissioners at (904) 548-4660 or Florida Relay Services at (800) 955-8770 (v) or (800) 955-8771 (TDD). Contact must be made a minimum of seventy-two (72) hours in advance if requiring such accommodations.

2. BID EVALUATION

2.1 Bids shall be evaluated based on all submitted information and pursuant to the criteria stated in the Specific Instructions which are provided herein. The County may conduct such investigations as deemed necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications, and financial ability of the bidders, proposed subcontractors (if any), and other persons and organizations to do the work in accordance with the ITB Documents to the County's satisfaction within the prescribed time. The County reserves the right to reject bids based upon insufficient qualifications, as determined by the County.

2.2 The County reserves the right to reject any or all bids, in whole or in part, for any reason whatsoever, and to re-let the ITB at the County's discretion. The County reserves the right to waive and/or accept minor irregularities when, in the sole opinion of the County, such waiver or acceptance is deemed to be in the best interest of the County.

2.3 Only additional terms or conditions necessary for clarification of bid requirements will be evaluated or considered. After the bid opening, the County may request such additional information as required to award the ITB. No deviations from specifications will be accepted; no alternate bids will be accepted unless requested in the specification or ITB form. Such bids will be deemed non-responsive.

2.4 A responsible and responsive bid will be considered as one which meets or exceeds the ITB specifications and which is submitted by a bidder capable of performing the requirements as stated in the ITB documents. General criteria used by the County for evaluating "responsible and responsive" bidders include, but are not limited to:

2.4.1 The ability, capacity, and skill of the bidder to perform the contract or provide the service required;

2.4.2 Whether the bidder can perform the contract or provide the service promptly, or within the time specified, without delay or interference;

2.4.3 The character, integrity, reputation, judgment, experience, and efficiency of the bidder;

2.4.4 The bidder's quality of performance of previous contracts or services;

2.4.5 The previous and existing compliance by the bidder with laws and ordinances relating to the contract or services;

2.4.6 The sufficiency of the financial resources and ability of the bidder to perform the contract or provide the service;

2.4.7 The quality, availability, and adaptability of the goods or services proposed by bidder to the particular use required; and

2.4.8 The number and scope of conditions attached to the submittal by bidder.

The bidder's ability to meet these requirements shall be solely by the determination of the County. An "unresponsive bidder" is one who fails to attend a mandatory pre-bid meeting or other mandatory meetings as required by the ITB Documents; fails to specifically include information required by the specifications; submits a bid that is not signed by the bidder; submits a bid that does not include information specifically required in the ITB Documents; or is otherwise unqualified. Lack of responsiveness shall solely be the determination of the County.

2.5 Bidder is responsible for accuracy of its bid.

2.6 Following the submittal of the responses to this ITB, the County will review the responsive bids. The recommendation of award will be forwarded to the Board of County Commissioners for review and final decision.

3. DISQUALIFICATION OF BIDDERS

Any cause including, but not limited to, the following may be considered as sufficient for the disqualification of a bidder and the rejection of its submittal:

3.1 Submission of more than one bid for the same work by an individual, firm, partnership, or corporation under the same or different names.

3.2 Evidence of collusion among bidders, or previous participation in collusive bidding or proposing on work for the County.

3.3 Any material misrepresentation.

3.4 Uncompleted work for which the bidder is committed by contract which, in the judgment of the County, might hinder or prevent the prompt completion of the work under this ITB if awarded to bidder.

3.5 Inconsistencies between the submittals provided from the bidder.

3.6 Violations of the cone of silence as provided for herein;

3.7 Familial relation with the County purchasing agent (County Manager or Procurement Manager) or public officer (County Commissioner) as provided for in Section 112.313(3), F.S.; or

3.8 Conviction for a public entity crime as provided for in Section 287.133, F.S.

The above listed causes are not an exclusive list, and the County may disqualify bidders for other good causes.

4. INTERPRETATIONS OF DATA

No interpretation of data including, but not limited to, surveys, plans, drawings, test results, and similar materials will be made to any bidder, except for what is provided in the ITB Documents or by written addendum.

5. BIDDER COMMUNICATION AND/OR INQUIRIES

The bidder shall review this competitive solicitation in its entirety to determine whether the Scope of Work, conditions and requirements are clearly stated. If the bidder has any questions regarding this competitive solicitation, the bidder must submit such inquiries and requests for clarification via email only to the County's Procurement Manager at bsimmons@nassaucountyfl.com. These inquiries or requests for clarification must provide the questions along with the relevant Section(s), Subsection(s), Paragraph(s), and page number(s) of the competitive solicitation being questioned by the bidder.

The County will consider only those communications and/or inquiries submitted in writing and received by the County's Procurement Division on or before Tuesday, February 12, 2021 at 4:00 PM local time (the "Inquiry Deadline Date").

The County will consider the bidder's lack of inquiries or requests for clarification prior to the Inquiry Deadline Date to constitute the bidder's acceptance of all of the conditions and requirements as stated in this ITB and any amendments thereto. Unless the County's Procurement Manager specifically requests the bidder to provide additional communications, the County may not accept or consider any of the bidder's written or other communications and/or inquiries received between the Inquiry Deadline Date and the posting of an award, if any, under this competitive solicitation.

To the extent the County determines, in its sole discretion, to respond to any communications, inquiries or requests for clarification prior to the Inquiry Deadline Date, the County's response will be made in a written addendum to this ITB and posted on DemandStar.

5.1 Addenda: The County's Procurement Manager or designee will distribute any addenda via DemandStar. The bidder's authorized representative must acknowledge receipt of each addendum issued. All bidders, vendors, and known interested vendors, are responsible for checking DemandStar for addenda in order to verify whether any changes have been made to the ITB. Bidders are cautioned that any oral or written representation made by any person that appears to change materially any portion of the competitive solicitation documents shall not be relied upon unless subsequently ratified by a written addendum to this ITB issued by the Procurement Manager.

6. EQUAL OPPORTUNITY/AFFIRMATIVE ACTION

The County is an equal opportunity/affirmative action employer. The County is committed to equal opportunity employment efforts and expects firms that do business with the County to have a affirmative action program.

7. WOMEN/MINORITY BUSINESS ENTERPRISE OUTREACH

The County hereby notifies all potential bidders that veteran-, woman-, and minority-owned businesses are to be afforded a full opportunity to participate in any procurement by the County and will not be subject to discrimination on the basis of race, color, sex or national origin.

8. BIDDER AFFIRMATION

By submitting a bid, the bidder affirms that the bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation, and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; the bidder has not directly or indirectly induced or solicited any other person to submit a false or sham bid; the bidder has not solicited or induced any person, firm, or corporation to refrain from submitting a bid; and the bidder has not sought by collusion to obtain any advantage over other persons or over the County.

9. BIDDER DEVELOPMENT COSTS

Neither the County nor its representative(s) shall be liable for any expenses incurred in connection with preparation of a response to the ITB. Bidders should prepare their responses simply and economically, providing a straightforward and concise description of the bidder's ability to meet the requirements of the ITB.

10. CODE OF ETHICS

If any bidder violates or is a party to a violation of the Code of Ethics of Nassau County, FL, or the State of Florida, with respect to this ITB, such firm may be disqualified from performing the work described in this ITB or from furnishing services for which the bid is submitted, and shall be further disqualified from bidding on any future requests for work, goods, or services for the County.

11. CONFLICT OF INTEREST

Subject to the provisions of Chapter 112, F.S., all bidders must disclose with their bid the name of any officer, director, agent, or shareholder who is also an employee of the County or a relative thereof. All bidders must disclose the name of any County employee who owns, directly or indirectly, an interest of five percent (5%) or more in the bidder's firm or any of its branches.

12. DISCLOSURE - ADVISORY BOARD MEMBER OF COUNTY

12.1 Sections 112.313(3) and 112.313(7), F.S., prohibit an advisory board member of the County from holding any employment or contractual relationship with any business entity doing business with the County. Section 112.313(12), F.S., provides that an advisory board member will not be in violation of the prohibition if certain conditions are met, including the filing of a disclosure form with the Supervisor of Elections, which is the sole responsibility of the bidder and must be filed prior to or at the time of submission of the bid. A copy of the filed disclosure form shall be included as part of the bidder's response.

12.2 Advisory board member is required to, prior to or at the time of the submissions of the bid, file a statement with the Supervisor of Elections, disclosing his or her interest and the nature of the intended business.

12.3 Advisory board member, or his or her spouse or child is required to have in no way used or attempted to use his or her influence to persuade a member of the County or any of its personnel to enter into such a contract other than by the mere submission of the bid.

12.4 Advisory board member, or his or her spouse or child is required to have in no way participated in the determination of the bid specifications or the determination of the responsible and responsive bidder.

13. CONE OF SILENCE

After the issuance of the ITB by the County, bidders and their representatives shall not contact, communicate with, or discuss any matter relating in any way to this ITB with the County, including any Commissioner, the County's project Engineer (or consultant) for this project, or any employee of the County other than the County's Procurement Manager (or designee) unless otherwise directed on the Invitation to Bid Overview of this ITB. This prohibition begins with the issuance of the ITB and ends upon award of the resulting contract. Such communications initiated by a bidder shall be grounds for disqualifying the offending bidder from consideration for award under this ITB and/or potentially any future procurement for goods or services with the County.

14. COPYRIGHT

The awarded bidder shall irrevocably transfer, assign, set over, and convey to the County all rights, title, and interest, including the sole exclusive and complete copyright interest, in any and all copyrightable works created pursuant to the contract awarded under this ITB. The bidder further agrees to execute such documents as the County may request to affect such transfer or assignment. Further, the bidder agrees that the rights granted to the County by this paragraph are irrevocable. The bidder's remedy in the event of termination of or dispute over any agreement entered into as a result of this solicitation shall not include any right to rescind, terminate, or otherwise revoke or invalidate in any way the rights conferred pursuant to the provisions of this paragraph. Similarly, no termination of any agreement entered into as a result of this solicitation shall have the effect of rescinding, terminating, or otherwise invalidating the rights acquired pursuant to the provisions of this paragraph.

15. INSURANCE

15.1 Within ten (10) days of the posted date of Notice of Award, the apparent qualified Successful Bidder shall submit to the County Attorney (or designee) a copy of its current insurance coverage with endorsements, as evidenced by certificates of insurance with an insurance carrier approved and licensed by the Insurance Department of the State of Florida.

15.2 Nassau County, FL, and the Engineer, Olsen Associates, Inc. (Engineer), shall be named as additional insureds, along with any additional entities specified in the General Conditions of the Contract. The insurer shall agree to waive all rights of subrogation against the County, Engineer, and any additional entities specified in the General Conditions of the Contract

15.3 Bid award will be subject to proof of insurance, in the form of certificates of insurance, being provided to the County within ten (10) days of the posted date of the Notice of Award, and subject to acceptance of the types and amounts of coverage by County's Procurement Manager.

15.4 The certificates of insurance shall provide thirty (30) days written notice for any change, cancellation, or non-renewal.

15.5 Insurance coverage required from the apparent qualified Successful Bidder shall be provided by or on behalf of all subcontractors to cover their operations performed. The selected bidder shall be held responsible for any modifications, deviations, or omissions in these insurance requirements as they apply to subcontractors.

15.6 Proof of insurance with endorsements shall be sent to:

Nassau County
Attention: Insurance Certificates
Nassau County Attorney
96135 Nassau Place
Suite 2
Yulee, Florida 32097

NOTE: Please affix ITB number and project title on certificate.

The acceptable form of the certificate of insurance shall be the industry standard ACORD certificate.

15.7 Once received by the County, the Certificate of Insurance and endorsements shall accompany the executed contract.

15.8 The specific level and type of insurance coverage required of bidders is set forth in the General Conditions associated with the draft contract attached at the end of this ITB document.

16. NEGOTIATION

16.1 The County shall negotiate a contract with the lowest responsible and responsive bidder for the subject services at compensation which the County determines is fair, competitive, and reasonable. This ITB process is conducted pursuant to Chapter 38 of the County's Code of Ordinances and the Finance Department's administrative procedures.

16.2 Preference may be given to bidders with drug-free workplace programs whenever identical submittals (quality, price, and service) are submitted; bidder shall certify that its program complies with the requirements of Section 287.087, F.S. Information about the program shall be included in the bid submittal.

16.3 At the sole discretion of the County, payment terms and other consequential information may also be utilized in resolving apparent tie bids.

16.4 The County reserves the right to accept or reject any or all bids, to waive any informalities or minor irregularities in the ITB process, and to postpone the award of the contract for a period of time not to exceed ninety (90) days from the ITB opening date.

16.5 Negotiation and award shall further be based on the criteria stated in the Specific Instructions to Bidders and County Purchasing Manual.

17. PRICES

Firm prices shall be bid. Unit prices will prevail on the submitted Bid Forms. Unit prices will be utilized to adjust the total compensation due to the successful bidder based on actual quantities provided as part of the work and verified by the County.

18. ESTIMATED QUANTITIES

When applicable, and unless specifically addressed in the Specific Instructions, the estimated quantities of work to be done and materials to be furnished under this ITB are to be considered as approximate only and are to be used solely for the comparison of proposals. The County does not expressly nor by implication represent that the actual quantities involved will correspond exactly therewith, nor shall the proposer plead misunderstanding or deception because of such estimate of quantities. Payment to the awarded proposer will be made only for the actual quantities of work performed and material furnished in accordance with the contract and it is understood that the quantities may be changed as provided in the ITB Documents without in any way invalidating any of the unit or lump sum prices.

19. MISTAKES

Bidders are required to examine the ITB and all other Contract Documents. Failure to do so will be at bidder's risk. In case of a mistake in extension, the unit price will govern. All corrections made by bidder to any bid entry must be initialed and must be submitted before the bid opening.

20. TAXES

Goods and services sold to the County under this ITB and the ensuing contract shall be less all federal, state, and local taxes, in accordance with the tax-exempt status of the County.

21. WARRANTY OF TITLE

The awarded bidder warrants and guarantees that title to all work, materials, and equipment covered by any invoice or application for payment will pass to the County, no later than the time of payment, free and clear of all liens.

1110 SPECIFIC INSTRUCTIONS TO BIDDERS
BID NO. NC21-008

1. BACKGROUND

The Nassau County, FL, Board of County Commissioners, acting as the head of the South Amelia Island Shore Stabilization Municipal Services Benefit Unit (MSBU), maintains a 3.0-mile engineered beach project along the Atlantic Ocean shoreline in Nassau County, FL. Through the MSBU, the County cooperates with the Florida Park Service to assist the Park Service in the maintenance of the adjoining 0.6 miles of engineered beaches in Amelia Island State Park. The engineered beach nourishment project is maintained principally through periodic beach nourishment to combat chronic beach erosion along the project limits. Chronic erosion of the engineered beach has prompted the need to place up to 1,800,000 cubic yards of beach-compatible sand from a borrow area identified upon the Nassau Sound ebb shoal along the project limits to protect the existing vegetated dunes and upland infrastructure and provide additional storm protection and recreational amenity space.

Time is of the essence in performing the dredging and beach nourishment work. The intent of the project is to rapidly excavate the borrow area to the fullest extent possible given the design and permit limits, and to place the material along the full alongshore extent of the beachfill limits indicated in the Construction Plans and as modified by the Engineer using the pre-construction survey data.

2. SCOPE OF WORK

The County (“Owner”) is currently seeking sealed bids from dredging contractors to excavate, transport, place, and shape 1,800,000 cubic yards of beach-quality sand from an offshore borrow area located within the ebb shoal of Nassau Sound, off the south tip of Amelia Island, FL, along approximately 17,100 ft of the Atlantic Ocean shoreline of south Amelia Island along First Coast Highway (A1A), Nassau County, Florida, to renourish the South Amelia Island Shore Stabilization Project. The Successful Bidder (Contractor) shall provide all materials, equipment, and labor to complete the work described above, and shall perform or provide all pavement and property restoration (as applicable), surveys, environmental monitoring, safety and security measures, permit compliance, tilling and final grading to the requirements indicated in the Contract Drawings and Specifications.

3. MINIMUM REQUIREMENTS FOR BIDS

The information identified below is required and shall be submitted with the Bid Form in a clear and concise manner, using the forms provided, for County review.

3.1 Bids should not contain information in excess of that requested, must be concise, and must specifically address all of the items set forth in this Invitation to Bid (ITB). Responses can be either single or double sided. It is requested that the response be submitted in the same order as set forth according to the selection method below:

3.1.1 Bid Forms and Addenda Acknowledgement. Bidders must submit all information requested for the Total Base Bid.

3.1.2 Bid Bond Form - Each Bid shall be accompanied by a certified or cashier's check or a Bid bond, satisfactory and payable to Nassau County in an amount not less than five percent (5%) of the Base Bid as a guarantee that the bidder will, within ten (10) days after the date of the award of the Contract, execute an agreement and file bonds and insurance as required by the Contract Documents.

If an intended awardee fails to execute and file an agreement, bonds, and insurance as required by the Contract documents, the amount of the security submitted with his

Bid shall be forfeited. However, the extent of damages to the Owner and the extent of the Contractor's responsibility shall not be limited to the amount of the security submitted with the Bid.

3.1.3 Fair Practices Affidavit;

3.1.4 Affidavit Where Bidder is a Corporation, Partnership or Joint Venture, or Sole Proprietor/Individual;

3.1.5 Statement of Organizational Structure, Claims and Suits;

3.1.6 Statement of License certificate;

3.1.7 List of Subcontractors Form;

3.1.8 Questionnaire & References Form

3.1.9 Equipment Schedule, including name of dredge;

3.1.10 Work Plan;

3.1.11 Drug Free Workplace Certification;

3.1.12 Equal Employment Opportunity Certification;

3.1.13 E-Verify Certification;

3.1.14 Scrutinized Companies Certification;

3.1.15 Bidder Checklist

3.2 Minimum Qualifications for Bid

The Successful Bidder must:

3.2.1 Provide a dredge (and booster, if necessary) that meets the certification and/or inspection requirements listed herein, as documented in writing at the time of the bid.

3.2.2 Demonstrate the capability to excavate sand and place it on the Project shorelines at a rate of at least 15,000 cy/day, on average, measured on the beach.

3.2.3 Provide three references for beach nourishment dredging construction projects of similar size and scope constructed by the Bidder within the last five (5) years. Projects similar in size and scope shall be projects involving beach placement of dredged material along the open shorelines of the Atlantic Ocean or Gulf of Mexico. Reference information must be current with the name and telephone number of a responsible entity for each project cited.

[Remainder of page intentional left blank.]

4. EVALUATION AND AWARD OF CONTRACT

Bids and Alternate Bids will be reviewed by the Engineer and the County. The recommendation of award will be forwarded to the County Manager for review and final decision.

4.1 The County reserves the following rights:

4.1.1 To be the judge of the bidder's qualifications.

4.1.2 To conduct pre-award discussions with any responsive and responsible bidders who submit bids determined to be reasonably acceptable of being selected for award. Such discussions may include, but not be limited to personal interviews with and/or presentations.

4.1.3 To request that bidder(s) modify their bid to more fully meet the needs of the County or to furnish additional information as the County may reasonably require.

4.1.4 To accord fair and equal treatment with respect to any opportunity for discussions and revisions of bids. Such revisions may be permitted after submission of bids and prior to award.

4.1.5 To request additional qualification information.

4.1.6 To limit and/or determine the actual services to be included in the contract with the successful bidder.

4.1.7 To obtain information from any available sources for use in evaluating the bids.

4.1.8 To waive any irregularity in any bid, or reject any or all bids, in part or in whole, should it be deemed to be in the best interest of the County to do so.

4.1.9 To recommend the bid award by the Board, if at all, to a single contractor to the lowest responsive and responsible bidder, provided that the bidder's bid submittal is considered (within the sole discretion of said County Manager) reasonable, presents the best overall value and is in the best interest the County to recommend, and no bid protest has been filed.

The basis of recommendation will be the Base Bid or Alternate Bid (if applicable) that presents the best overall value and is in the best interest of the County or may be determined by the availability of funds. The County will identify the least-cost, acceptable bid which presents the best overall value to the County.

4.1.10 Nassau County, FL, retains sole and final discretion as to the acceptability of bids and the Bid that is awarded for contract.

5. EASEMENTS AND PERMITS

5.1 The Contractor shall maintain its transport operations within the access areas and project limits depicted in the Construction Plans. In the event that the Contractor deems it necessary or advisable to operate beyond those areas, Contractor shall notify the Owner and request authorization for use of such areas, public or private. Immediately after an award of contract is made, the Contractor shall submit to the Owner a listing of those areas where Contractor plans by special agreement to work outside of the specified areas. If approved by the Owner, Contractor shall be responsible for making special agreements with affected property owners. Copies of all written special agreements shall be placed on file with the Owner.

5.2 Note - The Owner may not have acquired all Environmental Permits and/or-private and State Lands Easements necessary for construction of the project at the time of Bid solicitation. Prior to contract execution, the Owner shall furnish all dredge and/or fill permits to construct the

project, as required by the State of Florida and the U.S. Army Corps of Engineers. The Contractor shall abide by all terms of said permits. No other environmental permits will be required. Contractor and all subcontractors shall obtain and pay for business licenses from the County prior to commencing work.

6. LIQUIDATED DAMAGES

Provisions for Liquidated Damages are as set forth in Article 4 of the Draft Agreement (Section 2000).

7. STOPPAGE OF WORK

In addition to the execution of the Work itself, the Project entails numerous requirements for submittals and permit compliance criteria at prescribed times and dates. Provisions for stoppages of work are as set forth in the Agreement and the Specifications and Requirements to assure that the Work is executed and submittals are provided in accordance with same. Such provisions do not provide extensions in contract time for stoppages so issued.

8. MATERIAL SUBSTITUTIONS

Each bidder shall base its bid upon the placement of suitable beach quality material obtained from the borrow area identified in the Technical Specifications and Requirements section of these Contract Documents. The Contractor shall not make any substitutions of the permitted sand sources without the express written approval of the Project Engineer and all affected regulatory agencies.

9. SITE VISIT

No mandatory site visit is required. All prospective bidders are encouraged to visit the project shoreline, other access locations, and other relevant areas of the Work.

10. LICENSES see Addendum #1, BIDDER must be licensed.

At the time of bid, the bidder shall either provide evidence of licensure as a General Contractor in the State of Florida, or provide evidence of the General Contractor licensure status of the prime qualifying agent for the Contractor. Such status shall be noted on the Evidence of Licensure form and shall be evaluated by the Owner and Engineer for approval. The awarded Contractor shall provide a copy of their General Contractor license prior to the commencement of work.

[Remainder of page intentional left blank.]

11. ANTICIPATED SCHEDULE see Addendums #2 and #3

Anticipated Schedule*		
	Date	Event
a.)	Tuesday, January 19, 2021	Bid Advertisement
b.)	Tuesday, February 9, 2021 - 10:00 a.m.	Pre-bid Conference (Microsoft Teams)
c.)	Friday, February 12, 2021 - 4:00 p.m.	Last Questions Due
d.)	Tuesday, February 16, 2021 - 4:00 p.m.	Last Date to Issue Addendums
e.)	Wednesday, February 24, 2021 - 4:00 p.m.	Bids Due to the County
f.)	Thursday, February 25, 2021 – 10:00 a.m. (or soon thereafter)	Bid Opening (Microsoft Teams)
g.)	Tuesday, March 2, 2021	Engineer Recommendation to County
h.)	Friday, March 5, 2021	Notice of Intent to Award (BOCC meeting)
i.)	Wednesday, March 17, 2021 (approx.)	Notice of Award
i.)	Within Ten (10) Days of Notice of Award	Contractor Provides Signed Contract, Bonds, and Insurance Documents
k.)	Wednesday April 14, 2021	Owner Executes Contract (BOCC meeting) Owner Issues Notice to Proceed
l.)	Within Fourteen (14) Days of Contract Execution	Contractor submits pre-construction items
m.)	Within One Hundred Thirty-Five (135) Days of the initiation of sand placement	Substantial Completion
n.)	Within 30 days of Substantial Completion	Final Acceptance by Owner (No later than October 31, 2021)

* Dates are estimates only. Owner reserves right in its sole discretion to alter schedule as needed.
** Initiation of sand placement is defined as the placement of at least 1,000 cy of sand on the beach from the Nassau Sound borrow area, measured in place within the design beach fill template.

1200 SUBMITTED BID FORM
BID NO. NC21-008 – SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT

The undersigned bidder declares that the only person or parties interested in this Invitation to Bid (ITB) as principals are those named herein, that this bid is made without any understanding, contract, or connection with any other person, firm, or corporation providing a bid for the same purpose and that this bid is in all respects fair and without collusion or fraud. The bidder understands that this bid must be manually signed in ink, otherwise it will be considered unresponsive and subject to rejection.

The undersigned bidder represents that the bidder accepts, and that this bid complies with, the ITB Documents and that the bidder has carefully examined the ITB Documents for the designated Work. Bidder affirms that bidder has carefully examined the location of the designated Work and, from its own investigations, is satisfied as to the nature and location of the Work, the character, quality, and the quantity of materials, the kind and extent of equipment and other facilities needed for the performance of the Work, the general and local conditions and all difficulties that may be encountered, and all other items which may, in any way, affect the Work or its performance.

The undersigned bidder proposes, and agrees if this bid is accepted, that it will contract with the Owner to provide all necessary machinery, tools, software, labor, apparatus, and other means necessary to do all the Work, and furnish all the materials and equipment specified or referred to in the ITB Documents in the manner and time herein prescribed, and according to the requirements of the Owner as therein set forth.

Under provisions of Chapter 112, Florida Statutes, bidder must disclose with bid the name of any officer, director, or agent who is also an employee of the Owner (Nassau County). Bidder must disclose on an attachment (provided by bidder) entitled “Submitted Bid Conflict of Interest” the name of any Nassau County employee who owns, directly or indirectly, a five percent (5%) or more interest in the bidder’s firm or any of its branches, or in the firm of any subcontractor to this bid. Absence of such an attachment represents bidder’s certification of no such employee.

Bidder acknowledges receipt of the following addenda issued during the solicitation period; the cost of which, if any, is included in bid pricing. If an addendum is issued, the Addendum Acknowledgement sheet must be signed and submitted with the bid package at the time and due date of the bid.

ADDENDUM #	ADDENDUM DATE
ooo1	1/27/2021
ooo2	2/17/2021
ooo3	2/17/2021
ooo4	2/19/2021

In submitting a Base Bid or Alternate Bid (if applicable) to the Owner, the bidder acknowledges the following conditions:

A. It is expressly understood that quantities in the Bid Schedules for Unit Price Items are approximate only and that payment will be made only on the actual quantities of work complete in place, measured and accepted on the basis defined in the Contract Conditions and the Contract Specifications and Requirements.

B. It is expressly understood that the Owner desires to initiate and complete project construction at as early a date as possible.

C. It is expressly understood that the apparent low bidder will be determined by the costs associated with the Base Bid or Alternate Bid (if applicable) as selected by the Owner.

D. As directed by the Owner, the final contract quantities actually placed and accepted for payment under Bid Item No. 2 may vary from the estimated bid quantities by ±20%. Contractor shall not be entitled to any adjustment in unit prices or lump sum prices if quantities vary by ±20%, or less. The beach fill template will be redesigned by the Engineer prior to sand placement, based upon pre-construction surveys of the beach and borrow area to be conducted by the Contractor per the Specifications provided herein. It is understood that the beach fill template volume shall be less than the dredge excavation volume by a small percentage. The Specifications establish procedures for evaluating these differences and adjusting the fill template accordingly. It is the intent of the Owner to fully excavate the project borrow area place as much sand on the beach as can be achieved within the design and permit limits. The undersigned has carefully checked the Bid Schedules against the Contract Drawings and Specifications before preparing this bid and accepts the said quantities to be substantially correct, both as to classification and amount, and as correctly listing the complete work to be done in accordance with the Contract Drawings and Specifications.

E. The undersigned is aware of the importance of completing the Work within the time schedules determined by the Owner and the project permits. The bidder has examined both the project fill and borrow areas and is aware of local conditions, including meteorology, astronomical and storm tides, commercial fishing, shipping traffic, environmental constraints, roads, site access, Park operations, and other local resort, road and channel traffic which could affect performance of the Work prescribed by the Contract Drawings, Specifications and Requirements.

Having carefully examined the ITB Documents, bidder agrees to the terms contained therein and proposes to furnish all labor, material, and equipment for the entire Work for the **TOTAL BASE BID** (including mobilization and demobilization), and to execute a contract for Work and any and all bonds, insurance certifications, and other instruments or documents as specified or included in the ITB Documents, and will completely perform the Work in strict accordance with the terms of the ITB Documents. The undersigned bidder understands that the County reserves the right to reject any or all bids and to waive any informalities and minor irregularities in any bid. The bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) days after the scheduled bid opening.

BASE BID – Beach Fill at South Amelia Island, Nassau County, FL
The project shall be constructed as designed and in the order and timeframes stated in the Agreement and the Specifications and Requirements.

Item No. & Description	Number of Units	Units	Unit Price	Subtotal
1. Mobilization / Demobilization	1	job	$ 2,844,500.00	$ 2,844,500.00
2. Hydraulic Beach Fill	1,800,000	cubic yards	$ 6.49	$ 11,682,000.00
3. Turbidity monitoring	1	job	$ 62,000.00	$ 62,000.00
4. Beach Tilling / Decompaction	1	job	$ 8,500.00	$ 8,500.00
			Total Base Bid	$ 14,597,000.00

Total Base Bid Contract Price $ 14,597,000.00 and in words: Fourteen Million,

Five Hundred Ninety-Seven Thousand Dollars and No Cents.

Name of Dredge to be used: Savannah - 24" ABS Cutter Suction

Bidder agrees to commence dredging at the site no later than June 1, 2021

The undersigned bidder acknowledges that Work to be performed shall conform to all County codes and regulations. Work must be accomplished in a professional manner and meet all standards of any professional trade requiring a license and or permit. Work can be performed 24 hours per day, seven days per week. The undersigned bidder acknowledges that they have reviewed the draft Agreement (Section 2000) and they understand and acknowledge the contract provisions therein including, but not limited to, Contract Times and Liquidated Damages under Article 4.

(Signature of Bidder)

S J Hamill Construction Co., LLC
(Typed name of Bidder)

Doing Business As: SJ Hamill Construction Co., LLC

Business Address: 2008 Cherry Hill Lane

City: Charleston State SC Zip 29405

Phone: (843) 872-8000 E-mail address: will@sjhamill.com

Fax: _____

With the foregoing as a Total Base Bid, and having carefully examined the ITB Documents, bidder agrees to the terms contained therein and proposes to furnish all labor, material, and equipment for the entire Work for the **TOTAL BID ALTERNATE No. 1** (including mobilization and demobilization), and to execute a contract for Work and any and all bonds, insurance certifications, and other instruments or documents as specified or included in the ITB Documents, and will completely perform the Work in strict accordance with the terms of the ITB Documents. The undersigned bidder understands that the County reserves the right to reject any or all bids and to waive any informalities and minor irregularities in any bid. The bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) days after the scheduled bid opening.

BID ALTERNATE No. 1 – Beach Fill at South Amelia Island, Nassau County, FL
The project shall be constructed as designed and in the order and timeframes stated in the Agreement and the Specifications and Requirements.

Item No. & Description	Number of Units	Units	Unit Price	Subtotal
1. Mobilization / Demobilization	1	job	$ 2,844,500.00	$ 2,844,500.00
2. Hydraulic Beach Fill	1,400,000	cubic yards	$ 6.69	$ 9,366,000.00
3. Turbidity monitoring	1	job	$ 50,000.00	$ 50,000.00
4. Beach Tilling / Decompaction	1	job	$ 8,500.00	$ 8,500.00
			Total Base Bid	$ 12,269,000.00

Total Contract Price $ 12,269,000.00 and in words: Twelve Million, Two Hundred Sixty-Nine Thousand Dollars and no cents.

Name of Dredge to be used: Savannah - 24" ABS Cutter Suction

Bidder agrees to commence dredging at the site no later than June 1, 2021

The undersigned bidder acknowledges that Work to be performed shall conform to all County codes and regulations. Work must be accomplished in a professional manner and meet all standards of any professional trade requiring a license and or permit. Work can be performed 24 hours per day, seven days per week. The undersigned bidder acknowledges that they have reviewed the draft Agreement (Section 2000) and they understand and acknowledge the contract provisions therein including, but not limited to, Contract Times and Liquidated Damages under Article 4.

(Signature of Bidder)

SJ Hamill Construction Co., LLC
(Typed name of Bidder)

Doing Business As: SJ Hamill Construction Co., LLC

Business Address: 2008 Cherry Hill Lane

City: Charleston State SC Zip 29405

Phone: (843) 872-8000 E-mail address: will@sjhamill.com

Fax: _____

1300 BID BOND
(MUST BE COMPLETED AND SUBMITTED WITH BID)

KNOW ALL MEN BY THESE PRESENTS, that S. J. Hamill Construction Company, LLC (hereinafter called the "Principal") and Liberty Mutual Insurance Company (hereinafter called the "Surety"), a Corporation chartered and existing under the Laws of the State of Massachusetts, and authorized to do business in the State of Florida, are held and firmly bound unto the Nassau County, Florida, Board of County Commissioners, in the full and just sum of Five Percent (5%) of Total Base Bid---------- dollars ($ 5% T.B.B.--) good and lawful money of the United States of America, to be paid upon demand of the County, to which payment will and truly be made, we bind ourselves, our heirs, executors administrators, successors, and assigned jointly and severally and firmly by these presents.

WHEREAS, the Principal is about to submit, or has submitted to the County, a Bid under Nassau County, FL, BID NO. NC21-008 for the South Amelia Island Dredging & Beach Nourishment Project;

WHEREAS, the Principal desires to file this Bond in lieu of a certified Bidder's check otherwise required to accompany this Bid Proposal;

NOW THEREFORE, the conditions of this obligation are such if the Bid Proposal is accepted, the Principal shall, within ten (10) Days after the date of receipt of written Notice of Award of Contract, execute a Contract for the South Amelia Island Dredging & Beach Nourishment Project with the Nassau County, Florida, Board of County Commissioners in accordance with the Principal's Bid and upon the terms, conditions and price set forth therein, in the form and manner contained in the Contract Documents and execute sufficient and satisfactory Labor and Material and Performance Bonds payable to County, each in the amount of 100 percent (100%) of the total Contract Sum, in form and with surety satisfactory to said County, then this obligation to be void, otherwise to be and remain in full force and virtue in law, and the surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid County, upon demand, the amount of this Bond, in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

In the event the numerical expression is omitted or expressed as less than five percent (5%) of the total Base Bid price, this figure shall be assumed to be erroneously stated and this bid bond shall be binding upon the Principal and Surety in the amount of five percent (5%) of the total Base Bid price.

In testimony thereof, the Principal and Surety have caused these presents to be duly signed and sealed this 24th Day of February, 20 21.

S. J. Hamill Construction Company, LLC
Principal

by _____
seal

Liberty Mutual Insurance Company
Surety

by Sharon Cavanaugh
Sharon Cavanaugh Attorney-in-Fact
seal

Countersigned _____
John T. Foreman IV

State of South Carolina, County of Charleston

The foregoing instrument was acknowledged before me this 24th day of February, 20 21, by John T. Foreman IV, via x physical presence or __ online notarization and who x is personally known to me or __ who has produced a _____, as identification, who did not take an oath, and who acknowledged that s/he executed the same for the purposes therein expressed on behalf of said corporation.

_____
NOTARY PUBLIC

ELANA WHITMAN
NOTARY PUBLIC
My Comm. Exp. May 5, 2024
SOUTH CAROLINA

Elaena M. Whitman
PRINT OR TYPE NAME

_____
Commission Number

5/5/24
Commission expires

NOTES:
1. Write in the dollar amount of the bond, which must be at least five percent (5%) of the total of the Base Bid included in the Bid.
2. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.
3. Attorney-in-fact who signs Bid Bonds or Contract Bonds must file with each bond a certified and effectively dated copy of their power of attorney.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: 8201355

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Roxanne G. Brune, Sharon Cavanaugh, David R. Groppell, Sharen Groppell, Francine Hay, Beverly A. Ireland, Kurt A. Risk, Gloria Villa

all of the city of Houston state of TX each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 4th day of June, 2019.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 4th day of June, 2019 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 24th day of February, 2021.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

1305 FAIR PRACTICES AFFIDAVIT
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Each Contractor submitting a bid must complete the following affidavit:

STATE OF South Carolina COUNTY OF Charleston

William D. Spielvogel, under oath deposes and states that:
(Name of owner, partner, officer, representative, agent)

(1) S/he is President of SJ Hamill Construction Co., LLC, the bidder that
(Title: owner, partner, officer, representative, agent)
has submitted the attached bid;

(2) S/he is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such bid;

(3) Such bid is genuine and is not a collusive or sham bid;

(4) Neither the said bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, has in any way colluded, conspired, or agreed, directly or indirectly with any other bidder, firm or person to submit a collusive or sham bid in connection with the contract for which the attached bid has been submitted or to refrain from bidding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other bidder, firm or person to fix the price or prices in the attached bid of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against Nassau County, Florida, or any person interested in the proposed contract or the proceeds thereof;

(5) The undersigned has not given or donated or promised to give or donate directly or indirectly to any official or employee of the Engineer, or Nassau County, Florida, or the Nassau County Board of County Commissioners, or to anyone else for his benefit any sum of money or other thing of value for aid in assistance in obtaining this contract; and

(6) The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the bidder or any of its agents, representatives, owners, employees, or parties in interest, including the undersigned.

(Signature)

President
(Title)

Subscribed and sworn to before me

This 24th day of February, 2021 via X physical presence or __ online notarization.
S/he X is personally known to me or __ has produced a _____ as identification and who did take an oath.

(Signature of Notary)

June 8, 2030
(Commission Number & Commission Expiration)
State of South Carolina does not issue Commission numbers

1310 FORM OF AFFIDAVIT WHERE BIDDER IS A CORPORATION
(MUST BE COMPLETED AND SUBMITTED WITH BID)

STATE OF South Carolina COUNTY OF Charleston

Affiant, William D. Spielvogel, being duly sworn, deposes and says: I am the (title) Preisdent of S J Hamill Construction Compay, LLC, the South Carolina corporation described in and which executed the foregoing bid; that I have been duly authorized to execute and did execute the foregoing bid pursuant to that authorization, and that the several matters therein stated are in all respects true.

BIDDER:

S J Hamill Construction Company, LLC
Print or Type Name of Entity

By: _____ William D. Spielvogel
Signature Print or Type Name

Date: February 24, 2021

The foregoing instrument was acknowledged before me this 24th day of February, 20 21, by William D. Spielvogel, President
(name of officer or agent, title of officer or agent)
via X physical presence or __ online notarization of S J Hamill Construction Company, LLC
(name of corporation acknowledging)
a South Carolina corporation, on behalf of the corporation.
(state or place of incorporation)
S/he X is personally known to me or __ has produced a _____ as identification and did not take an oath.

NOTARY:

_____
Signature of Notary

Kelly J. Albers
Print or Type Name of Notary

Commission #s are not issued by South Carolina
Commission Number

June 8, 2030
Commission expires

1315 ORGANIZATIONAL STRUCTURE, CLAIMS, AND SUITS
(MUST BE COMPLETED AND SUBMITTED WITH BID)

ORGANIZATION

BIDDER NAME, ADDRESS: S.J. Hamill Construction Company, LLC
2008 Cherry Hill Lane
Charleston, SC 29405
PHONE # 843-872-8000
E-MAIL ADDRESS will@sjhamill.com

Type of Business Construction

How many years in business: 6.

How many years in business under the present business name: 6.

Under what other or former names has your organization operated:

If a corporation, answer the following:

Date of incorporation: 03/11/2015
State of incorporation: SC
President's name: William Spielvogel
Vice president's name(s): Jordan Adams
Secretary's name: Jordan Adams
Treasurer's name: Matthew Dick

If a partnership or joint venture, answer the following:

Date of organization: N/A
Type of partnership (if applicable): _____
Name(s) of general partners: _____

If individually owned, answer the following:

Date of organization: N/A
Name of owner:

CLAIMS AND SUITS (if the answer to any of the questions below is yes, please attach details).

BIDDER NAME, ADDRESS: S.J. Hamill Construction Company, LLC
2008 Cherry Hill Lane Charleston, SC 29405

Has your organization ever failed to complete any work awarded to it?
_X_ NO ____ YES (details attached)

Are there any judgments, claims, and arbitration proceedings or suits pending or outstanding against your organization or officers?
____ NO _X_ YES (details attached)

Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five (5) years?
____ NO _X_ YES (details attached)

Has your organization been named as a defendant or brought in as a party to any lawsuits within the last five (5) years?____ NO _X_ YES (details attached)

Within the last five (5) years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract?
_X_ NO ____ YES (details attached)

DETAILS OF CLAIMS AND SUITS

SJ Hamill Construction Company, LLC was performing work under a subcontract agreement to a General Contractor to transport Armor Stone to the Jones Oyster Dredge Disposal site on the Savannah River in Georgia. While performing the subcontract, the General Contractor damaged a barge beyond repair. SJ Hamill was renting the barge from a third party (Lessor). SJ Hamill's Insurance paid for the salvage value of the barge to the Lessor. The Lessor then sued SJ Hamill and the General Contractor for "loss of use" of the barge.

SJ Hamill, in turn has sued the General Contractor for the "loss of use" claim from the Lessor, the cost of the deductible SJ Hamill paid on the insurance claim, nonpayment for contract work and change order work SJ Hamill performed for the General Contractor on the Project.

The lawsuits are still in the discussion phase and have not yet proceeded to the trial stage.

1320 STATEMENT OF LICENSE CERTIFICATE
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Qualifying Firm Name S.J. Hamill Construction Company, LLC

Authorized Firm Qualifying Licensed Person William Spielvogel

FL General Contractor License # CGC1521172

Attach Copy of License

Ron DeSantis, Governor

Halsey Beshears, Secretary

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

CONSTRUCTION INDUSTRY LICENSING BOARD

THE GENERAL CONTRACTOR HEREIN IS CERTIFIED UNDER THE
PROVISIONS OF CHAPTER 489, FLORIDA STATUTES

SPIELVOGEL, WILLIAM DOUGLAS

S.J. HAMILL CONSTRUCTION COMPANY, LLC
2008 CHERRY HILL LANE
CHARLESTON SC 29405

LICENSE NUMBER: CGC1521172

EXPIRATION DATE: AUGUST 31, 2022

Always verify licenses online at MyFloridaLicense.com

Do not alter this document in any form.

This is your license. It is unlawful for anyone other than the licensee to use this document.

1325 SUBCONTRACTORS

List each subcontractor the bidder proposes to use in performing the Work, including survey and turbidity monitoring services. Describe the portion of the Work to be performed by each subcontractor.

	Subcontractor, Address, Phone Number	Work to be Performed
1.	Marinex Construction of North Carolina 1903 Pittsburgh Avenue Charleston, SC 29405	Dredging
2.	Vantage Observing, LLC 95315 Nassau River Rd Fernandina Beach, FL 32034	Turbidity Monitoring
3.	Vantage Observing, LLC 95315 Nassau River Road Fernandina Beach, FL 32034	Bird Monitoring
4.	Mary Duffy PO Box 566 Fernandina Beach, FL 32035	Turtle Monitoring
5.		

1330 QUESTIONNAIRE & REFERENCES FOR BIDDER EXPERIENCE

Provide complete information below for each question and provide three (3) reference projects for beach nourishment dredging construction projects of similar size and scope (work performed within last five (5) years). Projects similar in size and scope shall be projects involving of dredged material along the open shorelines of the Atlantic Ocean or Gulf of Mexico. Reference information must be current with the name and telephone number of a responsible entity for each project cited. References must apply to projects completed by the Bidder as Prime Contractor. Attach additional sheets as needed.

Q1: What is the name and size/capacity of dredge to be used? Dredge Savannah, 24" ABS Cutter Suction Dredge, 11,000 horsepower, 23,000 feet of pipeline and all necessary support equipment.

Q2: What is the name and size/capacity of the booster and barge to be used (if proposed for use on this project)? Not Applicable

Q3: What is the expected daily (24-hr) production rate of the dredge (and booster/barge if applicable) proposed for this project, in terms of cubic yards of sand measured in place per day on the beach? The Successful Bidder must demonstrate the capability of delivering at least 15,000 cubic yards of sand per day, on average and measured in place, to the shoreline over the course of the project.

In 2011, the Dredge Savannah performed this project. We pumped (pay yardage) 1,999,245cys in a period of less than 4 months (120 days). That exceeds the required minimum of 15,000 cys per day. We expect the Savannah to perform better than the pervious contract due to improvements made to the dredge in the last 10 years.

Q4: What is the expected duration, in calendar days, of sand placement operations to achieve Substantial Completion of all nourishment segments of the work, including weather, mechanical, refueling, and all other possible delays? Four months or approximately 120 days

Q5: It is very important that the borrow area be fully excavated to their design depths and tolerances to maximize the use of the sand resource for the County. What measures will be employed to assure that the designed and permitted excavation depths in the borrow areas will be achieved within the tolerances prescribed, without over- or under-dredging?

The Dredge Savannah will excavate the material from the borrow site with accurate precision by utilizing the latest GPS/RTK (Real Time Kenetic) Positioning Systems in conjunction with the ladder angle indicator. An onboard fathometer along with daily hydrographic surveys ensure depths are achieved as outlined in the specifications.

REFERENCE PROJECT 1:

NAME: Village of Bald Head Island, NC Contact: Eric Olsen

Address: Olsen Associates, Inc.

City: Jacksonville, FL 32204 State: FL

Telephone: 904-387-6114 Email: eolsen@olsen-associates.com

Summary of work performed: Placed 1,000,000 Cubic Yards on to Bald Head Island. Beach fill was removed from Jay Bird Shoal with a pumping distance of 17,000 FT. Environmental monitoring was conducted during the duration of the project.

12 mil

REFERENCE PROJECT 2:

NAME: HLT Terminal Contact: Butch Weber

Address: 2025 Bainbrige Ave.

City: North Charleston State: SC

Telephone: 843-290-7538 Email: bweber@scspa.com

Summary of work performed: Placed 650,000 Cubic Yards of sand for land reclamation.

9.0 mil

REFERENCE PROJECT 3:

NAME: NEXANS High Voltage USA. Contact: Brian Boan

Address: 1716 Bushey Park RD

City: Goose Creek State: SC

Telephone: 843-502-4163 Email: brianboan@nexans.com

Summary of work performed: Dredging of 120,000 cubic yards of sand/marl with upland placement.

7.8 mil

The undersigned guarantees the accuracy and truth of the information provided herein.

Bidder's Name:

By: William Spielvogel (name), its President (title)

Signature:

1335 EQUIPMENT SCHEDULE
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Provide a list of equipment to be delivered and used by bidder to perform the Work, including dredge, booster, attendant barges and tugs, pipe, land-based earth-moving equipment, storage units, etc. Provide the name of the dredge. Documentation addressing the suitability of the floating plant to operate in the waters of the Atlantic Ocean must be provided to the Owner at the time of bid.

Proposed floating plant (including dredges and booster barges) that are regulated by the U.S. Coast Guard shall have current inspections and certificates issued by the USCG. Copies of these current inspections and certificates shall be provided at the time of bid.

Proposed floating plant (i.e. dredges and booster barges) not subject to U.S. Coast Guard inspection and certification, or not having a current American Bureau of Shipping classification, shall be inspected in the working mode by a marine surveyor accredited by the National Association of Marine Surveyors (NAMS) or the Society of Accredited Marine Surveyors (SAMS) and having at least five (5) years' experience in commercial marine plant and equipment. The inspection and report shall consider the location of the borrow area for this Project and the potential locations for a booster barge for this Project (if a booster pump is proposed for use on this Project). The report must state that the dredge proposed for use by the Bidder is in suitable condition to be employed in the waters of the Atlantic Ocean at Nassau Sound, including the borrow area upon the ebb shoal. A copy of the documented inspection reports, including details of the qualifications and accreditations of the inspector, shall be provided at the time of bid.

Failure to submit this documentation at the time of bid may result in the disqualification of the Bidder.

Please see the next few pages for the PLANT & EQUIPMENT SCHEDULE along with relevant U.S. Coast Guard and Lloyd's of London Certificates for the Ocean Certified Dredge Savannah.

PLANT AND EQUIPMENT SCHEDULE

NO.	TYPE	CAPACITY	MANUFACTURER	AGE & CONDITIO	LOCATION
1226738	24"HYDCS/ABS "Savannah"	650,000cy 11,000hp	Detyens Shipards	2010-Excellent	Charleston, SC
594031	Tug SEGA	1,200hp	Main Iron Works	1978-Excellent	Charleston, SC
1256415	Tug CAPT. RIP	850hp	TCBW, Inc.	2014-Excellent	Charleston, SC
1282781	Tug CAPT BUD	850hp	TCBW, Inc.	2017-Excellent	Charleston, SC
	CB-3 w/Manitowoc Crane		Corn Isle Shipyard	2017-Excellent	Charleston, SC
	Diadapper A-3	22,000lbs.	Detyens Shipards	2010-Excellent	Charleston, SC
	Didapper Mobro 287	22,000lbs.	Marinex	1998-Good	Charleston, SC
	27.5" Survey Vessel	(2) 200hp	Silver Ships, Inc.	2000-Excellent	Charleston, SC
	24" Steel Submerged Pipeline	15,000'	Marinex	2015-Excellent	Charleston, SC
	24" Float Hose	1,800'	EMSTEC	2016-Excellent	Charleston, SC
	24" 13.5 Plastic Shore Pipe	15,000'	Performance	2010-Excellent	Charleston, SC
	24" Steel Shore Pipe	2,500'	Naylor	2014-Excellent	Charleston, SC
	6 - D6T Dozers		Caterpillar		Charleston, SC
	1- Front End Loader		Caterpillar		Charleston, SC
	1 - UTV				Charleston, SC
	1 Fuel & Water truck				Charleston, SC

The above equipment is currently working in Charleston Harbor, South Carolina. The dredge will be available the 2nd week in May. The Dredge and support equipment will be available to SJ Hamill Construction Company, LLC.

United States of America
Department of Homeland Security
United States Coast Guard

Certification Date:	20 Apr 2020
Expiration Date:	20 Apr 2025

Certificate of Inspection

For ships on international voyages this certificate fulfills the requirements of SOLAS 74 as amended, regulation V/14, for a SAFE MANNING DOCUMENT.

Vessel Name	Official Number	IMO Number	Call Sign	Service
SAVANNAH	1226738			Industrial Vessel

Hailing Port	Hull Material	Horsepower	Propulsion
CHARLESTON, SC UNITED STATES	Steel		

Place Built	Delivery Date	Keel Laid Date	Gross Tons	Net Tons	DWT	Length
NORTH CHARLESTON	20May2010	24May2006	R- I-1679	R- I-503		R-240.0 I-240.0

Owner
DREDGE SAVANNAH LLC
1903 PITTSBURG AVE
CHARLESTON, SC 29405
UNITED STATES

Operator
MARINEX CONSTRUCTION, INC
1903 PITTSBURG AVENUE
CHARLESTON, SC 29405
UNITED STATES

This vessel must be manned with the following licensed and unlicensed Personnel. Included in which there must be 0 Certified Lifeboatmen, 0 Certified Tankermen, 0 HSC Type Rating, and 0 GMDSS Operators.

0 Masters	0 Licensed Mates	0 Chief Engineers	0 Oilers
0 Chief Mates	0 First Class Pilots	0 First Assistant Engineers	
0 Second Mates	0 Radio Officers	0 Second Assistant Engineers	
0 Third Mates	0 Able Seamen	0 Third Assistant Engineers	
0 Master First Class Pilot	0 Ordinary Seamen	0 Licensed Engineers	
0 Mate First Class Pilots	0 Deckhands	0 Qualified Member Engineer	

In addition, this vessel may carry 0 Passengers, 0 Other Persons in crew, 0 Persons in addition to crew, and 16 Industrial personnel. Total Persons allowed: 16

Route Permitted And Conditions Of Operation:

---Oceans---

OCEANS ROUTE - UNMANNED (TOWING)

NOT ON AN INTERNATIONAL VOYAGE.

COASTWISE ROUTE NOT GREATER THAN TWELVE (12) MILES FROM SHORE WHEN PROVISIONALLY MANNED WITH INDUSTRIAL PERSONNEL ON SITE AS AGREED UPON WITH THE VESSEL OWNER AND/OR REPRESENTATIVE.

VESSEL MAY CARRY UP TO SIXTEEN (16) INDUSTRIAL PERSONNEL.

SEE NEXT PAGE FOR ADDITIONAL CERTIFICATE INFORMATION

With this Inspection for Certification having been completed at Charleston, SC, UNITED STATES, the Officer in Charge, Marine Inspection, SECTOR CHARLESTON certified the vessel, in all respects, is in conformity with the applicable vessel inspection laws and the rules and regulations prescribed thereunder.

Annual/Periodic/Re-Inspection

Date	Zone	A/P/R	Signature

This Amended certificate issued by:

J. D. COLE, CAPT, USCG

Officer in Charge, Marine Inspection

SECTOR CHARLESTON

Inspection Zone

United States of America
Department of Homeland Security
United States Coast Guard

Certification Date:	20 Apr 2020
Expiration Date:	20 Apr 2025

Certificate of Inspection

Vessel Name: SAVANNAH

ALL PERSONS SHALL WEAR COAST GUARD APPROVED PERSONAL FLOATATION DEVICES WHILE ON DECK.

---Hull Exams---

Exam Type	Next Exam	Last Exam	Prior Exam
DryDock	30Sep2022	30Sep2019	30Nov2017
Internal Structure	30Sep2022	30Sep2019	30Nov2017

--- Inspection Status ---

Fuel Tanks

	Internal Examinations		
Tank ID	Previous	Last	Next
Frame 16-26 Port	27Feb2015	30Sep2019	30Sep2024
Frame 16-26 Center	27Feb2015	30Sep2019	30Sep2024
Frame 16-26 Starboard	27Feb2015	30Sep2019	30Sep2024

Pressure Vessels

Type	Location	Previous	Last	Next
Air Receiver	Engine Room	19May2015	21Apr2020	30Apr2025
Air Receiver	Engine Room	19May2015	21Apr2020	30Apr2025

---Lifesaving Equipment---

Total Equipment for 16 Persons

Primary Lifesaving Equipment	Quantity	Capacity		Required
Lifeboats (Total)	0	0	Life Preservers (Adult)	16
Lifeboats (Port)	0	0	Life Preservers (Child)	0
Lifeboats (Starboard)	0	0	Ring Buoys (Total)	8
Motor Lifeboats	0	0	With Lights	4
Lifeboats With Radio	0	0	With Line Attached	2
Rescue Boats/Platforms	0	0	Other	2
Inflatable Rafts	2	32	Immersion Suits	0
Life Floats/Buoyant App	0	0	Portable Lifeboat Radios	0
Inflatable Buoyant Apparatus (IBA)	0	0	Equipped With EPIRB?	YES

--- Fire Fighting Equipment ---

Number of Fireman Outfits - 0

Number of Fire Pumps - 2

Hose Information

Location	Quantity	Diameter	Length
5 on Main Deck 2 on House Deck	7	1.5	50

Fixed Extinguishing Systems

Location	Type	Capacity	
Engine Room	Carbon Dioxide	1630	Pound

United States of America
Department of Homeland Security
United States Coast Guard

Certification Date:	20 Apr 2020
Expiration Date:	20 Apr 2025

Certificate of Inspection

Vessel Name: SAVANNAH

Fire Extinguishers - Hand portable and semi-portable

Quantity	Class Type
13	A-II
2	B-II

---Certificate Amendments---

Amending Unit	Amendment Date	Amendment Remark
Sector Charleston	21Sep2020	AMENDED DELIVERY DATE

END

Certificate of Class

This certificate is issued to the **SAVANNAH**

LR Number **8434441**

Date of Build **20/05/2010**

Port of Registry **Charleston, SC**

Gross tons **1,679**

to confirm that having been surveyed by Lloyd's Register North America, Inc. and having been found in compliance with the Rules and Regulations for the Classification of Ships, the aforesaid ship has been assigned the class

✠100 AN Pontoon Coastal Service within 12 Nautical miles

Date Special Survey Assigned **20 May 2020**

This Certificate is valid until* **19 May 2025**

* Unless extended after completion of a Special Survey (see page 3) or in accordance with Part 1, Chapter 2, Section 3.5.9 of the Rules and Regulations (see page 3) and is subject to surveys as prescribed (see page 2) being satisfactorily completed. (See notes 1 to 4, page 3)

Issued at **Charleston**

on **13 May 2020**

Lloyd's Register North America, Inc
P. Willems
Charleston Office
Lloyd's Register

P. Willems

Surveyor to Lloyd's Register North America, Inc.

A subsidiary of Lloyd's Register Group Limited

Note: 1. To establish the classification status of this ship, the Class Direct web site and the Interim Certificates issued on completion of classification surveys should be consulted in addition to this certificate. Access to Class Direct is available via http://www.cdlive.lr.org.

Ships Name **SAVANNAH** LR number **8434441**

Annual/Intermediate survey endorsements

1st Annual Survey endorsement

Signed: _____
Place of Survey
Date

2nd Annual Survey / Intermediate Survey* endorsement

Signed: _____
Place of Survey
Date

3rd Annual Survey / Intermediate Survey* endorsement

Signed: _____
Place of Survey
Date

4th Annual Survey endorsement

Signed: _____
Place of Survey
Date

** Delete as appropriate*

Ships Name **SAVANNAH** LR number **8434441**

Extension of special survey completion date

In accordance with the Rules and Regulations for the Classification of ships this certificate is extended until (see note 2) .

Signed:

Place of Survey

Date

Special survey completion

This Special Survey having been completed, this certificate is extended until .

Signed:

Place of Survey

Date

Notes

1. In accordance with the Rules and Regulations for the Classification of Ship's, class will be automatically suspended and this certificate becomes invalid if not endorsed annually within three months of the due date of the Annual or Intermediate Surveys.
2. This certificate expires on the due date of the Special Survey. Consideration can be given at the discretion of the Committee to any exceptional circumstances justifying an extension to the Special Survey completion date for a maximum period of three months beyond the validity of this certificate.
3. Prior to the endorsement of this certificate all overdue hull and machinery surveys should be dealt with or postponed by agreement.
4. In normal circumstances the Annual or Intermediate Survey is to be held in conjunction with the Periodical Load Line Inspection and the Safety Construction Annual Survey.

International Load Line Certificate

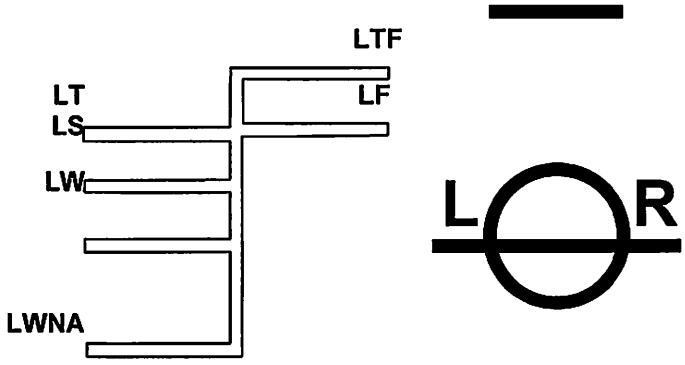
Issued under the provisions of the International Convention on Load Lines, 1966, as modified by the Protocol of 1988 relating thereto, under the authority of the Government of the United States of America by Lloyd's Register North America, Inc.

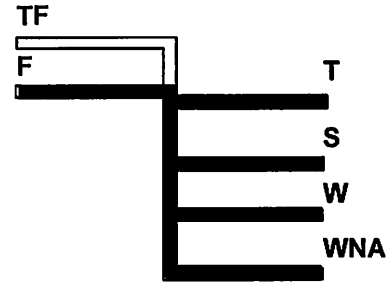
Particulars of Ship	
Name of ship	**SAVANNAH**
Distinctive number or letters	**CG1054718**
Port of registry	**Charleston, SC**
Length (L) as defined in article 2(8) (metres)	**73.152**
IMO number	**8434441**
Freeboard assigned as	**A new ship**
Type of ship	**Type B with reduced freeboard**

Freeboard from deck line [1]			Load line [1]	
Tropical	**954**	mm (T)	**49**	mm above (S)
Summer	**1003**	mm (S)	Upper edge of line through centre of ring	
Winter	**1053**	mm (W)	**49**	mm below (S)
Winter North Atlantic	**1103**	mm (WNA)	**100**	mm below (S)
Timber tropical	-	mm (LT)	-	mm above (LS)
Timber summer	-	mm (LS)	-	mm above (S)
Timber winter	-	mm (LW)	-	mm below (LS)
Timber winter North Atlantic	-	mm (LWNA)	-	mm below (LS)
Allowance for fresh water for all freeboards other than timber			**57**	mm
Allowance for fresh water for timber freeboards			-	mm
The upper edge of the deck line from which these freeboards are measured is				mm

Opposite top of Main Steel deck at side.

This certificate is only valid for the service as endorsed on page 2.





*Delete as appropriate

[1] *Freeboards and load lines which are not applicable need not be entered on the certificate. Subdivision load lines may be entered on the certificate on a voluntary basis.*

This is to certify:

1. that the ship has been surveyed in accordance with the requirements of article 14 of the Convention;
2. that the survey showed that the freeboards have been assigned and load lines shown on page 1 have been marked in accordance with the Convention.

This certificate is valid until[2] **19 May 2025** subject to annual surveys in accordance with article 14(1) (c) of the Convention.

Completion date of the survey on which this certificate is based **21 April 2020**

Issued at **Charleston** on **13 May 2020**

Lloyd's Register North America, Inc
P. Willems
Charleston Office
Lloyd's Register

P. Willems
Surveyor to Lloyd's Register North America, Inc.

a member of the Lloyd's Register group.

Service endorsement*

This certificate is valid only so long as the unmanned operating restrictions in the vessels stabillity letter, issued by ABS Americas and dated 21 April 2010, are observed.

Notes:

1. When a ship departs from a port situated on a river or inland waters, deeper loading shall be permitted corresponding to the weight of fuel and all other materials required for consumption between the point of departure and the sea.
2. When a ship is in fresh water of unit density the appropriate load line may be submerged by the amount of fresh water allowance shown above. Where the density is other than unity, the allowance shall be made proportional to the difference between 1.025 and the actual density.

[2] Insert the date of expiry as specified by the Administration in accordance with article 19 (1) of the Convention. The day and the month of this date correspond to the anniversary date as defined in article 2 (9) of the Convention, unless amended in accordance with article 19 (8) of the Convention.
**Delete as appropriate*

Endorsement for annual surveys

This is to certify that, at an annual survey required by article 14(1)(c) of the Convention, the ship was found to comply with the relevant requirements of the Convention.

Annual survey

Signed: _____

Place of survey

Date

Annual survey

Signed: _____

Place of survey

Date

Annual survey

Signed: _____

Place of survey

Date

Annual survey

Signed: _____

Place of survey

Date

Annual survey in accordance with article 19(8)(c)

This is to certify that, at a survey in accordance with article 19(8)(c) of the Convention, the ship was found to comply with the relevant requirements of the Convention.

Annual survey

Signed: _____

Place of survey

Date

Endorsement to extend the certificate if valid for less than 5 years where article 19(3) applies

The ship complies with the relevant requirements of the Convention, and this certificate shall, in accordance with article I9(3) of the Convention, be accepted as valid until

Signed:

Place of survey

Date

Endorsement where the renewal survey has been completed and article 19(4) applies

The ship complies with the relevant requirements of the Convention, and this certificate shall, in accordance with article 19(4) of the Convention, be accepted as valid until

Signed:

Place of survey

Date

Endorsement to extend the validity of the certificate until reaching the port of survey or for a period of grace where article 19(5) or 19(6) applies

This certificate shall in accordance with article **19(5) / 19(6)*** of the Convention, be accepted as valid until

Signed:

Place of survey

Date

Endorsement for advancement of anniversary date where article 19(8) applies

In accordance with article 19(8) of the Convention, the new anniversary date is

Signed:

Place of survey

Date

In accordance with article 19(8) of the Convention, the new anniversary date is

Signed:

Place of survey

Date

**Delete as appropriate*

1340 WORK PLAN
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Provide a brief description of the proposed methods of mobilization/demobilization, the development, use, and protection of access areas, the proposed placement of pipelines and boosters (if used) and the general sequence and schedule of operations to perform the Work, including a schedule of the alongshore distribution of sand placement from the borrow area (attach additional pages if desired).

Please see the following pages for our Work Plan and Schedule.

WORK PLAN
South Amelia Island Dredging and Beach Renourishment

Methods of Mobilization and Demobilization & Work Plan are as follows:

1. Survey crew will arrive and set up field office at location.

2. Dozers, Loader, Beach Shack/Mobile office and Shore pipe delivered by truck to the primary staging area shown on the contract drawings for the following work sites: **Primary Stockpile & Staging Area.** Prior to any offloading being performed an onsite meeting will be held with the Amelia Island State Park for a mutual understanding of where and how the equipment will be stored.

3. Submerged Pipe and Plastic pipe will arrive by water (seaward).

4. Submerged pipe will be installed from the beach to the borrow site. Once the bell end is placed on the beach the shore crew will begin connecting and setting up for beach fill and placement. The first pipe landing will be placed near station 50+00, a 90 elbow would allow the progression to go from North to South keeping the pipe landing out of the state park. Once the area is filled from 50+00 to 19+00, the pipe would be redirected back to station 50+00 and head north for the duration of the project.

5. 500 foot sections of plastic pipe will be placed on the beach from the seaward side of the work site as the fill line progresses forward. These sections will replace the steel shore pipe after every 1000 feet of beach profiles are completed.

6. Submerged pipe will be redirected and added from the borrow site two additional times during the life of the project. These two locations will be decided in the field to minimize impacts to the public, homeowners and the environment.

7. Once all work has been accepted all equipment will demobilized from the site. During the demobilization process tilling will be completed and all areas will be cleaned and inspected by SJ Hamill and the Owners engineer.

Anticipated Schedule

South Amilia Island Dredging & Beach Renourishment Project 2021

	TASK	DATE
1	**Begin Mobilization** A. Begin Shipping Equipment to Laydown Yard B. Set up field office C. Set up RTK ,QC control locations and elevations and survey D. Unload shore pipe and beach equipment in staging area (beach site) E. Begin submergeline and setup beach fill F. Set up Dredge Savannah in borrow site	**1 May -17 May 2021**
2	**Beach Fill**	
	Accceptance Section No. 1	**18 May -1 June 2021**
	Accceptance Section No. 2	**2 June -17 June 2021**
	Accceptance Section No. 3	**18 June -2 July 2021**
	Accceptance Section No. 4	**3 July -19 July 2021**
	Accceptance Section No. 5	**20 July - Aug 6 2021**
3	**Demobilization**	**7 August - 21 August 2021**

1345 DRUG FREE WORKPLACE CERTIFICATION
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Identical Tie Bids: Preference shall be given to businesses with drug free workplace programs. If two or more bids are equal with respect to price, quantity, and service then a bid received from a business that certifies that it has implemented a drug free workplace program shall be given preference in the award process. Established procedures for processing tie bids will be followed if all or none of the tied vendors have or do not have a drug free workplace program (Florida Statutes Section 287.087). In order to have a drug free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the action that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug free workplace, and available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendre to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this business complies fully with the above requirements.

BIDDER:

S J Hamill Construction Company, LLC
Print or type name of entity

By: _____
Signature

William D. Spielvogel
Print or type name

President
Print or type title

February 24, 2021
Date

Drug Free Workplace Certification, page 2 of 2

State of South Carolina County of Charleston

The foregoing instrument was acknowledged before me this 24h day of February, 20 21, by William D. Spielvogel, via __ physical presence or __ online notarization, and who X is personally known to me or __ who has produced a _____, as identification and who did (did not) take an oath and who acknowledged before me that he executed the same for the purposes therein expressed on behalf of said corporation.

NOTARY PUBLIC
Kelly J. Albers
Typed Name

Commission Expires: June 8, 2030

S. J. Hamill Construction Company, LLC.

STATEMENT OF POLICY ON DRUG AND ALCOHOL ABUSE

The use of alcohol or drugs can lead to serious health problems and can adversely affect an individual's judgment, work habits and personal relationships. An individual under the influence of alcohol or drugs constitutes a potential safety hazard to himself, fellow workers and to Company equipment and may undermine public confidence in the Company. As such, he or she fails to discharge responsibilities to the Company, fellow employees and the public. Alcohol and drug abuse are serious illnesses that should be diagnosed and treated at the earliest possible stage. The following statement of policy is intended to advise all employees of their responsibilities in this area.

We believe that those employees with drug and alcohol abuse problems make up only a small fraction of the work force and the Company regrets any inconvenience that may be caused to the many non-abusers. The benefits to be derived from the reduction in number of accidents, the greater safety of all employees, and the termination of those who, because of alcohol or drugs, are a burden upon others, will more than outweigh the inconvenience to the rest of us. The company earnestly solicits the cooperation of all employees in implementing the policies described below.

POLICY

1. The use or possession of alcohol by any employee while operating Company equipment or while on Company property or the use of alcohol at any time that would manifest itself while on Company property, is absolutely prohibited. "Alcohol" for purposes of the Policy means any beverage that may be legally sold and consumed and that has an alcoholic content in excess of .04% by volume. "Manifest" for purposes of this Policy shall include use of alcohol which results in excessive absenteeism or tardiness or is the cause of accidents or poor work in addition to actually being under the influence of alcohol while on duty. “Under the influence” for purposes of this Policy means the employee has an alcohol concentration of .04% by weight or more in their blood.

2. The illegal use, sale or possession of marijuana, narcotics or controlled substances at any time, on or off duty, is absolutely prohibited. A "controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation as 21 CFR 1308.11.15, which includes, but is not limited to, marijuana, cocaine, narcotics, hallucinogens, amphetamines, barbiturates, and tranquilizers.

3. Any employee who violates paragraphs 1 or 2 above shall be discharged.

4. Employees undergoing prescribed medical treatment with a legal drug or controlled substance that might affect behavior or work performance must report this fact to their supervisor. It may be necessary to restrict the employee's work activity while he undergoes treatment. No prescription drug shall be brought upon Company property by any person other than the person for whom the drug is prescribed by a licensed medical practitioner, and shall be used only in the manner, combination and quantity prescribed. No prescription drug shall be contained in any container other than that in which it was originally obtained bearing the pharmacists' label.

Abuse of prescription drugs which causes absenteeism or tardiness or is the cause of accidents or poor work will result in disciplinary action up to and including discharge.

5. Supervisors are required to monitor the behavior and work pattern of their crews. Significant emotional mood or behavior changes, repeated absenteeism or general behavior consistent with intoxication from alcohol or drugs should be reported to the Superintendent, or his appointee. Failure to do so will result in disciplinary action up to and including discharge.

6. In order to ensure the safety of the work place and the work force, the following work rules will apply to all employees effective thirty (30) days after receipt of notice of this policy and to new employees, immediately upon hiring.
   (a) Each employee, as a condition of continued employment, will be required, upon request of Company supervisory personnel, to:
      1. submit to search of any vehicle brought upon or parked upon company premises;
      2. submit to search of any pocket, package, purse, briefcase, tool box. lunch box, or other container brought upon Company premises;
      3. submit to search of desk, locker or similar item.
   (b) Each employee, as a condition of continued employment will also be required, upon request of company supervisory personnel, to promptly submit to blood, breath and/or urine tests for determining use of alcohol and/or drugs, this includes but is not limited to post-accident drug and alcohol screening. Any employee whose blood, breath and/or urine tests positive for a controlled substance or alcohol shall be discharged.
   (c) Each employee, as a condition of continued employment, will also be required, from time to time, to supply the form of "Certification and Declaration" that illegal drugs are not being used (attached as Exhibit "A").
   (d) All applicants for employment will be required to take a pre-employment physical examination (including urinalysis, breath and/or blood test). Applicants whose examinations and interviews, combined with general reference and background checks, indicate present alcohol or drug abuse, may not be hired. However, if the physical follows the hiring, the company reserves the right to discharge the employee.

7. The policies set forth in this Policy Guide are effective immediately upon notice to employees. Each present employee will be furnished a copy of this policy and will sign a receipt for same. Later-hired employees will each be furnished a copy before hiring. These policies will be implemented in a manner that will comply with all applicable federal and state laws.

8. The results of all physical examinations and blood, breath and/or urine tests will be treated as confidential, and distribution limited to those having a need to know.

SUBSTANCE ABUSE/USE

S. J. HAMILL has a strong commitment to provide a safe and secure workplace for its employees and to establish programs promoting high standards of employee health.

Substance abuse means the misuse or illicit use of drugs or controlled substances including but not limited to: marijuana, heroin, or cocaine.

Applicants considered for employment

In order to maintain a safe and drug-free work environment for its employees, S. J. HAMILL will not hire applicants for employment who are involved in substance use.

A. Following an employment offer and prior to becoming an active employee, the successful candidate will be screened for drugs as part of the pre-employment procedure.

B. At the time of the drug screen, the applicant will be informed of the testing procedure and consequences of positive results. The applicant will be requested to sign a consent release form acknowledging his/her understanding, authorizing the diagnostic procedure and releasing the test results to the company.

C. Since drug screening is an integral part of the procedures used to determine suitability for employment, applicants who refuse to sign the consent release form or to undergo the drug screening will be denied employment.

D. In the event that the test result is positive for drugs, the applicant will be notified by S. J. HAMILL or its MRO and advised that he/she has seventy-two (72) hours to request that the MRO send his/her secondary specimen to a second, DHHS certified laboratory for analysis. All costs associated with the testing of the secondary specimen are the responsibility of the applicant. If testing of the secondary specimen does not confirm the test results of the primary specimen, the applicant will be reimbursed for the costs of having the secondary specimen tested and the applicant would be allowed to proceed with the pre-employment process.

Current Employees

Unlawful use, possession, manufacture, dispensation or distribution of illicit drugs on company time or on company property will subject the employee to disciplinary action, up to and including termination. Current employees may be subject to random drug screening, reasonable cause testing, follow-up testing, return-to-duty testing, post-accident drug and alcohol screening at company's discretion. Any positive results indicating unlawful use of marijuana, amphetamine/methamphetamine, cocaine, opiates (codeine/morphine), phencyclidine "PCP, barbiturates, benzodiazepines, prioixohenes, methadone, methaqualone, or any other illegal or "designer drug", will be subject to the following disciplinary action(s):

First Incident

Any employee that takes a chemical test for alcohol and results are 0.04 or greater or that fails a chemical test for dangerous drugs will be immediately removed from performing employees duties and will subject to disciplinary action, up to and including termination. S. J. HAMILL will normally afford the employee the opportunity for rehabilitation. S. J. HAMILL, however, reserves the right, depending on the

circumstances of the incident, to terminate the employee without affording any rehabilitation. Normally upon receipt of the first positive result, the employee shall be suspended without pay for a period of up to thirty days. Prior to being allowed to return to work, S. J. HAMILL's medial review (MRO) must determine that the employee is drug-free and at a low risk to return to drug use. The MRO may require that the employee take a return to duty test. The MRO may also determine that the employee must be subject to increased unannounced follow-up testing for a period of up to 60 months. S. J. HAMILL will not be responsible for bearing any costs associated with the evaluation, treatment, counseling, or rehabilitation by any employee; nor shall S. J. HAMILL be responsible for any losses incurred by the employee as a result of testing positive under this program.

Second Incident

If an employee is involved in a second incident in which either a chemical test for alcohol indicates a result of 0.04 or greater or the employee fails a chemical test for dangerous drugs, the employee will be immediately removed from performing employees duties and will be terminated from employment with S. J. HAMILL.

Any employee that is considered to have refused to submit to chemical testing will be immediately removed from performing employees duties and will be terminated from employment with S. J. HAMILL.

EXHIBIT " A "
CERTIFICATION AND DECLARATION

1. I have been provided a written copy of the Alcohol and Drug Policy. I am aware that this policy forbids the use of or dealing in illegal drugs, on or off duty, and that violation of this policy is cause for termination.

2. I have not at any time since receiving a copy of this policy used any illegal drug, on or off duty.

_____ _____

Signature of Employee Date

CONSENT TO DRUG AND ALCOHOL TESTING

READ CAREFULLY BEFORE SIGNING

It is the policy of S. J. HAMILL that the use of drugs and/or alcohol on the job or working under the influence of drugs and/or alcohol is strictly prohibited.

I, the undersigned employee, understand that my work involves a potential danger to the health and safety of other persons and the environment, and that there exists a legitimate and very serious interest in maintaining a Drug-Free environment where I work. I understand that if I use drugs and/or alcohol on the job or work under the influence of drugs and/or alcohol that I am subject to immediate dismissal.

By my signature below, I, the undersigned employee, hereby acknowledge that I have read and understand the Drug Policy of S. J. HAMILL, which outlines the company's policy regarding the use or possession of drugs and related items. I understand the company requires employees to submit to urine specimens to be analyzed for the presence of drugs and/or alcohol. I realize that the testing positive for dangerous drugs or for being under the influence of alcohol is grounds for disciplinary action and that this may include termination of my employment. I further realize that my cooperation is voluntary and that refusal to submit a specimen for testing upon request is grounds for termination.

Furthermore, I agree to cooperate and abide by this policy and understand that any failure to do so on my part is grounds for termination.

Therefore, I understand and agree and I hereby freely waive all rights and objections, whether legal, constitutional or other, and hereby voluntarily consent to be tested for drugs and/or alcohol at any time and in any manner as directed by S. J. HAMILL and/or its agents or assigns. I further understand and agree that this testing may include but is not limited to pre-employment, post-accident, follow-up, return-to-duty, random and/or drug tests conducted by the company where there is reasonable suspicion.

I further understand that evidence of any adulteration of the specimen or refusal to cooperate will be treated as if I tested positive and I will be subject to immediate termination.

_____

Print Name

_____ _____

Signature Date

I hereby state that I have read and fully understand the above waiver of rights and objections, that any questions I had were answered to my satisfaction, and that if I hold any USCG licenses, I understand that my refusal to sign this form or submit to a drug and/or alcohol test must be reported to the USCG by my prospective employer and may result in a loss of my documentation.

_____

Print Name

_____ _____

Signature Date

_____ _____

Witness Date

1350 EQUAL EMPLOYMENT OPPORTUNITY
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Nassau County, FL is an Equal Opportunity/Affirmative Action Employer.

Pursuant to Executive Order 11346 as amended, you are advised that under the provisions of government contracting, contractors and subcontractors are obliged to take affirmative action to provide equal employment opportunity without regard to race, creed, color, national origin, age or sex.

CERTIFICATION BY PROPOSED PRIME OR SUBCONTRACTOR
REGARDING EQUAL EMPLOYMENT OPPORTUNITY

This certification is authorized pursuant to Executive Order 11246, Part II, Section 203(b), (30 F. R. 12319-15). Any bidder or prospective contractor, or any of the proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicated that the prime or subcontractor has not filed a compliance report due under applicable instruction, such contractor shall be required to submit a compliance report.

_____
(Signature of Bidder)

SJ Hamill Construction Company, LLC
(Typed name of bidder)

Phone # 843-872-8000 Fax # _____ e-mail : will@sjhamill.com

Address: 2008 Cherry Hill Lane, Charleston, South Carolina, 29405

1. Bidder has participated in a previous contract or subcontract, subject to the Equal Opportunity Clause: YES X NO____

2. Compliance Reports were required to be filed in connection with such contract or subcontract:
   YES____ NO X

   If YES, state what reports were filed and with what agency.

3. Bidder has filed all compliance reports due under applicable instructions:
   YES____ NO____

If answer to Item 3 is NO, please explain in detail on reverse side of this certification.

1355 PARTICIPATION IN E-VERIFY PROGRAM
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Contractor hereby certifies compliance with the following:

Pursuant to State of Florida Executive Order No.: 11-116, Contractor shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by Contractor while performing work or providing services for Nassau County, Florida. Contractor shall also include in any related subcontracts a requirement that subcontractors performing work or providing services for the County on its behalf utilize the E-Verify system to verify employment of all new employees hired by subcontractor.

CONTRACTOR:

SJ Hamill Construction Company, LLC
Business Name

By: _____
Signature

Name: William D. Spielvogel
Printed

Title: President
Printed

Date: February 24, 2021

1360 SCRUTINIZED COMPANIES CERTIFICATION
(MUST BE COMPLETED AND SUBMITTED WITH BID)
(Florida Statutes, Section 287.135)

SOLICITATION NUMBER: BID NO. NC21-008
PROJECT NAME: SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT

The undersigned, as President of SJ Hamill Construction Co., LLC (the "Contractor"), a SC Corporation, hereby certifies the following to the Board of County Commissioners of Nassau County, Florida, a political subdivision of the State of Florida, by and on behalf of the Contractor in accordance with the requirements of Florida Statutes, Section 287.135:

(i) the Contractor is not on the Scrutinized Companies with Activities in Sudan List, and

(ii) the Contractor is not on the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List

(as both such lists are created pursuant to Florida Statutes, Section 215.473); and

(iii) the Contractor does not have business operations (as that term is defined in Florida Statutes, Section 287.135) in Cuba and Syria; and

(iv) the Contractor was not on either of the foregoing lists or conducting business operations in Cuba or Syria; and

(v) the Contractor is fully aware of the penalties that may be imposed upon the Contractor for submitting false certification to the County regarding the foregoing matters; and

(vi) the undersigned in duly authorized to execute this Certification.

ATTEST:
As to Contractor Name

(Signature)

Matthew Dick, Treasurer
(Print or Type Name)

Date: February 24, 2021
Seal:

CONTRACTOR
SJ Hamill Construction Company, LLC
(Contractor Name)

By:
(Signature)

Its President
(Title of Authorized Representative)

William D Spielvogel
(Print or Type Name)

Date: February 24, 2021

1365 BIDDER CHECKLIST
(MUST BE COMPLETED AND SUBMITTED WITH BID)

Failure to submit the documents below shall result in the Bidder being deemed by the County as an unresponsive bidder.

All Bidders must acknowledge they have submitted the documents below with the Bid.

X	1200	Submitted Bid Form and Acknowledgement of Addenda Bidders must submit all information requested for the Total Base Bid; name of dredge to be used; commencement date; and sign acknowledgement
X	1300	Bid Bond
X	1305	Fair Practices Affidavit
X	1310	Affidavit of Organization
X	1315	Organizational Structure, Claims, and Suits
X	1320	Statement of License Certificate
X	1325	Subcontractors
X	1330	Questionnaire & References for Bidder Experience Bidders must provide answers for Q1 through Q5; provide three (3) reference projects; and sign acknowledgement
X	1335	Equipment Schedule Bidders must submit a list of equipment to be delivered and used to perform the Work including dredge, booster, attendant barges and tugs, pipe, land-based earth-moving equipment, storage units, etc.; Bidders must submit name of dredge and copies of U.S. Coast Guard current inspections and certifications; and/or copies of a current marine survey inspection report, including details of the qualifications and accreditations.
X	1340	Work Plan Bidders must submit a brief description of the proposed methods of mobilization/demobilization, the development, use, and protection of access areas, the proposed placement of pipelines and boosters (if used) and the general sequence and schedule of operations to perform the Work.
X	1345	Drug-Free Workplace Certification
X	1350	Equal Employment Opportunity
X	1355	Participation in E-Verify Program
X	1360	Scrutinized Companies Certification
X	1365	Checklist

STATEMENT OF NO BID
BID NO. NC21-008

If you do not intend to submit a bid, please complete the information below and return this form by:

Mail: Nassau County
Procurement Division
96135 Nassau Place
Suite 2
Yulee, Florida 32097

Or

E-mail to: procurement@nassaucountyfl.com

( )	Insufficient time to respond	( )	Unable to meet specifications
( )	Schedule would not permit us to perform	( )	Do not offer this product
( )	Specifications unclear	( )	Other (please specify below)

Company Name:_____ Date: _____

Signature:_____

Telephone Number:_____

E-Mail address _____

2000 AGREEMENT
FOR
BID NO. NC21-008 SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT

This Agreement for the SOUTH AMELIA ISLAND DREDGING & BEACH NOURISHMENT PROJECT is entered into by and between the Board of County Commissioners of Nassau County, Florida, a political subdivision of the State of Florida, sitting as the governing board of the South Amelia Island Shore Stabilization Association, Inc., a Municipal Services Benefit Unit, located at 96135 Nassau Place, Suite 1, Yulee, Florida, 32097 (hereinafter "County" or "Owner") and S.J. HAMILL CONSTRUCTION COMPANY, LLC, a South Carolina limited liability company, whose address is 2008 Cherry Lane, Charleston, South Carolina, 29405 (hereinafter "Contractor") as of the date appearing on the signature lines below.

ARTICLE 1 – WORK

1.01 Contractor shall complete all work as specified or indicated in the County's Invitation to Bid No. NC21-008 (hereinafter "ITB"), Contractor's bid submittal in response to the ITB, all Contract Documents as enumerated herein, the Technical Specifications and Drawings, and as otherwise directed by the County. The work (hereinafter "Work") is generally described as Nassau Sound hydraulic dredging and beach nourishment at Amelia Island or as more fully described in Article 2 of this Agreement.

ARTICLE 2 – THE PROJECT

2.01 The South Amelia Island Dredging & Beach Nourishment Project ("Project"), generally includes the hydraulic dredging, transport, placement, and shaping of approximately one million, eight hundred thousand (1,800,000) cubic yards of beach-quality sand from the approved Nassau Sound ebb shoal borrow area to the Atlantic Ocean shoreline of the south end of Amelia Island in Nassau County, Florida.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Olsen Associates, Inc., of Jacksonville, Florida (Engineer).

3.02 The Owner has retained Engineer to act as Owner's representative, assume all duties and responsibilities related to the Project, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

All time limits for Substantial Completion and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

A. Contractor shall initiate dredging and beach fill operations for the Project and shall complete sand placement from the point of initial sand placement to the point of Substantial Completion within one hundred thirty-five (135) days. Initial sand placement is defined by the placement of 1,000 cubic yards of material on the beach from the Nassau Sound borrow area, measured in place within the prescribed beach fill pay template. Substantial Completion of the beach fill is defined by the placement and surveyed acceptance of the volumes established in the Contract Specifications and Drawings.
B. Final Acceptance is defined as the date when the construction of the project is complete in accordance with the Contract Documents so that the entire project can be utilized for the purposes for which it is intended and all monies due Contractor can be paid in the final Application for Payment.

4.02 *Contract Times*

The contract time for this project is a total of up to two-hundred fifteen (215) calendar days or to November 15, 2021, whichever is sooner, from the County's issuance of the Notice to Proceed to reach Substantial Completion of the Project and up to two-hundred forty-five (245) calendar days, or to December 15, 2021, whichever is sooner from the Notice To Proceed for Final Acceptance of the entire Project.

Completion of the Contract will have been achieved once Final Acceptance has been reached and all final documentation, including final application for payment, has been received and processed.

4.03 *Liquidated Damages*

Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and milestones not achieved within the times specified in Paragraphs 4.01 and 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal

proceeding the actual loss suffered by Owner if the Work is not completed on time. The parties confirm that, (i) the assessment of liquidated damages is reasonable and appropriate; (ii) the terms and the amount(s) of the liquidated damages stated below are reasonable; and (iii) the liquidated damages will be assessed as the County's remedy under such circumstances and not as a penalty. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

A. Substantial Completion: Contractor shall pay Owner Ten Thousand Dollars ($10,000.00) for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02 above for Substantial Completion of the Project until the Work is substantially complete.
B. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) to reach the point of Final Acceptance, Contractor shall pay Owner $10,000.00 for each day that expires after such time until the Work is completed and ready for final payment.
C. Liquidated damages for failing to timely attain Substantial Completion and Final Acceptance are not additive and will not be imposed concurrently.
D. This remedy is in addition to and supplements any and all other remedies to Owner as set forth in the Contract Documents or at law or in equity for damages other than delay.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. Total of Lump Sum Amounts and Unit Price Work (subject to final quantity adjustments), a contract sum of: fourteen million five hundred ninety seven thousand dollars ($14,597,000.00), pursuant to the following schedule of values.

Item No. & Description	Number of Units	Units	Unit Price	Subtotal
1. Mobilization / Demobilization	1	Job	$2,844,500.00	$2,844,500.00
2. Hydraulic Beach Fill	1,800,000	cubic yards	$6.49	$11,682,000.00
3. Turbidity Monitoring	1	Job	$62,000.00	$62,000.00
4. Beach Tilling / Decompaction	1	Job	$8,500.00	$8,500.00
			Total Contract Amount	$14,597,000.00

B. The foregoing Total Contract Amount is approximate only, being herein above inserted for the purpose of establishing the face amount of bonds to be provided by the Contractor. Payment of work covered by unit price items will be made only on the basis of the actual quantities of work completed in place as authorized, and as measured and accepted as provided in the Contract Documents. As directed by the Owner, the final quantities actually placed and accepted for payment may vary from the quantities listed herein by ± twenty percent (20%). Contractor may not be entitled to any adjustment in unit prices or lump sum prices if quantities vary by ± twenty percent (20%), or less.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

Contractor shall submit Applications for Payment in accordance with Article 13 of the General Conditions and the determination of eligible payments described in the Specifications and Requirements. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

Prior to Substantial Completion, Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment in an amount equal to ninety percent (90%) of the Work completed (with the balance being retainage), less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided herein (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

6.03 *Final Payment*

Upon final completion and acceptance of the Work in accordance with the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer and as provided in said General Conditions.

ARTICLE 7 – CONTRACTOR'S REPRESENTATIONS

7.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items, including State and Federal permits for the work, identified in the Contract Documents.

B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and can and shall comply with all Federal, State, and local laws and regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Contract Documents, especially with respect to technical data in such reports and drawings, and (2) reports and drawings relating to hazardous environmental conditions, if any, at or adjacent to the Site that have been identified in the Contract Documents, especially with respect to technical data in such reports and drawings. Contractor acknowledges that the Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents, if any, with respect to physical conditions at or contiguous to the Work sites

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.
K. Contractor has had duly issued and executed all required Payment and Performance Bonds and Certificates of Insurance required by this Contract and the Contract Documents. Insurance requirements are set forth in the General Conditions.
L. Contractor is properly licensed in the State of Florida to perform the work set forth herein.

ARTICLE 8 – CONTRACT DOCUMENTS

8.01 *Contents*

A. The Contract Documents consist of the following:
   1. This Agreement;
   2. The General Conditions attached hereto and incorporated by reference;
   3. All Bonds, Certificates of Insurance with endorsements, Notice of Award, and Notice to Proceed;
   4. Specifications as listed in the table of contents of the Project Manual;
   5. Plans (as defined in the General Conditions of the Contract) consisting of sixteen (16) sheets;
   6. Permits (as defined in the General Conditions of the Contract);
   7. Any and all Addenda (as defined in the General Conditions of the Contract, including Change Orders and Field Orders);
   8. The Invitation to Bid (ITB), Instructions to Bidders, and Contractor's Bid to the ITB; and
   9. Technical Appendices as listed in the table of contents of the Project Manual.
B. The documents listed in Paragraph 8.01.A are attached to this Agreement (except as expressly noted otherwise above).
C. The Contract Documents may only be amended, modified, or supplemented as provided for in the General Conditions.

ARTICLE 9 – MISCELLANEOUS

9.01 *Terms*

Terms used in this Agreement will have the meanings stated in the General Conditions.

9.02 *Assignment of Contract*

Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without

the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

9.03 *Successors and Assigns*

Contractor binds itself, its successors, assigns, and legal representatives to the Owner, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

9.04 *Choice of Law and Forum Selection*

The laws of the State of Florida shall govern all provisions of this Contract. Venue for any dispute shall be Nassau County, Florida.

9.05 *Contract Modifications or Amendments*
This Contract shall not be modified or amended except in writing with the same degree of formality with which this Agreement is executed.

9.06 *Waiver*

A waiver of any breach of any provision of this Contract shall not constitute or operate as a waiver of any other breach of such provision or of any other provisions, nor shall any failure to enforce any provision hereof operate as a waiver of such provision or of any other provisions.

9.07 *Severability*

Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

9.08 *Dispute Resolution*

The laws of the State of Florida shall govern all provisions of this Contract. In the event the parties to this Contract cannot resolve a difference with regard to any matter arising herefrom, the disputed matter will be referred to court-ordered mediation pursuant to Section 44.102, F.S. If no agreement is reached, any party may file a civil action and/or pursue all available remedies whether at law or equity. Venue for any dispute shall be Nassau County, Florida.

9.09 *Public Records*

Pursuant to applicable Florida law, the Contractor's records associated with this Contract may be subject to Florida's public records laws, Section 119.01, F.S., et seq, as amended from time to time. The Contractor agrees to comply with Florida's public records law by keeping and maintaining public records required by the County in order to perform the Work. Upon request from the County's Custodian of Public Records, the Contractor shall provide the County with copies of or allow access to the requested public records at a cost that does not exceed the cost provided for under Chapter 119, Florida Statutes, or as otherwise provided for by Florida law. The Contractor shall ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the term of the Contract and following completion of the Contract if the Contractor does not transfer the records to the County. Upon completion of the Contract the Contractor shall transfer, at no cost, to the County all public records in possession of the Contractor or keep and maintain all public records required by the County to perform the Work. If the Contractor transfers all public records to the County upon completion of the Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the Contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the County, upon request from the County's custodian of public records, in a format that is compatible with the information technology systems of the County.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE COUNTY'S CUSTODIAN OF PUBLIC RECORDS AT RECORDS@NASSAUCOUNTYFL.COM.

9.10 *Contractor's Certifications*

Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 9.10:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

9.11 *Notice*

All notices required under this Contract shall be sent by e-mail, registered mail, or certified mail with receipt requested, and if sent to the Owner, shall be mailed:

To OWNER:

Taco Pope, County Manager
96135 Nassau Pl.
Suite 6
Yulee, FL 32097
(904) 321-5784 (fax)
tpope@nassaucountyfl.com

With copies to:

Brian Simmons, Procurement Manager
96135 Nassau Pl.
Suite 2
Yulee, FL 32097
procurement@nassaucountyfl.com

Albert E. Browder, Ph.D., P.E., D.CE
Olsen Associates, Inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 384-7368 (fax)
abrowder@olsen-associates.com

To CONTRACTOR:

Contractor's Contact _____

Contractor's Name _____

Contractor's Address _____

Contractor's E-Mail _____

Contractor's FAX # _____

[Signatures on next page.]

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement as of the day and year last written below. Owner and Contractor have signed this Agreement in two originals in counterpart. One counterpart each has been delivered to the County Purchasing Manager and the Contractor. All portions of the Contract Documents have been signed, initialed or identified by County and Contractor or identified by Engineer on their behalf.

ATTEST:
As to (NAME OF CONTRACTOR)

_____
Signature

_____
(Print or Type Name)

_____
(Print or Type Title)

Date: _____

Seal:

CONTRACTOR
(NAME OF CONTRACTOR)

By:_____

Its _____
(Title of Authorized Representative)

_____

_____
(Print or Type Title)

Date: _____

ATTEST:
As to Authenticity of the Chairman's Signature

_____
John C. Crawford, County Clerk

Date _____

Seal:

SAISSA GOVERNING BOARD:
Nassau County, Florida

By:_____
Thomas R. Ford, as its Chairman

Date:_____

Review of Contract as to Form

By: _____
Michael S. Mullin, Esq., County Attorney

PERFORMANCE BOND
BID NO. NC21-008

Bond #_____

KNOW ALL MEN BY THESE PRESENTS: That we, _____ _____, as Principal, and _____, a surety insurer chartered and existing under the laws of the State of _____ and authorized to do business in the State of Florida, as Surety, are held and firmly bound unto the Board of County Commissioners of Nassau County, Florida, as Obligee (hereinafter referred to as Owner) in the sum of_____ _____dollars ($_____), for the payment whereof we bind ourselves, our heirs, executors, personal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has entered into a contract dated as of the _____ day of_____, 20____, with Owner for the **South Amelia Island Dredging & Beach Nourishment Project**, in accordance with drawings and specifications which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS BOND is that if Principal:

1. Performs the Contract at the times and in the manner prescribed in the Contract; and

2. Pays Owner any and all losses, damages, costs and attorneys' fees that Owner sustains because of any default by Principal under the Contract; and

3. Performs the guarantee of all work and materials furnished under the Contract applicable to the work and materials, then this bond is void; otherwise it remains in full force; and

4. Principal understands and agrees that this bond shall remain in full force and effect throughout the one (1) year warranty period after substantial completion of the work.

The Surety, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or other work to be performed hereunder, or the specifications referred to therein shall in anywise affect its obligation under this bond, and it does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to work or to the specifications.

This instrument shall be construed in all respects as a common law bond.

In no event will the Surety be liable in the aggregate to Owner for more than the penalty sum of this Performance Bond, regardless of the number of suits that may be filed by Owner.

IN WITNESS WHEREOF, the above parties have executed this instrument this _____ day of_____, 20____, the name and corporate seal of each corporate party being hereto affixed and these premises duly signed by its undersigned representative, pursuant to authority of its governing body.

Signed, sealed and delivered in the presence of:

PRINCIPAL:

_____

_____
Witnesses as to Principal

By:_____
Name:_____
Its:_____

STATE OF _____ COUNTY OF _____

The foregoing instrument was acknowledged before me this _____ day of_____, 20__, by _____
(name of officer or agent, title of officer or agent)
via __ physical presence or __ online notarization of _____
(name of corporation acknowledging)
a _____ corporation, on behalf of the corporation.
(state or place of incorporation)
S/he __ is personally known to me or __ has produced a _____ as identification and did not take an oath.

My Commission Expires:

_____
(Signature)

Name:_____

ATTEST:

_____
Witness

_____
Witnesses as to Surety

SURETY: _____
(Printed Name)

_____

_____
(Business Address)

_____
(Authorized Signature)

_____
(Printed Name)

OR

_____ _____
As Attorney In Fact (Attach Power)

_____ _____
Witnesses _____
_____
(Business Address)

_____
(Printed Name)
_____
(Telephone Number)

STATE OF _____ COUNTY OF _____

The foregoing instrument was acknowledged before me this _____ day of_____, 20__, by _____
(name of officer or agent, title of officer or agent)
via __ physical presence or __ online notarization of _____
(name of corporation acknowledging)
a _____ corporation, on behalf of the corporation.
(state or place of incorporation)
S/he __ is personally known to me or __ has produced a _____ as identification and did not take an oath.

My Commission Expires: _____
(Signature)

Name:_____

APPROVED as to form:

BY:_____
Michael S. Mullin, County Attorney

LABOR & MATERIAL PAYMENT BOND
BID NO. NC21-008

Bond #_____

KNOW ALL MEN BY THESE PRESENTS: That we, _____ _____, as Principal, and _____, a surety insurer chartered and existing under the laws of the State of _____ and authorized to do business in the State of Florida, as Surety, are held and firmly bound unto the Board of County Commissioners of Nassau County, Florida, as Obligee (hereinafter referred to as Owner), in the sum of _____ _____dollars ($_____), for the payment whereof we bind ourselves, our heirs, executors, personal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has entered into a contract dated as of the _____ day of_____, 20____, with Owner for the **South Amelia Island Dredging & Beach Nourishment Project**, in accordance with drawings and specifications which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS BOND is that if Principal:

1. Performs the contract dated _____, 20___, between Principal and Owner for construction of **South Amelia Island Dredging & Beach Nourishment Project,** the contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the contract; and

3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that the Owner sustains because of a default by Principal under the contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

BE IT FURTHER KNOWN:

1. Any changes in or under the Contract and compliance or noncompliance with any formalities connected with the said Contract or alterations which may be made in the terms of the said Contract, or in the work to be done under it, or the giving by the County

of any extension of time for the performance of the said Contract, or any other forbearance on the part of the Owner or Principal to the other, shall not in any way release the Principal and the Surety, or either of them, their heirs, personal representatives, successors or assigns from liability hereunder, notice to the Surety of any such changes, alterations, extensions or forbearance being hereby waived.

2. Certain claimants seeking the protection of this Bond must timely comply with the strict requirements set forth in Section 255.05, Florida Statutes, and as otherwise provided by law.

3. As concerns payment for labor, materials and supplies, as affects certain claimants, no legal action shall be instituted against the Principal or Surety on this Bond after one (1) year from the performance of labor or the completion of delivery of the materials or supplies as is specifically mandated pursuant to Section 255.05, Florida Statutes.

THIS BOND DATED THE _____ DAY OF _____, 20____.

Signed, sealed and delivered
in the presence of:

PRINCIPAL:

_____

_____ By:_____

Witness as to Principal Name:_____

_____ Its:_____

Witness as to Principal

STATE OF _____ COUNTY OF _____

The foregoing instrument was acknowledged before me this _____ day of_____, 20__, by _____
(name of officer or agent, title of officer or agent)
via __ physical presence or __ online notarization of _____
(name of corporation acknowledging)
a _____ corporation, on behalf of the corporation.
(state or place of incorporation)
S/he __ is personally known to me or __ has produced a _____ as identification and did not take an oath.

My Commission Expires:

_____
(Signature)

Name:_____

ATTEST:

SURETY: _____
(Printed Name)

_____

_____
(Business Address)

_____
Witness as to Surety

_____
(Authorized Signature)

_____
Witness as to Surety

_____
(Printed Name)

OR

_____
Witness as to Attorney in Fact

_____
As Attorney In Fact (Attach Power)

_____
Witness as to Attorney in Fact

_____

_____
(Business Address)

_____
(Printed Name)

_____
(Telephone Number)

STATE OF _____ COUNTY OF _____
The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by _____, as _____, of _____, a_____ corporation, on behalf of the corporation. He/she is personally known to me OR has produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Signature)

Name:_____
Notary Public, State of _____

APPROVED as to form:
BY:_____
Michael S. Mullin, County Attorney

AFFIDAVIT
(MUST BE COMPLETED AND SUBMITTED WITH CONTRACT)

STATE OF _____ COUNTY OF _____.

Affiant, _____makes oath that he/she is the _____ (attorney in fact or agent) of _____ (surety) on the attached Contract dated _____, 20____, executed by _____(Contractor).

Affiant further deposes and says that no officer, official, or employee of the Owner or Engineer has any interest directly or indirectly, or is receiving any premium, commission fee, or other thing of value on account of the same or furnishing of the bond, undertaking, or contract of indemnity, guaranty, or suretyship in connection with the above-mentioned Contract.

Signed _____

Subscribed and sworn to before me
This _____day of _____, 20___ via __ physical presence or
__ online notarization.

NOTARY:

_____
Signature of Notary

_____
Print or Type Name of Notary

_____ _____
Commission Number Commission expires

NOTICE OF AWARD
BID NO. NC21-008

DATE: _____

TO: _____

PROJECT: **Board of County Commissioners, Nassau County, FL (OWNER)**
South Amelia Island Dredging & Beach Nourishment Project

You are notified that your bid dated _____, 20___, for the above Contract has been considered. You are the apparent successful bidder and will be awarded a contract for **BID NO. NC21-008 South Amelia Island Dredging & Beach Nourishment Project** upon fully conforming with the following requirements for award.

Within ten (10) days of the date of this Notice of Award, you must deliver to the OWNER the enclosed contract documents, fully executed, signed and witnessed, and a Certificate of Insurance as follows:

Two (2) originals - Contract Agreement
Two (2) originals - Performance Bond
Two (2) originals - Labor and Material Bond
Two (2) originals - Certificate of Insurance certifying compliance with all insurance requirements specified in the General Conditions

Within twenty-one (21) days after receipt of the above documents, the OWNER will return to you one (1) fully executed original of the Contract. You may obtain two additional free copies of plans and specifications upon request. You will be notified of the time and place for a preconstruction conference; your proposed work schedule must be delivered to the OWNER at that time.

Failure to deliver the aforementioned contract documents and insurance certificate within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited.

The Nassau County Board of County Commissioners (OWNER)

By: _____ _____
(Authorized Signature) (typed name & title)

ACCEPTANCE OF NOTICE OF AWARD

DATE: _____

PROJECT: **Board of County Commissioners, Nassau County, FL (OWNER)**
South Amelia Island Dredging & Beach Nourishment Project

Receipt of the above NOTICE OF AWARD is hereby acknowledged this _____ day of _____, 20____.

_____
(CONTRACTOR)

_____
(SIGNATURE)

NOTICE TO PROCEED

PROJECT: **BID NO. NC21-008**
Board of County Commissioners, Nassau County, FL (OWNER)
South Amelia Island Dredging & Beach Nourishment Project

DATE: _____

TO: _____

_____

_____

As of the date posted above, you are hereby notified to commence work in accordance with the Agreement dated _____, and you are to fully and satisfactorily complete the work to the point of Final Acceptance on, or before _____.

ISSUED BY: Olsen Associates, Inc. (Agent for OWNER)

BY: _____
(Authorized Signature)

_____
(TYPED NAME & TITLE)

ACCEPTANCE OF NOTICE TO PROCEED

Receipt of the above NOTICE TO PROCEED is hereby acknowledged this _____ day of

_____ , 20____.

_____
(CONTRACTOR)

_____
(SIGNATURE)

_____
(TITLE)

WAIVER AND RELEASE OF LIEN

FROM:_____

TO: **Board of County Commissioners, Nassau County, FL**

PROJECT: **BID NO. NC21-008**
Board of County Commissioners, Nassau County, FL (OWNER)
South Amelia Island Dredging & Beach Nourishment Project

KNOW ALL MEN BY THESE PRESENTS:

1. The undersigned, having been employed by the Board of County Commissioners of Nassau County, FL, (hereinafter called the Owner), to furnish labor and/or materials for the referenced project, does hereby waive and release any and all lien and claim or right to lien and claim against the Owner on the referenced project on account of labor or materials, or both furnished for the referenced project.

2. The undersigned further certifies that to the best of his knowledge and belief, there are no unsatisfied or outstanding claims of any character arising out of the furnishing of labor and/or materials for the referenced project.

3. The undersigned further agree that, after execution of this document, it will defend at its expense, and save the Owner harmless from any and all claims or liens arising out of the undersigned's furnishing of labor and/or materials for the referenced project.

4. The undersigned has executed this document in order to induce the Owner to make final payment to and in no way acts as a release of any claim the undersigned may have against parties other than the Owner arising out of the furnishing of labor and/or materials for the referenced project.

IN WITNESS WHEREOF, the undersigned has signed and sealed this instrument this _____day of_____, 20___.

_____

STATE OF _____ COUNTY OF_____

Personally appeared before me the undersigned Notary Public in and for said County and State, _____, via __ physical presence or __ online notarization, and who __ is personally known to me or __ produced _____ as identification and, after being duly sworn, deposes and says that the facts stated in the above affidavit are true.

_____
NOTARY PUBLIC

2200 GENERAL CONDITIONS

TABLE OF CONTENTS

ARTICLE 1 – DEFINITIONS

1.01 *Defined Terms and Terminology*

A. *Defined Terms* - Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Acceptance Section* – A predefined section of the project fill eligible for progress payment subject to Acceptance by the Owner or Engineer.
2. *Addenda*— Written or graphic instruments which clarify, correct, or change the Contract Documents including but not limited to Change Orders and Field Orders.
3. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
4. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
5. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
6. *Bidder*—An individual or entity that submits a Bid to Owner.
7. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
9. *Bonds* – Bid, performance, and payment bonds and other instruments of security as provided by the Contractor.
10. *Change Order*—A written recommendation from the Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
11. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
12. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
13. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
14. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
15. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
16. *Day* – A calendar day of twenty-four hours measured from midnight to the next midnight.
17. *Drawings* - See *Plans*.
18. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
19. *Engineer*—The firm of Olsen Associates, Inc., Jacksonville, FL, acting through its authorized representative(s). The term is synonymous with "Project Engineer" or "Consultant."
20. *Environmental Pollution* - the presence of chemical, physical or biological elements or agents which adversely affect human health or welfare, unfavorably alter ecological balance of importance to human life, affect other species of importance to man, or degrade the utility of the environment for aesthetic or recreational purposes. The

control of environmental pollution requires consideration of air, water and land and involves noise, solid waste-management and management of radiant energy and radioactive materials, as well as other pollutants.

21. *Environmental Requirements* –The part of the Specifications (Section 3400) that consists of written requirements for standards for environmental habitat and species protection and pollution control as applied to the Work, and certain environmental administrative requirements and procedural matters applicable to the Work.
22. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
23. *Final Acceptance* – The date when the construction of the project is complete in accordance with the Contract Documents so that the entire project can be utilized for the purposes for which it is intended and all monies due Contractor can be paid in the final Application for Payment.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract. Herein the Owner is the Board of County Commissioners of Nassau County, FL. The terms Owner and County are used interchangeably.
29. *Permits*-The documents issued that provide authorization and requirements or restriction for the Work to be performed from Federal, State, County, or local regulatory agencies.
30. *Plans* - The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor, also called Construction Plans or Drawings.
31. *Progress Schedule* - A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
33. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
34. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
35. *Shop Drawings*- All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for Contractor to illustrate some portion of the work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams, and other information prepared by a supplier and submitted by Contractor to illustrate material or equipment for some portion of the work.

36. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
37. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
38. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
39. *Substantial Completion*— Substantial completion shall be defined as the time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
40. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
41. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
42. *Technical Reports* – Reports issued by the Owner consisting of written technical material.
43. *Technical Requirements* – The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
44. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
45. *Unit Price Work*—Work to be paid for on the basis of unit prices.
46. *Wave Zone* – That portion of the beach profile, fill profile, or fill template above Mean Low Water (at South Amelia Island: -3.0 ft NAVD88), extending landward to the typical wave uprush or wrack line.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

B. *Terminology*
1. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
2. *Intent of Certain Terms or Adjectives*:
The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign

to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

3. *Defective*:
   The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
   a. does not conform to the Contract Documents; or
   b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
   c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 13.03 or 13.04).
4. *Furnish, Install, Perform, Provide*:
   a. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
   b. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
   c. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
   d. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
5. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

2.02 *Copies of Documents*

Owner shall furnish to Contractor three printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

2.03 *Before Starting Construction*

Preliminary Schedules: Within fifteen (15) days after issuance of the Notice to Proceed (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer and Owner for timely review:

A. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work and

B. a preliminary schedule of submittals.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, agents of appropriate regulatory agencies, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03, requirements of the Permits for the Work, the procedures for handling Shop Drawings, samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

At least ten (10) days before submission of the first Application for Payment, Contractor shall submit for review a draft of the Application for Payment for review by Engineer as to the form of the Application and the proposed allocation of the Contract Price for that and subsequent Applications for Payment. Such review will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all. The Contract Documents shall be construed in accordance with the Laws of the State of Florida.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

Standards Specifications, Codes, Laws and Regulations

A. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

B. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to

applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall be liable to Owner for failure to report any conflict, error, defect, ambiguity, or discrepancy in the Contract Documents if the Contractor knew or reasonably should have known thereof.

B. *Resolving Discrepancies*:

Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

1. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
2. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's and Engineer's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

The Contract Times will commence to run on the day indicated in the Notice to Proceed.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Time commences to run. No Work shall be done at the Site prior to such date.

B. Notice - Contractor shall notify Owner forty-eight (48) hours in advance of starting work at the site of its intentions to do so. In case of temporary suspension of the work, Contractor shall give reasonable notice before resuming work.

4.03 *Reference Points*

Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.03 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 14.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times as may be determined by the Owner. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference

described in this paragraph. Delays due to adverse weather conditions or tides, excepting significant specific or named storm events, will not be regarded as cause for adjustment in Contract Time, as Contractor should understand that such conditions are to be expected and plan work accordingly. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
2. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
3. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph immediately upon occurrence of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site, including rights-of-way and easements that are made available to Contractor. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the work is to be performed

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment.
2. *Loss or Damage of Contractor's Equipment:* Loss or damage to Contractor's or Subcontractor's equipment is solely at the risk of Contractor or Subcontractor.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Specifications and Requirements and Appendices identify:
   1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site that have been utilized in the preparation of the Contract Documents;
   2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
   3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the general accuracy of the Technical Data expressly identified in the Technical Requirements with respect to such reports and drawings, but such reports and drawings are not Contract Documents. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
   1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
   2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
   3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
   1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
   2. is of such a nature as to require a change in the Drawings or Specifications; or
   3. differs materially from that shown or indicated in the Contract Documents; or
   4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

   then Contractor shall, immediately upon becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.14), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the condition in question; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:
   1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
      a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
      b. any adjustment in Contract Price will be subject to the provisions of Article 11; and,
      c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
   2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
      a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
      b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
      c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
   3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
   4. Contractor may submit a written request for a Change Order regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than thirty (30) days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided elsewhere in these Contract Documents:
   1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
   2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
      a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
      b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
      c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
      d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.14),

identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
   a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
   b. any adjustment in Contract Price will be subject to the provisions of Article 11; and,
   c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
   d. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
3. Contractor may submit a request for a Change Order regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than thirty (30) days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due except as provided otherwise by Laws or Regulations, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury, and rated 'A', FSC VII or better by A.M. Best. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within ten (10) days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

6.02 *Insurance—General Provisions*

A. Contractor is to secure, pay for, and file with the Owner (Board of County Commissioners of Nassau County, FL), prior to commencing any work under the Contract, all certificates for workers' compensation, public liability, and property damage liability insurance, and such other insurance coverages as may be required by specifications and addenda thereto, in at least the following minimum amounts with specification amounts to prevail if greater than minimum amounts indicated. Notwithstanding any other provision of the Contract, the Contractor shall provide the minimum limits of liability insurance coverage as listed in Section 6.03.

B. All insurance required by the Contract to be purchased and maintained by Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds or insurance policies for the required limits and coverages. Unless a different standard is indicated elsewhere in the Contract Documents, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of 'A', FSC VII or better.

C. Contractor shall furnish an original Certificate of Insurance indicating, and such policy providing coverage to, the Owner (Board of County Commissioners of Nassau County, FL), the Engineer (Olsen Associates, Inc.), the Florida Department of Environmental Protection, Division of Recreation and Parks, and the entities listed in Section 6.02.C.1. (if any) named as additional insureds on a PRIMARY and NON CONTRIBUTORY basis utilizing an ISO standard endorsement at least as broad as CG 20 10 (11/85) or its equivalent (combination of CG 20 10 07 04 and CG 20 37 07 04, providing coverage for completed operations, is acceptable), including a waiver of subrogation clause in favor of the Owner (Board of County Commissioners of Nassau County, FL), the Engineer (Olsen Associates, Inc.), the Florida Department of Environmental Protection, Division of Recreation and Parks, and the entities listed in Section 6.02.C.1. (if any) on all policies. Contractor will maintain the General Liability and Umbrella Liability insurance coverages summarized in Section 6.03 with coverage continuing in full force including the additional insured endorsement throughout the duration of the project and the warranty period.

1. *(No private upland easements provided at this time.)*

D. Contractor shall not allow a Subcontractor to work on the project or to be present at the project area without either Subcontractor carrying his own Workers Compensation and Liability Insurance to the limits stated herein, excepting umbrella liability insurance, or the Contractor expressly covering the Subcontractor under his policies. The policy is the same for any sub-tier Contractor. The Owner may request proof of such coverage at any time during the performance of the work.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Notwithstanding any other provision of the Contract, the Contractor shall maintain complete workers' compensation coverage for each and every employee, principal, officer, representative, or agent of the Contractor who is performing any labor, services, or material under the Contract. Further, Contractor shall additionally maintain the following minimum limits of coverage:
   1. Bodily Injury Each Accident $1,000,000
   2. Bodily Injury by Disease Each Employee $1,000,000
   3. Bodily Injury by Disease Policy Limit $1,000,000
   4. If the work is being done on or near a navigable waterway, CONTRACTOR's workers compensation policy shall be endorsed to provide USL&H Act (WC 00 01 06 A) and Jones Act (WC 00 02 01 A) coverage if specified by the Owner (Board of County Commissioners of Nassau County, FL).
   5. Contractor shall provide the Owner (Board of County Commissioners of Nassau County, FL) with a Certificate of Insurance verifying compliance with the workman's compensation coverage as set forth herein and shall provide as often as required by the Owner (Board of County Commissioners of Nassau County, FL) such certification which shall also show the insurance company, policy number, effective and expiration date, and the limits of workman's compensation coverage under each policy.

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
   1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
   2. claims for damages insured by reasonably available personal injury liability coverage.
   3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
   4. Liability Insurance policy shall include minimum limits of:
      a. $5,000,000 Aggregate (Per Project)
      b. $2,000,000 Products Aggregate
      c. $5,000,000 Any One Occurrence
      d. $5,000,000 Personal Injury

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on an industry standard ACORD certificate and include the following coverages and endorsements:
   1. Products and completed operations coverage:
      a. Such insurance shall be maintained for three years after final payment.
   2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.17.
   3. Broad form property damage coverage.
   4. Severability of interest.
   5. Underground, explosion, and collapse coverage.
   6. Personal injury coverage.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis. Policy shall include minimum limits of:
   1. $5,000,000.00 combined single limit

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies. Policy shall include minimum limits of:
   1. $10,000,000.00 occurrence/aggregate

F. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and the entities listed in Section 6.02.C.1 (if any); include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

G. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. be endorsed to give 30 days written notice to the Owner in the event of cancellation or material change, using form CG 02 24, or its equivalent. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
2. Certificates of Insurance submitted to the Owner will not be accepted without copies of the endorsements being requested. This includes additional insured endorsements, cancellation/material change notice endorsements, and waivers of subrogation. Copies of USL&H Act and Jones Act endorsements will also be required if necessary. CONTRACTOR SHALL ADVISE INSURANCE AGENT ACCORDINGLY.
3. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
4. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

H. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.03, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

B. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Contract Documents as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by any insurance applicable to the Work.

6.05 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by the Contract Documents will be adjusted and settled by the Owner as fiduciary for the insured as their interest may appear. The Owner shall account for all money received and shall distribute it in accordance with such agreements as the parties in interest may reach.

B. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The Owner reserves the right to require the Contractor to remove and replace the superintendent of the Project within fifteen (15) days of notice.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Working Hours are as set forth in the Specifications and Requirements (Section 3000).

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer and applicable regulatory agencies to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor.
2. The requirements for review by Engineer will be as set forth in Paragraph 7.04.B, as supplemented by the Specifications and Requirements, and as Engineer may decide is appropriate under the circumstances.
3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
    a. shall certify that the proposed substitute item will:
        1) perform adequately the functions and achieve the results called for by the general design,
        2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:
   1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
   2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents, including regulatory permits (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
   3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:
   1) all variations of the proposed substitute item from that specified, and
   2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute and has been approved for use under the project Permits. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

D. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Field or Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

7.05 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

B. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Contractor shall not employ any Subcontractor until Owner's approval in writing is received for each Subcontractor. As necessary, all Subcontractors must obtain the appropriate business licenses before commencing work.

C. Should any Subcontractor fail to perform their portion of the Work in a satisfactory manner, such Subcontractor shall be terminated immediately by Contractor upon notice from the Owner.

D. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

E. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

F. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

G. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.06 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify, defend, and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.07 *Permits*

A. Owner will provide permits and easements for the Work from the following major agencies having jurisdiction:

1. Florida Department of Environmental Protection (FDEP)
2. U.S. Army Corps of Engineers (USACE)
3. Nassau County, FL (waived)

B. Permits so obtained by Owner as of the date of publication of the Contract Documents are included as Appendix A and Appendix D of the Contract.

C. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all other construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.08 *Taxes*

Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all

fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

7.10 *Record Documents*

Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.11 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
   1. all persons on the Site or who may be affected by the Work;
   2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
   3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
   1. Contractor shall notify Owner (Board of County Commissioners of Nassau County, FL) and Engineer (Olsen Associates, Inc.) immediately by telephone at contact numbers to be provided at the time of the pre-construction conference of any accident or injury to anyone that occurs on the jobsite and is related to any of the work being performed by the Contractor.

C. Contractor is responsible for observing and complying with all applicable Occupational Safety and Health Administration (OSHA) regulations.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. Accident Prevention. In order to provide safety controls for protection of the life and health of employees and other persons; for prevention of damage to property, materials, supplies and equipment; and for avoidance of Work interruptions in the performance of this Contract, the Contractor shall comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated 30 November 2014, entitled "Safety and Health Requirements Manual", as amended, and will also take or cause to be taken such additional measures as the Owner or Engineer may determine to be reasonably necessary for the purpose.
   1. The Contractor will maintain an accurate record of, and will report to the Engineer in the manner and on the forms prescribed by the Engineer, exposure data and all accidents

resulting in death, traumatic injury, occupational disease, and damage to property, materials, supplies and equipment incident to work performed under this Contract.

2. The Owner or Engineer will notify the Contractor of any noncompliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his representative at the site of the Work, shall be deemed sufficient to the purpose. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

F. All damage, injury, or loss to any property referred to in Paragraph 7.11.A.2 or 7.11.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense.

G. The Owner or Engineer may periodically monitor Work site safety. Neither the Owner or Engineer, or their representatives, shall have or assume any responsibility or duty whatsoever with respect to the adequacy of the Contractor's safety measures in, on, or near the project area. The Contractor shall have the sole and exclusive duty and responsibility for compliance with all OSHA and other safety requirements with respect to the Work and the performance of the Work.

H. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed in accordance with Article 13 (except as otherwise expressly provided in connection with Substantial Completion).

I. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.12 *Safety Representative*

Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.13 *Hazard Communication Programs*

Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.14 *Emergencies*

In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer written notice within twenty-four (24) hours that the emergency action has been taken and shall state the reasons therefore. If Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof, Contractor shall provide written notice of such. Engineer shall review such notice and shall make recommendations to Owner regarding the issuance of a Field Order or Change Order will be issued.

7.15 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
    a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
    b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings*:
a. Contractor shall submit the number of copies required in the Specifications.
b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.15.D.

2. *Samples*:
a. Contractor shall submit the number of Samples required in the Specifications.
b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.15.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents, including the project permits, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.15.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample.

Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.15.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, nor other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.15.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.16 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
2. recommendation by Engineer or payment by Owner of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal;
6. the issuance of a notice of acceptability by Engineer;
7. any inspection, test, or approval by others; or
8. any correction of defective Work by Owner.

C. All work shall be guaranteed by Contractor for a period of one (1) year from and after the date of Final Acceptance of the Work by owner.

D. If, within the guarantee period, repairs or changes are required in connection with guaranteed work which, in the opinion of Owner or Engineer, is rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract, Contractor shall, promptly upon receipt of notice from Owner and without expense to Owner, do the following:

1. Place in satisfactory condition in every particular all of such guaranteed work and correct all defects therein.
2. Make good all damage to the building, or site, or equipment, or contents thereof which, in the opinion of Engineer, is the result of the use of materials, equipment, or workmanship which is inferior, defective, or not in accordance with the terms of the Contract.
3. Make good any work or materials or the equipment and contents of building, structure, or site disturbed in fulfilling any such guarantee.
4. Submit a work schedule showing the dates of starting and completing the repair work.

E. If Contractor, after notice, fails to proceed within ten (10) days to comply with the terms of this guarantee, Owner may have the defects corrected, and Contractor and his surety shall be liable for all expense incurred: provided, however, that in case of an emergency where, in the opinion of Owner, delay would cause loss or damage, repairs may be started without notice being given to Contractor and Contractor shall pay the cost thereof.

F. If minor repairs are made by Owner without notice to Contractor, or if Owner personnel are used to assist Contractor or an equipment supplier in making repairs to defective work, Contractor will be billed for and shall pay the costs of the minor repairs and the costs associated with the use of Owner's personnel.

7.17 *Indemnification*

A. To the fullest extent permitted by law, the Contractor expressly agrees to indemnify, defend, and hold harmless the Board of County Commissioners of Nassau County, FL, the South Amelia Island Shore Stabilization Association, the Florida Park Service, Olsen Associates, Inc., the entities listed in Section 6.02.C.1 (if any), their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the Contractor, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of Contractor's insurance or $1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

B. The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the Contractor or of any third party to whom Contractor may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to

properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Furnish Data*

Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.03 *Pay When Due*

Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.04 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.06. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not

supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in these General Conditions and limitations on the responsibilities thereof will be as provided in Paragraph 10.08.

10.04 *Rejecting Defective Work*

Engineer has the authority to reject Work in accordance with Article 12.

10.05 *Decisions on Requirements of Contract Documents and Acceptability of Work*

Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work.

10.06 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
D. The limitations upon authority and responsibility set forth in this Paragraph 10.06 shall also apply to the Resident Project Representative, if any.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

The Contract Documents may be amended or supplemented by a Change Order or a Field Order.

1. *Change Orders*: If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order signed by Contractor, Engineer, and Owner. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
2. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical

matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price.

B. Upon receipt of any such written order, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Contractor shall not be entitled to claim lost profits for work deleted. Added or revised Work shall be performed under the applicable conditions of the Contract Documents.

11.03 *Unauthorized Changes in the Work*

Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.14 or in the case of uncovering Work as provided in Paragraph 12.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order.

B. An adjustment in the Contract Price will be determined by one or more of the following methods, as selected by the Owner:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved; or
2. where the Work involved is not covered by unit prices contained in the Contract Documents, by negotiated unit prices; or
3. then by a mutually agreed lump sum.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Notification to Surety*

If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

12.01 *Access to Work*

Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at all times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

12.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging

and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

C. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
   1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
   2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
   3. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

   Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

D. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

12.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

12.04 *Acceptance of Defective Work*

If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order, including an appropriate reduction in project sum. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner to compensate for the defect.

12.05 *Uncovering Work*

A. Engineer has the authority to require special inspection or testing of the Work at the Contractors expense, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction.

12.06 *Owner May Stop the Work*

If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor or any other party. The Contractor shall have no right to claim an increase in the Contract Sum or Contract Time or other damages for a Stop Work order issued under this paragraph.

12.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven (7) days written notice to Contractor, correct or remedy any such deficiency.

B. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph will be charged against Contractor as set-offs against payments due under Article 13. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

C. Contractor shall not be allowed an increase in the Contract Sum or an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph.

ARTICLE 13 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

13.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 5 of the Agreement will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payment applications shall be prepared and values determined as established in the Specifications and Requirements (Section 3100). The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Reductions in Payment by Owner*:

1. Owner is entitled to impose a set-off against payment based on any of the following:
    a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
    b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
    c. Contractor has failed to provide and maintain required bonds or insurance;
    d. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
    e. the Work is defective, requiring correction or replacement;
    f. Owner has been required to correct defective Work in accordance with Paragraph 12.07, or has accepted defective Work pursuant to Paragraph 12.04;
    g. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
    h. liquidated damages have accrued as a result of Contractor's failure to achieve Substantial Completion and/or Final Acceptance of portions of the Work, as defined in the Agreement;
    i. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
    j. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a proposal for a Change Order contesting the reduction.

13.02 *Contractor's Warranty of Title*

Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, at the time of payment by Owner.

13.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete. Contractor shall at the same time submit to Owner and Engineer a thorough and conclusive punch list of items to be completed or corrected before final payment. The Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. Failure to include an item on this list does not relieve the Contractor of the responsibility to complete all Work in accordance with the Contract Documents.
B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor giving the reasons therefor.

C. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

13.04 *Partial Use or Occupancy*

Prior to Substantial Completion of all the Work, Owner or general public may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work. Such use or occupancy shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents.

13.05 *Final Inspection*

Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

13.06 *Final Payment*

Application for Payment:

1. After Contractor has, in the opinion of Owner and Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
    a. all documentation called for in the Contract Documents;
    b. consent of the surety, if any, to final payment;
    c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
    d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work, including the Waiver and Release of Lien form found in Section 2220.
3. In lieu of the releases or waivers of Liens specified in Paragraph 13.06. 2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

13.07 *Waiver of Claims*

The acceptance of final payment and submittal of the Waiver and Release of Lien Form by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 15.

13.08 *Correction Period*

A. If after approval of final payment and prior to one (1) year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work or materials are found to be defective, incomplete, or not in accordance with the Contract Documents, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
   1. correct the defective repairs to the Site or such other adjacent areas;
   2. correct such defective Work;
   3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
   4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

ARTICLE 14 – SUSPENSION OF WORK AND TERMINATION

14.01 *Owner May Suspend Work*

At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than ninety (90) days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any proposal seeking such adjustments shall be submitted no later than thirty (30) days after the date fixed for resumption of Work.

14.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
   1. Contractor's declaration of bankruptcy, development of insolvency, or assignment assets to the benefit of Contractor's creditors;
   2. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
   3. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
   4. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
   5. Contractor's repeated disregard of the authority of Owner or Engineer.
   6. Contractor's loss of license or certification.

B. If one or more of the events identified in Paragraph 14.02.A occurs, then after giving Contractor (and any surety) ten (10) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. If Owner proceeds as provided in Paragraph 14.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraph 14.02.B.

14.03 *Owner May Terminate For Convenience*

A. Upon seven (7) days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
   1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
   2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
   3. other reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or incidental or consequential damages, or other economic loss arising out of or resulting from such termination.

14.04 *Additional Owner Termination Rights*

A. The Owner may immediately terminate the Agreement upon occurrence of any of the following events:
   1. The Contractor is found to have submitted a false certification to the Owner with respect to whether the Contractor:
      a. is on the Scrutinized Companies with Activities in Sudan List (pursuant to Florida Statutes, Section 215.473);
      b. is on the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List (pursuant to Florida Statutes, Section 215.473);
      c. has business operations in Cuba or Syria

   2. The Contractor:

a. is placed on the Scrutinized Companies with Activities in Sudan List, or
b. is placed on the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or
c. engages in business operations in Cuba or Syria.

ARTICLE 15 – FINAL RESOLUTION OF DISPUTES

15.01 *Procedure*

Contractor shall notify the Owner in writing within five (5) calendar days of the date any dispute or claim occurs or is discovered, that may arise in the course of this Agreement, including but not be limited to, law, additional work and all claims for alleged breach of contract. **Means for dispute resolution are set forth in the Agreement**.

ARTICLE 16 – MISCELLANEOUS

16.01 *Giving Notice*

Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if in compliance with the Notice instructions provided in the Agreement (Section 2000).

16.02 *Computation of Times*

When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day acknowledged as a County holiday, such day will be omitted from the computation.

16.03 *Cumulative Remedies*

The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

16.04 *Survival of Obligations*

All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

16.05 *Controlling Law*

The Contract Documents shall be construed and controlled by and under the laws of the State of Florida. Further, any dispute arising out of or concerning the Contract, or any action performed thereunder, shall be adjudicated solely in the state courts in Nassau County, Florida and the parties waive any defenses of personal and/or subject matter jurisdiction to the aforesaid venues.

GENERAL INFORMATION AND MINIMUM INSURANCE REQUIREMENTS

COMMERCIAL GENERAL LIABILITY INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Commercial General Liability insurance coverage (ISO or comparable Occurrence Form) for the life of this Contract. Modified Occurrence or Claims Made forms are not acceptable.

The Limits of this insurance shall not be less than the following limits:

Each Occurrence Limit	$1,000,000
Personal & Advertising Injury Limit	$1,000,000
Fire Damage Limit (any one fire)	$ 500,000
Medical Expense Limit (any one person)	$ 50,000
Products & Completed Operations Aggregate Limit	$4,000,000
General Aggregate Limit (other than Products & Completed Operations) Applies Per Project	$4,000,000

General liability coverage shall continue to apply to "bodily injury" and to "property damage" occurring after all work on the Site of the covered operations to be performed by or on behalf of the additional insureds has been completed and shall continue after that portion of "your work" out of which the injury or damage arises has been put to its intended use.

WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Workers' Compensation and Employer's Liability insurance coverage for the life of this Contract.
The Limits of this insurance shall not be less than the following limits:

Part One – Workers' Compensation Insurance – Unlimited
Statutory Benefits as provided in the Florida Statutes and
Part Two – Employer's Liability Insurance

Bodily Injury By Accident	$1,000,000 Each Accident
Bodily Injury By Disease	$1,000,000 Policy Limit
Bodily Injury By Disease	$1,000,000 Each Employee

*If leased employees are used, policy must include an Alternate Employer's Endorsement

U.S. LONGSHORE & HARBOR COVERAGE (Federal Act)

The Contractor shall purchase and maintain at the Contractor's expense U. S. Longshore & Harbor Workers Coverage for the life of this Contract.

This can be a stand-alone policy or added by endorsement to the State Act Workers' Compensation and Employers Liability policy noted above.

Limits as noted under Workers' Compensation and Employers Liability Insurance.

AUTOMOBILE LIABILITY INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Automobile Liability insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Combined Single Limit – Each Accident	$1,000,000

Covered Automobiles shall include any auto owned or operated by the insured Contractor, insured Sub-subcontractor including autos which are leased, hired, rented or borrowed, including autos owned by their employees which are used in connection with the business of the respective Contractor or Sub-subcontractor.

UMBRELLA INSURANCE

The Contractor shall purchase and maintain at the Contractor's expense Umbrella Liability (Umbrella Form) insurance coverage for the life of this Contract.

The Limits of this insurance shall not be less than the following limits:

Each Occurrence Limit	$2,000,000
Aggregate Limit	$4,000,000

Contractor shall require each of his Subcontractors to likewise purchase and maintain at their expense Commercial General Liability insurance, Workers' Compensation and Employer's Liability coverage, Automobile Liability insurance, Umbrella Liability Professional Liability, Environmental Liability, Builders Risk or Installation Floater (as applicable) insurance coverage meeting the same limit and requirements as the Contractors insurance.

Certificates of Insurance acceptable to Nassau County Board of County Commissioners for the Contractor's insurance must be received within five (5) days of Notification of Selection and at time of signing Agreement.

Certificates of Insurance and the insurance policies required for this Agreement shall contain an endorsement that coverage afforded under the policies will not be cancelled or allowed to expire until at least thirty (30) days prior written notice has been given to Nassau County Board of County Commissioners.

Certificates of Insurance and the insurance policies required for this Agreement will include a provision that policies, except Workers' Compensation and Professional Liability, are primary and noncontributory to any insurance maintained by the Contractor.

Nassau County Board of County Commissioners must be named as an Additional Insured and endorsed onto the Commercial General Liability (CGL), Auto Liability and Umbrella Liability policy (ies). A copy of the endorsement(s) must be supplied to Nassau County Board of County Commissioners ten (10) days following the execution of the agreement or prior to the first date of services, whichever comes first.

CGL policy Additional Insured Endorsement must include Ongoing and Completed Operations (Form CG2010 11 84 **OR** Form CG2010 04 13 and GC2037 04 13 edition or equivalent). Other Additional Insured forms might be acceptable but only if modified to delete the word "ongoing" and insert the sentence "Operations include ongoing and completed operations".
CGL policy shall not be endorsed with Exclusion - Damage to Work performed by Subcontractors on Your Behalf (CG2294 or CG2295)
CGL policy shall not be endorsed with Contractual Liability Limitation Endorsement (CG2139) or Amendment of Insured Contract Definition (CG 2426)
CGL policy shall not be endorsed with Exclusion - Damage to Premises Rented to you (CG 2145)
CGL policy shall include broad form contractual liability coverage for the Contractors covenants to and indemnification of the Authority under this Contract

Certificates of Insurance and the insurance policies required for this Agreement shall contain a provision under General Liability, Auto Liability and Workers' Compensation to include a Waiver of Subrogation clause in favor of Nassau County Board of County Commissioners.

All Certificates of Insurance shall be dated and shall show the name of the insured Contractor, the specific job by name and job number, the name of the insurer, the policy number assigned its effective date and its termination date and a list of any exclusionary endorsements.

All Insurers must be authorized to transact insurance business in the State of Florida as provided by Florida Statute 624.09(1) and the most recent Rating Classification/Financial Category of the insurer as published in the latest edition of "Best's Key Rating Guide' (Property-Casualty) must be at least A- or above.

All of the above referenced Insurance coverage is required to remain in force for the duration of this Agreement and for the duration of the warranty period. Accordingly, at the time of submission of final application for payment, Contractor shall submit an additional Certificate of Insurance evidencing continuation of such coverage.

If the Contractor fails to procure, maintain or pay for the required insurance, Nassau County Board of County Commissioners shall have the right (but not the obligation) to secure same in the name of and for the account of Contractor, in which event, Contractor shall pay the cost thereof and shall furnish upon demand, all information that may be required to procure such insurance. Nassau County Board of County Commissioners shall have the right to back-charge contractor for the cost of procuring such insurance. The failure of Nassau County Board of County Commissioners to demand certificates of insurance and endorsements evidencing the required insurance or to identify any deficiency in contractors coverage based on the evidence of insurance provided by the contractor shall not be construed as a waiver by Nassau County Board of County Commissioners of contractor's obligation to procure, maintain and pay for required insurance.

The insurance requirements set forth herein shall in no way limit Contractors liability arising out of the work performed under the Agreement or related activities. The inclusions, coverage and limits set forth herein are minimum inclusion, coverage and limits. The required minimum policy limits set forth shall not be construed as a limitation of Contractor's right under any policy with higher limits, and no policy maintained by the Contractor shall be construed as limiting the type, quality or quantity of insurance coverage that Contractor should maintain. Contractor shall be responsible for determining appropriate inclusions, coverage and limits, which may be in excess of the minimum requirements set forth herein.

If the insurance of any Contractor or any subcontractor contains deductible(s), penalty(ies) or self-insured retention(s), the Contractor or Subcontractor whose insurance contains such provision(s) shall be solely responsible for payment of such deductible(s), penalty(ies) or self-insured retention(s).

The failure of Contractor to fully and strictly comply at all times with the insurance requirements set forth herein shall be deemed a material breach of the Agreement.

SPECIFICATIONS & REQUIREMENTS
BID NO. NC21-008 SOUTH AMELIA ISLAND
DREDGING & BEACH NOURISHMENT PROJECT

TABLE OF CONTENTS

3000 GENERAL REQUIREMENTS

1. SCOPE

The Work covered by this section consists of mobilization and demobilization, furnishing all plant, labor, equipment, surveying, supplies and material, site preparation and restoration, hydraulic dredging, beach placement, grading, and performance of all operations in connection with the placement and shaping of up to 2,000,000 cubic yards of beach-quality sand fill from the Nassau Sound ebb shoal for beach nourishment along the Atlantic Ocean shoreline of Amelia Island in Nassau County, Florida, in accordance with the project permits (Appendix A), the Construction Plans (Appendix B) and these Specifications.

The Contractor shall comply with all Terms and Conditions included in the Florida Department of Environmental Protection (FDEP) permit, including the Sediment Quality Assurance/Quality Control (Sediment QA/QC) Plans and other attachments, and the U.S. Army Corps of Engineers (USACE) permits, including the U.S. Fish and Wildlife Service and National Marine Fisheries Service Biological Opinions (BOs) issued for this Work and other attachments.

The project shall be completed to the point of Substantial Completion and Final Acceptance by the dates and times set forth in the Agreement.

1.1 Project Intent – The intent of the project is to excavate the project borrow area to the fullest extent possible given the design and permit limits, and to place the material along the full alongshore extent of the beach fill limits indicated in the Construction Plans and as modified by the Engineer using the pre-construction survey data.

2. SUBMITTALS AND MEETINGS

The execution of the Work requires numerous submittals for permit compliance and construction progress tracking (e.g. daily reports, turbidity reports, etc.). These submittals are mandatory and shall be provided in the timeframes listed below. Failure to adequately submit these documents in accordance with the schedule set forth in these Specifications may result in stoppages of Work by the Owner or Engineer for a time period sufficient to receive delinquent reports and properly determine or establish permit compliance and the status of the Work. Construction delays occasioned by such stoppages of Work shall not be grounds for modification of the Project Schedule.

2.1 Construction Schedule and Work/Dredge Plan. The Contractor shall submit to the Owner and Engineer a practicable construction schedule and methodology statement for the Work; including but not limited to proposed dates for starting and completing the Work; plan for mobilization; a detailed dredge excavation plan with cut lanes (as applicable); a dredge-vs-beach fill placement schedule; the proposed location of booster barges (if applicable); and the intended submerged pipeline corridor(s) and shore-landing locations. These items shall be submitted prior to the pre-construction conference. No Work on site shall begin until the schedule is approved by the Owner.

2.1.1 Advance Communication of Work Plan Milestones and Changes – Contractor shall communicate with Owner and Engineer in advance regarding upcoming schedule milestones, major movements of equipment, and proposed changes in access sites, dredge/booster locations, and other activities that may have impacts to the community. Failure to provide timely notice of such activities may result in a

stoppage of the Work until adequate notice to the Owner and the public can be provided. Construction delays occasioned by such stoppages of Work shall not be grounds for modification of the Project Schedule.

2.2 Storage, Staging and Access Areas. The Contractor shall submit to the Owner and Engineer for approval at least thirty (30) days prior to the initiation of Work a map or description of the areas Contractor intends to use to transport equipment and pipe to the beach fill placement areas, a description of where the Contractor intends to store material and equipment during construction, and how the Contractor intends to access the work area. All storage areas, access areas, and facilities are subject to the approval of the Owner and Engineer.

2.2.1 Video Documentation of Access Point Conditions – Prior to initiation of any work at any of the access points, the Contractor shall acquire and submit to the Owner video evidence of the pre-construction condition of each access point. Similarly, post-construction conditions of the access areas shall be acquired and submitted to the Owner.

2.3 Environmental Protection Plan (EPP) The Contractor shall submit to the Owner and Engineer for approval at least thirty (30) days prior to the initiation of Work and prior to the mandatory pre-construction conference a plan document describing the actions to be taken by the Contractor to protect the wildlife, air, and water resources at the project site as described in Section 3400 – Environmental Protection.

2.4 Contractor's Safety Plan The Contractor shall submit to the Owner and Engineer at least thirty (30) days prior to the initiation of Work a Safety Plan acceptable to the Owner and Engineer. The plan shall outline the steps to ensure safety as required in this Section.

2.5 Turbidity Monitoring Plan, Monitor Qualifications, and Sample Report The Contractor shall submit to the Owner and Engineer for approval at least thirty (30) days prior to the initiation of Work an updated Turbidity Monitoring Scope of Work and sample daily report that addresses the monitoring requirements included in the FDEP Permit (Appendix A). The SOW shall ensure that the turbidity monitoring will be conducted correctly at any location, under any conditions, using the right equipment and that identifies the monitoring personnel and their qualifications. As specified in the project permits the Contractor shall submit daily turbidity monitoring reports to the Engineer throughout the period of hydraulic dredging operations.

2.6 Pre-Construction Conference. The Contractor shall attend a pre-construction conference with the Owner, Engineer, agents of appropriate regulatory agencies, and others as appropriate, as required by the project FDEP Joint Coastal Permit (Appendix A). Before any Work is started, the Pre-Construction Conference will be held no less than fifteen (15) days prior to construction start in order to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in this section of these General Requirements, requirements of the Permits for the Work, the procedures for handling Shop Drawings, samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

2.7 Contact List. The Contractor shall submit to the Owner and Engineer at least fifteen (15) days prior to initiation of Work a typed list of pertinent project personnel, their e-mail addresses, and their telephone, telefax, and other numbers by which key personnel can be reached for purposes of notification and other matters discussed in these Specifications and Requirements. Should a subcontractor perform any portion of the Work, the Contractor shall provide a contact person or person(s) directly employed by the Contractor who shall be the Owner's point of contact and who shall be in responsible charge of the subcontractor during the duration of the Work.

2.8 List of Subcontractors. The Contractor shall submit to the Owner and Engineer at least

fifteen (15) days prior to the initiation of Work a list that includes the name, physical address and updated contact information of each subcontractor and vendor and a description of the work or products to be provided completed by each entity. Owner and Engineer reserve the right to request the qualifications of other personnel performing work for Contractor. All subcontractors must be acceptable to the Owner.

2.9 Surveys. See "SURVEY REQUIREMENTS", below, and “PAYMENT SURVEYS,” Section 3100.

2.10 Letter Regarding Permit Conditions. The Contractor shall submit to the Owner and Engineer at least fifteen (15) days prior to the initiation of Work a letter attesting to his understanding and intent to fully comply with the project's permit conditions. A similar letter (or endorsement by the Contractor) shall be required of each Subcontractor which will perform work within or adjacent to the beach fill area.

2.11 Construction Grade Stake Log and Recovery Plan. Contractor shall submit to the Owner and Engineer at least 15 days prior to the initiation of Work a Grade Stake Recovery Plan acceptable to the Owner and Engineer. The plan shall outline the steps that the Contractor will implement to recover all the stakes used on the project as required under Section 3300 – Execution of the Work. Upon completion of the project, the Contractor shall furnish a final grade stake log and Grade Stake Recovery Certification to the Owner.

2.12 Dredge Mobilization/demobilization Notification. The Contractor shall submit notification to the Owner and Engineer at least fifteen (15) days prior to the mobilization or demobilization of the dredge and all other equipment to and from the project site.

2.13 Notice to Mariners. The Contractor shall issue a Notice to Mariners to the U.S. Coast Guard and others, as required by Section 3300 and copy the Owner, the Engineer, and the U.S. Army Corps of Engineers, Jacksonville District, Navigation Section. The Contractor shall submit all required information for the Notice to Mariners to the USCG at least three (3) weeks prior to construction.

2.14 Notice of Commencement - The Contractor shall submit to the Owner and Engineer at least four (4) days prior to the initiation of Work a written notice of Contractor’s intention to commence work at the site.

2.15 Daily Reports. The Contractor shall submit daily reports that summarize the operations, quality control, and testing or monitoring efforts conducted each day. Daily Reports shall be submitted every working day during the construction period (even when no work is done) between the time at which mobilization begins and the time of Final Acceptance. Reports shall be submitted by 12:00 p.m. (noon) the following day to the Engineer on a daily basis via email in electronic format. The Contractor shall coordinate with the Engineer to formulate an acceptable format for the daily reports (e.g. USACE Report of Operations, Contractor Quality Control Report, etc.). At a minimum, each Daily Report should include:

2.15.1 Project name, date, report #, general weather conditions;

2.15.2 total quantity of sand pumped (gross and pay (estimated)) for that day and project cumulative totals;

2.15.3 measurement and location of daily alongshore advance of fill, alongshore limits of fill placement, referenced to project baseline, location of dredging within borrow area, and surveys of the recently excavated portions of the borrow area;

2.15.4 listing of plant, pipeline, and other equipment used on site that day;

2.15.5 time of operations, including pumping time, downtime (and explanation therefore);

2.15.6 Dredge Positioning. The Contractor shall provide a daily dredge position time series electronic file and graphic indicating the location and depth of the bottom of the cutterhead or hopper dredge dragheads. Position time series data shall be submitted in *. ASCII or *.XLSX format as required by Section 3300 – Execution of the Work;

2.15.7 results of environmental monitoring tests conducted for that day;

2.15.8 results of safety inspections and quality control checks or tests conducted that day.

2.15.9 results of turbidity testing conducted for that day, (provided as a separate report by independent subcontractor);

2.15.10 Certification from the Contractor of the information provided each day.

2.16 Unsuitable Material. The Contractor shall notify the Engineer of the discovery of any unsuitable material within the borrow area or fill area, including debris or other obstacles.

2.17 Misplaced Material The Contractor shall notify the Engineer of any misplaced material or of the occurrence of any lost material or equipment.

2.18 Cultural Resource Discovery The Contractor shall notify the Owner, Engineer, and the Florida State Historical Preservation Officer of any discovery of cultural resources

2.19 Pay Estimates. Contractor shall submit pay estimates for the Work completed as directed in Section 3100.

2.20 Project Close-Out Submittals. See Item 9, below. Contractor shall submit:

2.20.1 Special guarantees and bonds;

2.20.2 Contractor's waiver of liens;

2.20.3 Separate waivers of lien for subcontractors, supplies, and other with lien rights against property of Owner;

2.20.4 Final pay estimate

2.21 Progress Meetings. The Contractor shall attend progress meetings to be held at approximately weekly intervals with the Owner, Engineer, and representatives of regulatory agencies, as appropriate, to discuss project issues such as safety, production status, and environmental monitoring (meeting format to be determined).

2.22 Other. Other submittals and notifications may be required as described elsewhere in the Contract Documents.

3. SURVEY REQUIREMENTS - GENERAL

Surveys shall be utilized for the purposes of (a) establishing pre-and post-construction conditions for regulatory monitoring purposes, (b) verifying the distribution of placed material (sand fill) on the beach and (c) establishing payment quantities.

3.1 Survey Standards. The Contractor's surveying personnel shall be directed by a surveyor licensed in the State of Florida who has proven hydrographic/bathymetric surveying experience satisfactory to the Engineer, such as qualification as a Certified Hydrographic Surveyor, and demonstrated evidence of successful survey data and product submittals on projects completed under FDEP surveying standards for beach erosion control projects and Joint Coastal Permit requirements.

3.1.1 Surveys shall be performed in a manner consistent with the standards of the State of Florida and those established in the Division of Water Resource Management - Department of Environmental Protection report entitled "Monitoring Standards for Beach and Erosion Control Projects" dated October 2014.

3.1.2 The survey methods are subject to the approval of the Engineer. If the Engineer does not approve of the survey procedures, the Contractor shall modify his survey methods to the satisfaction of the Engineer at no additional cost to the Owner. If any survey results do not meet the approval of the Engineer, the Contractor shall resurvey any portion of the work to meet the Engineer's requirements at no additional cost to the Owner.

3.1.3 The Contractor shall use Real-Time Kinematic Positioning (RTK) Global Positioning Systems (GPS) methods or equivalent during all surveys to acquire elevation measurements.

3.1.4 Survey notes shall be reduced to elevations, be neat, legible, and in accordance with accepted practices. Survey notes shall include the date performed, bench marks or monument used, and the name and title of each member of the survey party. Surveys that are lacking information, illegible, or in error, will be returned to the Contractor for correction.

3.2 Survey Datums. Horizontal and vertical datums for surveys are as set forth in the project Construction Plans.

3.3 Survey Observation. Unless waived by the Owner or Engineer in each specific case, all surveys made by the Contractor shall be made in the presence of a representative of the Owner or Engineer. The Contractor shall notify the Owner twenty-four (24) hours in advance of each survey intended for purposes of payment.

3.4 Additional Surveys. The Owner reserves the right to make additional surveys as necessary for purposes of verification of surveys made by the Contractor. The Owner may also make independent final surveys for acceptance.

3.5 Survey Discrepancies. If there is a discrepancy between surveys conducted by the Contractor and the Owner, the respective surveyors will attempt to resolve the survey discrepancy. If the discrepancy cannot be resolved, the post-construction survey conducted by the Owner will be used to compute the fill volume for verification purposes.

4. LAYOUT OF THE WORK

4.1 Measurement for Control. Horizontal control data and elevations for the Work are included in the Construction Plans. Descriptions of the monument control in the vicinity of the Work are also furnished in the Plans.

4.2 The Contractor shall establish the horizontal and vertical limits of the Work using the tabulated and noted control provided in the Construction Plans. The Contractor shall not scale positions, distances, dimensions, elevation, slope, etc. from the Plans for the purposes of work layout. The Contractor shall be responsible for all measurements that may be required for the execution of the Work to the location and limit marks prescribed in the Plans and in these Specifications. The Engineer reserves the right to modify the locations and elevations of the limit marks as may be required to meet changed conditions or as a result of necessary modifications to the Work.

4.3 If the Contractor elects to establish temporary benchmarks through the Work site, they shall be established by a closed loop of levels from a permanent benchmark or a line of levels between two permanent benchmarks. Any such temporary benchmark shall be located upon fixed objects such as utilities, roadways, etc. to assure reliability through the duration of the Work.

4.4 Construction Stakes. The Contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the Work from the monuments, control data and elevations. It shall be the responsibility of the Contractor to maintain and preserve the stakes and other marks established by the Engineer for the purposes of this Work until authorized to remove them. If such marks are destroyed by the Contractor or through his negligence prior to their authorized removal, they may be replaced by the Engineer at his discretion, and the expense of replacement will be deducted from any amounts due or to become due. Work may be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the Work. Contractor shall maintain a construction and grade stake log, as described elsewhere in these Specifications.

5. RECORD DRAWINGS

The Contractor shall maintain a set of full-size (11”x17”) project drawings, clearly marked up in color, to indicate current, as-built conditions. These drawings shall be maintained at or near the site in a current condition at all times until completion of the Work. The drawings shall be available for review by the Owner or Engineer, or their respective representatives at all times. Any variations from the Contract Drawings, for whatever reason, including those occasioned by modifications, optional materials, and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the Contract Drawings. The marked-up drawings may be utilized for preparation of the as-built drawings, but may not be substituted for the as-built drawings.

6. ACCESS, WORK AREA, AND STORAGE AREAS

6.1 General. The general location and extent of borrow, fill placement, rock groin installation, access, stockpiling, staging, and equipment storage areas are indicated in the Construction Plans. The location and extent of access and staging as depicted on the Plans are approximate. The Contractor shall evaluate the utility of the roads in the vicinity of the project area for mobilizing equipment and materials to the site prior to making his bid. The construction of new access roads is not permitted without prior approval by the Owner and the Engineer. Mobilization and demobilization of equipment and materials may require barge delivery. The final location, extent, and associated restrictions of the access and staging

areas shall be coordinated with the Owner prior to mobilization to the project site. Unless otherwise directed in writing by the Engineer, the Contractor is responsible for removing existing vegetation, fencing and other impediments, as necessary, to allow equipment access and material deliveries to the Work area. Upon project completion, and at the cost of the Contractor, the Contractor shall restore to at least pre-project conditions and to the satisfaction of the Owner those areas where access routes and staging areas are developed.

6.2 The Contractor shall exercise caution when operating in the access, staging and all other Work areas and while driving on the beach with vehicles or equipment. The beach and adjacent areas are used by the public throughout the year.

6.3 The Contractor shall accomplish the Work in such a manner as to minimize disruption to traffic, residents, and the public to as great a degree as practicable.

6.4 Public Access.

6.4.1 The Contractor shall Work with the Owner to maintain access to areas adjacent to the Work sites as much as practical during the construction of the Work.

6.4.2 The Contractor shall not close the entire beach between an access point and an active fill placement area without prior permission from the Owner or the Engineer. The Contractor shall provide equipment and crews including escort vehicles for equipment traversing the beach to protect the public from construction activities.

6.4.3 The Contractor shall cordon off and/or fence the access and staging areas to prohibit public access. The access and staging areas shall be kept neat, orderly, and in a safe manner.

6.4.4 Where practicable, the Contractor shall construct of temporary sand ramps at 200-ft alongshore intervals over shore-pipe to facilitate access to the waterline.

6.4.5 The Engineer reserves the right to make final determination regarding accessibility following fill placement and may direct Contractor to improve access.

6.5 Equipment shall be placed in such a manner as to minimize impacts to the local community. The Work zone shall be kept to the minimum spatial extent necessary. Equipment not in immediate use for the Work shall be stored in appropriate access and staging areas or shall be moved along with the advance of the beach fill operations.

6.5.1 The temporary stockpiling of shore pipe on the beach shall be minimized and performed in such a manner that it does not adversely affect any ocean-front commercial establishment or areas of mature salt tolerant vegetation.

6.6 Failure to maintain orderly and managed Work and storage areas may result in stoppages of Work by the Owner or Engineer for a time period sufficient to correct deficiencies that have been noticed to the Contractor should such deficiencies not be addressed in a prompt fashion. Construction delays occasioned by such stoppages of Work shall not be grounds for modification of the Project Schedule.

7. PERMISSIBLE WORK DAYS AND HOURS

Construction activity shall be permitted twenty four (24) hours per day, seven (7) days per week. Lighting of the Work Site, including the dredge, booster barges, and other attendant floating equipment, shall be kept to the minimum level and extents required to meet safety regulations, and in keeping with State and Federal permits.

8. NOTIFICATION & INSPECTION

8.1 The Contractor shall specifically notify the Engineer:

8.1.1 at least four (4) calendar days prior to the Contractor's intended date of commencement of the Work;

8.1.2 at least one (1) calendar day prior to the establishment of horizontal and vertical control work;

8.1.3 at least five (5) calendar days prior to the date of expected substantial completion of the entire Work.

8.2 The Contractor shall specifically notify the Engineer in the case of:

8.2.1 Misplaced Material. The Contractor shall immediately notify the Engineer of any misplaced material or of the occurrence of any lost material or equipment.

8.2.2 Cultural Resource Discovery. The Contractor shall immediately notify the Owner, Engineer, and the Florida State Historical Preservation Officer of any discovery of cultural resources.

8.2.3 Unsuitable Material. The Contractor shall immediately notify the Engineer of the discovery of any unsuitable material within the borrow area(s), fill areas, or groin footprints, including debris or other obstacles.

8.2.4 Dredge Mobilization/Demobilization. The Contractor shall notify the Owner and Engineer at least fifteen (15) days prior to the mobilization or demobilization of the dredge plant and all other dredging and beach fill related equipment to and from the project site.

8.3 Failure to provide timely notice of project milestones may result in a stoppage of the Work until adequate notice to the Owner and the public can be provided. Construction delays occasioned by such stoppages of Work shall not be grounds for modification of the Project Schedule.

8.4 The presence or absence of the Engineer or the Engineer's Representative shall not relieve the Contractor of its responsibility to properly execute the Work in accordance with these Specifications and the Construction Plans.

8.5 The Engineer shall notify the Contractor of any observed non-compliance with the Construction Plans and Specifications and/or applicable Federal, State or local laws and regulations, promptly upon discovery. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or its authorized representative, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken.

8.6 The Contractor shall provide at all times facilities for access and inspection of the work by representatives of Owner and Engineer and of such governmental agencies designated by Owner as having the right to inspect the work.

8.6.1 The Contractor shall notify the Owner and Engineer of any visit or correspondence from any government agency having such rights of inspection. Such contact shall likewise be noted in the daily report.

9. PROTECTION OF EXISTING STRUCTURES

Bulkheads, revetments, piers, groins, walkovers, pools, or other structures, including roadways and driveways within the Work area, shall be protected by the Contractor to prevent damage thereto by the Contractor's operations. Should the removal of a structure or portion of a structure be required, such removal shall be coordinated with the Owner and replacement of the structure shall be made to the satisfaction of the Owner. See Section 3300 – Execution of the Work for additional requirements for protection of structures.

10. NOISE CONTROL

All dredging, lifting, hauling, handling, and grading equipment used on this Work shall be equipped with satisfactory mufflers or other noise abatement devices. The Contractor shall conduct its operations so as to comply with all Federal, State, and local laws pertaining to noise. The use of horns, whistles, or signals shall be held to the minimum necessary in order to ensure as quiet an operation as possible while maintaining safety on the Work site.

11. SITE CLEAN-UP AND RESTORATION

11.1 It is the intent of the Owner that the Work be accomplished with minimum disturbance to the natural resources adjacent to the Work area (specifically, the adjacent upland, lawns, dunes, dune vegetation, landscaping, trees, and nearshore areas), and that the immediate and general vicinity of the Work area remain in its pre-project state subsequent to completion of the Work. All materials utilized by the Contractor during construction shall be removed from the Site; including survey stakes, debris, flagging and other temporary survey controls.

11.2 Should the Contractor during the progress of the Work, lose, dump, sink, or misplace any material or equipment which in the opinion of the Engineer may be considered unaesthetic, environmentally deleterious, dangerous to the public, or impactful to private properties, the Contractor shall recover and remove same within twenty-four (24) hours of receipt of said notice at no additional cost to the Owner.

11.3 The Contractor shall inspect the Work areas at least once per day to ensure that all debris left by the Contractor's and subcontractor's workers has been removed from the Work areas and properly disposed of. This includes, for example, lunch bags, soda cans, drink cups, etc. The Contractor shall utilize predator-proof trash receptacles on the Work Site.

11.4 Upon completion of all construction activity, the Contractor shall restore all staging, storage, transport, and Work areas, fences, boardwalks, dunes, vegetation, and other facilities to an equivalent pre-project condition or better and to the satisfaction of the Owner.

11.5 No direct payment for the cost of site clean-up and restoration shall be made. All costs associated with these activities shall be included in the total contract price.

12. EXAMINATION & FINAL ACCEPTANCE

12.1 The Work will be thoroughly examined by the Engineer or Owner's designated representative as soon as practicable, and no later than two (2) weeks after the completion of the entire Work or any portion of the Work thereof. The Contractor or its authorized representative will be notified when the examinations are to be made and will be permitted to accompany the inspecting parties.

12.2 Should deficiencies in the Work be determined relative to the contract Plans and

Specifications, the Contractor will be required to correct same at the discretion and direction of the Engineer. No direct payment shall be made for corrections to the Work involving the removal and replacement of unacceptable materials or site clean-up unless specifically allowed by the Engineer.

12.3 Final acceptance of the whole or a part of the Work and the deductions or corrections of deductions made thereon will not be reopened after having once been made, except on evidence of collusion, fraud or obvious error, and the acceptance of a completed section shall not change the time of payment of the retained percentages of the whole or any part of the Work.

13. PHYSICAL CONDITIONS

The Work Site is exposed to the forces of the Atlantic Ocean and is accordingly subject to waves, winds, tides, currents, storms, and changing beach and seabed conditions so associated. It is the responsibility of the Contractor to familiarize themselves with the physical nature of all aspects of the Site and complexities of the subject Work within this environment, and to take all requisite precautions to ensure the applicability of its equipment, and the safety and general welfare of its workers, the public and the improvements under construction.

14. WEATHER DELAYS

Construction delays occasioned by adverse weather, other than named tropical storm or hurricane events, will not be grounds for modification of the Project Schedule. No extension of time beyond the date of Final Acceptance listed in the Contract will be granted.

15. PROJECT SIGNS

15.1 Excepting signage, barriers or other structures required for public safety or regulatory compliance, no construction-related signs are required under this Contract. See Item 16 - SAFETY for public safety signage requirements.

16. SAFETY

16.1 Injury or Illness Report. Contractor shall file with Engineer three (3) copies of employer's first report of injury or illness immediately following any incident requiring the filing of said report during the prosecution of the Work under this Contract. Contractor shall also furnish to Engineer three (3) copies of the employer's first report of injury or illness involving any subcontractor on this project.

16.2 Protection of Persons and Property

16.2.1 Contractor will be solely and completely responsible for conditions of the job Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. Contractor shall furnish such watchmen, guards, fences, warning signs, lights, and walkways, and shall take all other precautions as shall be necessary to prevent damage to persons and property. It is intended that all existing structures, lawns, vegetation, dunes, decks, walkways, driveways, pools, and improvements within the project boundaries and outside the limits of permanent work shall be protected by the Contractor, its employees, subcontractors, or agents. Such items, if damaged, shall be restored to a condition as good as when Contractor entered upon the Site.

16.2.2 The duty of the Engineer to conduct construction inspection of Contractor's performance does not include the review of the adequacy of Contractor's safety measures in, on, or near the construction Site or Sites. Engineer has not been retained or compensated to provide design and construction review services relating to Contractor's safety precautions or to means, methods, techniques, sequences, or procedures required for Contractor to perform the Work.

16.3 Liability of Owner's Representative and Officials. No official or employee of Owner or Engineer, or any authorized assistant, or agent of any of them, shall be personally responsible for any liability arising under this Contract. Engineer shall not be responsible for construction means, methods, techniques, sequences and procedures, time of performance, or for safety precautions and programs in connection with construction work. Engineer shall not be responsible for Contractor's failure to carry out the Work in accordance with the Contract. Engineer shall not be responsible for acts or omissions of Contractor, any subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

16.4 Accident Prevention. In order to provide safety controls for protection of the life and health of employees and other persons; for the prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract, the Contractor shall comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated November 2014, entitled "Safety and Health Requirements Manual", as amended, and will also take or cause to be taken such additional measured as the Engineer may determine to be reasonably necessary for the purpose.

The Contractor will maintain an accurate record of, and will report to the Engineer in the manner and on the forms prescribed by the Engineer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and damage to property, material, supplies and equipment incident to work-performed under this Contract.

The Engineer will notify the Contractor of any observed noncompliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his representative at the site of the work, shall be deemed sufficient to the purpose. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

16.5 Drill and Emergency Signals. The Contractor will be required to provide and maintain procedures and emergency signals, including Fire, Abandon Ship and Man Overboard signals, as required by pertinent U.S. Coast Guard Regulations and U.S. Army Corps of Engineers EM 385-1-1, as amended.

16.6 Signal Lights. The Contractor shall display signal lights and conduct his operation in accordance with the General Regulations of the Department of the Army and of the U.S. Coast Guard governing lights and day signals to be displayed by towing vessels with tows on which no signals can be displayed, vessels working on wrecks, dredges, and vessels engaged in laying cables or pipe or in submarine or bank protection operations, lights to be displayed on dredge pipelines, and day signals to be displayed by vessels of more than 65 ft in length moored or anchored in a fairway or channel, and the passing by other vessels of floating plant working in navigable channels, as approved by the Secretary of the Army and Commandant, U.S. Coast Guard.

16.7 Project Safety Sign. Contractor is required to erect and maintain a safety bulletin board at job

sites, or on dredges, within fifteen (15) calendar days after commencement of Work which displays data reflecting the overall job safety record on a current basis. The sign shall indicate the number of days on the job and the number of days since a reportable lost time personal injury of material or equipment damage loss of $100.00 or greater. The poster "Safety and Health Protection on the Job" required by OSHA, Department of Labor, for all private industrial operations shall be posted with a copy of the approved Accident Prevention Plan, safety posters and literature as provided by the Contractor's insurance company and the Engineer. Such posting shall be in a weather proof bulletin case, whereby it is easily legible, adequately protected from the elements and cannot be removed by an unauthorized person.

16.8 OSHA Regulations. The Contractor is responsible to meet and comply with all Occupational Safety & Health Regulations of the U.S. Department of Labor (OSHA) as might apply to this Work.

16.9 Trench Excavation. On all parts of the Work that require excavation exceeding four (4) feet in height, the Contractor shall submit to the Engineer a reference to the trench safety standards that will be in effect during the period of construction of the project and written assurance by the Contractor that he will comply with such standards. The cost of compliance with trench safety standards shall be included in the cost of all pay items that require trenching. The Contractor shall:

16.9.1 at a minimum, comply with the excavation standards applicable to the project;

16.9.2 adhere to any special shoring requirements, if any, of the state or other political subdivisions, which may be applicable to the project; and

16.9.3 consider any available geotechnical information in the design of the trench safety system, which it will employ, on the project. Nevertheless, the Contractor shall conduct his/her own studies and investigations to satisfy any and all requirements for safety.

16.10 Dredge Certification. Floating plant (including dredges and booster barges) that are regulated by the U.S. Coast Guard shall have current inspections and certificates issued by the USCG. Copies of these current inspections and certificates shall be provided to the Owner and Engineer. Proposed floating plant (i.e. dredges and booster barges) not subject to U.S. Coast Guard inspection and certification, or not having a current American Bureau of Shipping (ABS) classification, shall be inspected in the working mode by a marine surveyor accredited by the National Association of Marine Surveyors (NAMS) or the Society of Accredited Marine Surveyors (SAMS) and having at least five (5) years of experience in commercial marine plant and equipment. The inspection and report shall consider the location of the borrow area for this Project and the potential locations for a booster barge for this Project (if a booster pump is proposed for use). The report must state that the dredge proposed for use by the Contractor is in suitable condition to be employed in the waters of the Atlantic Ocean and at the ebb shoal of Nassau Sound. A copy of the report shall be provided to the Owner.

16.11 Navigation. The Contractor shall coordinate with the U.S. Army Corps of Engineers, Jacksonville District and the U.S. Coast Guard so as to ensure safe regional navigation during the period of construction, including mobilization and demobilization of plant, personnel, and pipeline. The Contractor is responsible for seeking relevant Notice-To-Mariners throughout the period of construction.

16.12 Traffic and Public Safety. The Contractor shall provide and maintain fencing, barricades, warning signals, escort vehicles and crews, and a flag person(s), as necessary, in the project area(s) to direct pedestrians when equipment is operational and ensure public safety as

required by local, State, or Federal regulations or as required by the Construction Plans or Contract. If the Contractor is not able to keep and maintain the public at a safe distance from the construction activity, the Contractor shall notify the Owner and Engineer and request assistance in controlling public access to the construction site. All movement of off-road trucks or heavy equipment, outside of the immediate fenced work zone, on the beach will be accompanied and escorted by small off-road, ATV-type vehicles to assure safety compliance. Such movement shall occur as close to the Mean Low Water Line as possible and shall avoid natural beach wrack areas to the greatest extent practicable.

16.13 The Contractor will be required to maintain and move as necessary a restrictive barrier around the discharge of his hydraulic pipeline. The barrier shall be constructed so as to prevent the public from approaching the discharge from any direction closer than 150 feet. The Contractor shall post signs in a conspicuous manner stating "DANGER - HIGH PRESSURE DISCHARGE FROM DREDGE". The Contractor will be required to prevent any public access to the dredge discharge pipeline by posting a minimum of one employee, for the sole purpose of security, full time at the discharge location.

3100 PAYMENTS TO CONTRACTOR

17. GENERAL

17.1 Payment. Payment for the materials and Work specified in this section, and all appropriate costs in connection therewith or incidental thereto, shall be included in the contract unit or lump sum prices for the respective Pay Items.

17.2 Progress Estimates, Applications for Payment The Contractor shall, on the 25th day of each calendar month, together with a representative of Engineer, make an estimate of the value of the Work performed in accordance with this Contract since the last preceding Application for Payment was made. Contractor shall then prepare and submit the Application for Payment to Engineer on the periodical estimate for partial payment forms (e.g. AIA documents G702 and G703, or similar). Payment forms will be approved by Owner. The number of copies to be submitted will be determined by Engineer after construction has started.

18. PAYMENT FOR MOBILIZATION AND DEMOBILIZATION

18.1 Scope. The work specified in this Section consists of the preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for the establishment of temporary offices, buildings, utilities, traffic control, safety equipment and first aid supplies, sanitary and other facilities, as required by the Contract Documents and State and local laws and regulations. The costs of Bonds and any required insurance, and any other pre-construction expense necessary for the start of the Work, excluding the cost of construction materials, shall also be included in this Section. The demobilization cost shall include final clean-up and restoration activities. This section shall also include all other costs required by the Contract Documents for which there is not a separate Pay Item.

18.1.1 All costs connected with the mobilization and demobilization of all the Contractor's equipment and personnel to and from the job site shall be included in the contract lump sum price given under Unit Price Schedule Item No. 1, “Mobilization/Demobilization”. Mobilization shall comprise sixty percent (60%) of the total cost for Pay Item No. 1. Demobilization shall comprise the remaining forty percent (40%) of the total cost for the same item.

18.2 Basis for Payment All costs connected with mobilization of all the Contractor's equipment and personnel will be paid for at the Contract lump sum price for this item. Mobilization will be paid to the Contractor after placement of a quantity of, at minimum, 1,000 cubic yards of material within the construction template in a 24-hour period. Payment for Mobilization shall be subject to retainage withholding as described in the Agreement. Payment for demobilization, along with the cumulative retainage amounts withheld over the course of the project, shall be made upon completion of all beach fill activities, final dressing, grading and tilling of the beach fill areas, submittal of all required documentation, final acceptance of the completed Work, provision of the Waiver and Release of Lien form, and demobilization of all equipment.

18.3 No payment shall be made for multiple demobilizations or re-mobilizations in the event that work on the beach is halted or restricted for any reason.

19. PAYMENT FOR SAND FILL

19.1 Scope. The Contractor shall excavate, transport, handle, place, shape, grade, and survey beach fill sand from the prescribed borrow area as required under this Contract. All costs associated with beach fill sand placement, including, but not limited to, debris removal and disposal, site preparation, QA/QC, excavation, transport, delivery, handling, placement, shaping and grading, and reporting shall be included in the contract unit price given under the pay items for beach sand fill (Pay Item #2).

19.2 Modification of Sand Fill Quantities. The Owner reserves the right to modify the total quantity of sand fill specified in the scheduled Item "Beach Sand Fill." Reductions or increases to the project's fill volume by an amount up to twenty percent (20%) of the proposal volume will be deducted or added, respectively, to the total contract sum at the unit price for the Pay Item "Beach Sand Fill." Increases to the project's fill volume in excess of twenty percent (20%) of the bid volume will be added to the total contract sum at a unit price to be negotiated by the Owner and the Contractor.

19.3 Basis for Payment. The Owner will pay for the amount of compliant beach fill sand delivered to the beach and placed within the specified lines, grades, and tolerances of the construction template. The specifications for compliant sand fill are provided in Section 3200. Payment will be based on the number of cubic yards of compliant sand fill placed and accepted within the prescribed beach fill construction template, as documented by pre- and post-placement surveys ('BD' – Before Dredge, and 'AD' – After Dredge surveys) conducted in accordance with the Survey Requirements set forth herein. The Owner and Engineer reserve the right to modify the construction template and the amount of material that may be required within any acceptance section on an ongoing basis throughout the course of the project based on the results of the pre- and post-placement beach and borrow area surveys in order to manage the project budget and comply with project permits.

19.3.1 Pre-Construction R-monument Survey – The Contractor' Surveyor shall collect updated beach profile survey data at the FDEP R-monument profiles identified in the Construction Plans. These data shall be provided to the Owner and Engineer in advance of construction.

19.3.2 Initial Template Rebalance – It is the intent of the Engineer to utilize the pre-construction survey conducted by the Contractor of the beach fill and borrow areas to update the beach fill template to reflect a pay template fill volume, measured to the low tolerance of the template, of at least 85% of the updated volume in the borrow area measured to the neat design limits of the borrow area.

19.4 Pre- and Post-Placement Surveys. For purposes of payment and verifying sand placement, the Contractor shall make pre-placement and post-placement surveys of the beach at 100-foot stations along the project beach, consistent with the survey requirements set forth herein. The cost for all survey work shall be included in Pay Item No 2. "Beach Sand Fill." The pre-placement surveys shall be performed no earlier than two (2) weeks prior to placement of fill along a particular area of beach. The survey data shall be provided to the Engineer no less than five (5) days prior to sand placement along the reach of shoreline represented by the survey data. In the event that adverse weather alters the conditions in an unconstructed section after survey, or if alongshore losses from a previously constructed section enter an unconstructed section, the Owner reserves the right to require a second survey prior to placement, to be completed at no additional cost to the Owner.

19.4.1 No manipulation of the sand on the existing beach may occur prior to the pre-placement survey. Following the pre-placement survey at each cross-section, the Contractor may grade or move the existing beach sand lying within the construction template limits in the cross-shore direction to facilitate construction of the template.

Such existing sand manipulation must occur only within the design limits of the construction template and shall not alter the volume of the manipulated sand, such that the required amount of pay fill sand for that template remains unchanged. No existing sand shall be graded or moved in the alongshore direction.

19.4.2 Post-placement surveys shall be made immediately after placement of fill and dressing/grading of the filled beach segments, consistent with the survey requirements set forth herein. The Contractor shall use common survey control stations and azimuths for both the pre-placement and post-placement surveys along the established construction baseline for the 100-foot pay profile lines. Data and plots of the surveyed sections shall be promptly submitted to the Engineer for review.

19.4.3 Timing for Review of Sand Placement Payment Section Surveys. The notification of rejection of or agreement with a payment section will be based on written notification provided by the Engineer to the Contractor and Owner after the Engineer has reviewed the submitted survey data. After receipt of the survey data, the Engineer will have three (3) days to review the data, consult with the Owner if necessary, and prepare a written response indicating whether the section(s) have been rejected or agreed to, and the reason for rejection, if applicable.

19.5 Eligibility for Payment. Each fill template must be filled in its entirety prior to acceptance. Tolerances for the fill placement are as specified in Section 3300 – Execution of the Work.

19.6 Computation of Payment Quantities. Computation of the volume of cubic yards of sand eligible for payment shall be made on 100-ft intervals along the construction baseline via the average end-area method, computed from the volume densities of sand (cubic yards per foot) placed within the pay templates at each survey station. From the gross quantities of sand determined from comparison of the pre- and post-placement surveys, the quantity of fill material lying outside the tolerances, shall be deducted and the net amount shall be the basis for payment. The quantities shall be verified by the Engineer from data submitted by the Contractor in accordance with the Survey Requirements set forth herein.

19.7 Progress Payments. Monthly progress payments shall be based upon the number of completed Acceptance Sections which have been approved by the Owner. Progress payments will not be made for partially completed Acceptance Sections. All original field notes, surveys, volume computations, and other records used by the Contractor to compute the payment quantities shall be furnished to the Engineer and Owner with the Application for Progress Payment and Final Application for Payment.

19.8 Maintenance of Beach Fill. The Contractor is not responsible to maintain the beach fill within the construction template after acceptance by the Engineer of an Acceptance Section for payment, with the exception of scarp reduction and grading and dressing for Final Acceptance as required. However, the Contractor shall be responsible for maintaining the condition of the filled beach (i.e., eliminating ruts and ridges) until he has completely demobilized from a particular area. The Contractor shall not remove fill from an area of the beach once the fill has been placed, verified, and accepted as meeting the fill volume requirements by the Engineer.

20. PAYMENT FOR TURBIDITY MONITORING

20.1 Scope. The Contractor, through a qualified independent subcontractor, shall perform permit-required turbidity monitoring as described in Section 3400 of these Specifications. Payment for labor, materials, equipment, reporting, and all appropriate costs in connection therewith or incidental thereto for water quality turbidity monitoring shall be paid for at the lump sum bid price listed in Pay Item #3. Progress payments will be made for turbidity monitoring based

upon the percent of beach fill work completed and accepted during each month. Acceptance of the Work will be determined from review by the Owner and the Engineer of monthly activities and Contractor daily reporting. Final acceptance of the Work will be determined by receipt of all documentation materials by the Owner.

20.2 Basis for Payment Acceptance of the Work and payment will be determined from review by the Owner and the Engineer of monthly activities and Contractor reporting. Final acceptance of the Work will be determined by receipt of all documentation materials by the Owner.

20.3 Progress Payments Progress payments may be made based upon the percentage of beach fill segments completed and accepted during each month (generally, percentage of the total shoreline length of the fill).

21. PAYMENT FOR BEACH TILLING/DECOMPACTION

21.1 Scope. The Contractor shall perform permit-required tilling and decompaction of the newly constructed beach fill berm as described in Section 3400 of these Specifications. Payment for labor, materials, equipment, and all appropriate costs in connection therewith or incidental thereto for beach tilling and decompaction shall be paid for at the lump sum bid price listed in Pay Item #4. Progress payments may be made for this item based upon the percentage of acceptance sections of the beach fill area completed (e.g. percentage of the total shoreline length of fill) and accepted during each month. Acceptance of the Work will be determined from review by the Owner and the Engineer of monthly activities and Contractor reporting. Final acceptance of the Work will be determined by receipt of all documentation materials by the Owner.

21.2 Basis for Payment Acceptance of the Work and payment will be determined from review by the Owner and the Engineer of monthly activities and Contractor reporting. Final acceptance of the Work will be determined by receipt of all documentation materials by the Owner.

21.3 Progress Payments Progress payments may be made based upon the percentage of beach fill segments completed and accepted during each month (generally, percentage of the total shoreline length of the fill).

3200 MATERIALS

22. SAND FILL

The FDEP and USACE permits for this project identify a portion of the ebb shoal of Nassau Sound off the southern tip of Amelia Island in Nassau County, FL, as the authorized sand borrow area (sand source) for the project. The fill material shall be beach compatible and meet the specifications required by Rule 62B-41.007(j), Florida Administrative Code. The fill material to be placed at the Work area shall be clean sand, free of construction debris, asphalt, gravel, rocks, clay balls, branches, leaves and other organics, components prone to cause cementation, oil, pollutants and any other non-beach-compatible materials. All sand shall be similar to the existing beach sediments in color and texture.

22.1 Borrow Area Sediments. The Owner has determined that the sediments typifying the offshore borrow areas are acceptable for beach fill construction at South Amelia Island (as depicted in Appendix C, Project Data). The Contractor shall ensure that all excavation occurs within the limits of work indicated in the plans and these specifications and shall take all operational actions necessary to continuously avoid the placement of unsuitable sediments, should same be encountered. There are no requirements to screen the dredged material for placement on the beach. The Contractor shall perform blending and grading operations on the beach fill as necessary to satisfy the requirements of the Sediment QA/QC Plans as written in the FDEP permits (Appendix A).

22.2 QA/QC Sampling Contractor shall be responsible for providing continuous observation of the character and quality of the fill during placement, and shall perform grading and/or remediation actions as necessary, consistent with the requirements listed in Section 3300 – Execution of the Work. The Contractor shall sample the beach fill berm at the intervals specified in the QA/QC plan and archive these samples during the construction period. The Owner/Engineer shall also sample the beach fill berm at appropriate intervals alongshore to comply with the approved project QA/QC plan attached to the FDEP Permits (Appendix A).

3300 EXECUTION OF THE WORK

23. SURVEY REQUIREMENTS – BEACH FILL

23.1 Beach Profile Cross-Section Surveys. For all surveys, a sufficient number of points shall be surveyed along each profile cross-section (or transect) to ensure adequate description of all topographic features, including major breaks in slope, dunes, beach berms, foreshore, and bar trough systems, with a maximum elevation difference of approximately one (1) foot between adjacent points and a maximum horizontal distance of no more than twenty (20) feet between adjacent points. When unusual site or geographical conditions exist, additional stations, ranges, and elevations shall be surveyed for greater definition. The product will be a continuous line representing the beach/seabed profile. All surveys within the pay template shall be performed with a rod and level, total station, RTK GPS, or equivalent acceptable survey means and methods.

23.1.1 Regarding nearshore surveying, Contractor shall meet the requirements of this section without extrapolation or interpolation of survey points. In reference to the safety requirements listed in the General Conditions of the Contract Documents, at his discretion, Contractor may elect to swim the survey lines to provide adequate overlap of boat and wading surveys. The method of survey and the safety precautions to be taken shall be documented in the Contractor's Safety Plan. Neither the Engineer nor the Owner accepts any form of liability for this activity, regardless of the method selected.

23.2 Pre- and Post-Construction Surveys. For purposes of updating the beach fill template prior to construction start and documenting the pre- and post-construction condition of the project shoreline and fulfilling the requirements of the FDEP Approved Physical Monitoring Plan for the project, the Contractor shall make cross-section surveys of the beach at the FDEP R- and half-R- monuments listed in the Construction Plans.

23.2.1 Limits - The survey profiles shall commence at the specified transect origin, or a point 150 ft landward of the vegetation line, whichever is more landward, and extend seaward to a point 3,000' offshore of the shoreline, or to a depth contour of -30 ft NAVD88, whichever is reached first.

23.2.2 Timing - The pre-construction survey shall be performed within 90 days prior to commencement of fill operations. The post-construction survey shall be performed within 60 days following construction completion.

23.2.3 Submittals/Products - For each survey, the Contractor shall submit a signed and sealed surveyor's report; a survey QA/QC report; copies of all field notes; ASCII file of x,y,z data; ASCII file containing the profile data processed into the FDEP distance and depth format; monument information report (given/found/used report); metadata file, including methodology of data collection and processing procedures; and plan view plots depicting the profile survey lines at 1"=200' scale; per the FDEP Monitoring Standards for Beach Erosion Control Projects. Reports and data shall be submitted promptly to the Engineer.

23.3 Pre- and Post-Placement Surveys. For purposes of verifying sand placement and establishing pay quantities, the Contractor shall make pre-placement and post-placement (Before Dredge - 'BD' and After Dredge - 'AD') surveys of the beach at 100-foot stations along the established construction baseline.

23.3.1 Limits - The placement survey profiles shall extend from a distance sufficiently landward of the sand placement area along that profile seaward to a point sufficiently seaward of all sand placement along each profile (including any placement seaward of the construction toe of fill shown in the Construction Plans – Appendix B). In all cases the cross-shore limits shall be sufficient to describe all changes in topography due to the project. The Contractor shall use common survey control stations for both the pre-placement and post-placement surveys. This does not prohibit the use of supplemental stations to accurately describe the fill volume.

23.3.2 Timing – Refer to Section 3100 – Payments to Contractor.

23.3.3 Submittals/Products - Refer to Section 3100 – Payments to Contractor. The Contractor shall prepare cross-section profile plots immediately after each section survey of both pre- and post-placement conditions and make such drawings and data available to the Owner and Engineer. These drawings shall also indicate the required construction template, any allowable tolerances, and the expected and final pay fill volumes, if surveyed. Pay volumes shall be expressed as cubic yards per alongshore foot.

24. SURVEY REQUIREMENTS – BORROW AREA

24.1 Pre- and Post-Construction Surveys. The Contractor's surveyor shall survey the borrow area and buffer zones before and after construction in a manner consistent with the FDEP Monitoring Standards for Beach Erosion Control Projects Surveys. Surveys shall be referenced to the datum provided in the project Construction Plans and shall comply with the following requirements. The Contractor and/or surveyor shall coordinate with the Project Engineer prior to all borrow area surveys to determine the proper orientation of the survey tracklines.

24.1.1 Limits – The limits of survey shall extend at least 200 ft beyond the permitted limits of the borrow area. Cross-section transects of the borrow area shall be surveyed perpendicular to the long axis of the borrow area. Cross-sections of the borrow area shall be surveyed at 100 ft intervals.

24.1.2 Timing – The pre-construction and post-construction surveys shall be completed and submitted no earlier than 60 days prior to construction start and no later than 60 days following final dredging operations, respectively.

24.1.3 Submittals/Products – The Contractor shall submit survey data and, as requested by the Engineer, neat, legible field notes to the Owner and Engineer promptly after completion of each survey. Deliverables to the Owner and Engineer shall include submittal of plotted survey sections and a contour map with at least 2-ft contour plotted intervals; the reduced X,Y,Z, station, and range data in electronic ASCII format in the specified horizontal and vertical datums; volume computations as applicable; and ACAD and HYPACK files.

24.2 Intermediate Borrow Area Surveys – It is the intent of the Owner to have the channel-like borrow area fully and uniformly excavated to its designed and permitted limits as indicated in the Construction Plans.

24.2.1 Limits - The Contractor's surveyor shall perform intermediate progress surveys of the recently-excavated portions of borrow area, including a 100-ft buffer area beyond that excavation area. Surveys shall be performed at a trackline spacing of no more than 100 ft. Where practicable, the intermediate survey tracklines shall be along the same

tracklines provided from the pre-construction surveys such that the intermediate surveys can be directly compared to the pre-construction survey.

24.2.2 Timing – The Contractor's surveyor shall conduct daily intermediate surveys of the area excavated within the last 72 hours. Such surveys shall be submitted promptly as part of the daily reports. The Engineer reserves the right to adjust the spatial extent and frequency of the surveys. In addition to this survey requirement, the Contractor shall comply with the provisions of these specifications to continuously measure and report daily the position of the bottom of the cutterhead (Section 3300). Overdredging of the borrow area, as determined by the post-dredging surveys, will not be permitted and will result in stoppages of work to remedy the operations. Construction delays occasioned by such stoppages of Work shall not be grounds for modification of the Project Schedule.

24.2.3 Submittals/Products – As part of the daily reports, plots and x-y-z data from intermediate surveys of the borrow area shall be submitted promptly in electronic format (e.g. *.PDF, *.xlsx, and ASCII formats as applicable).

25. ORDER OF WORK

25.1 General. The Contractor shall clear and grade as necessary all construction access and storage areas, remove/relocate and provide temporary fencing, establish the project control, lay out the limits of the Work, place the required sand fill, perform the required grading and dressing of the fill, and perform site restoration prior to final acceptance by the Engineer. Unless otherwise instructed by the Engineer, any existing erosion control structures within the fill area shall be adequately ramped over and buried (or avoided entirely) by the Contractor to prevent damage thereto by the Contractor's equipment. Voids which occur behind such structures shall be continually backfilled by the Contractor throughout the duration of the project without causing damage to the structures, the existing dune line or vegetation. Grading and other construction equipment will not be permitted outside the construction limits of the project except for ingress and egress to and from the site as provided by the Owner.

25.2 Reporting Requirement. The Contractor shall prepare daily reports as listed in Section 3000.

25.3 Prior to commencement of Work, the Contractor shall propose the order and methodology by which Contractor plans to do the Work. No work at the project Site shall begin until written concurrence with the order and methodology are issued by the Owner. Contractor shall provide advance notice of activities as described in Section 3000.

25.4 Order of Fill. Fill placement shall be completed for Final Acceptance no later than the date listed in the Agreement. The Contractor is directed to initiate filling operations at the southern end of the project fill limits, due to the scheduling required for potential sea turtle nest relocations by the Contractor's patrols. Fill densities and Acceptance Section volumes shall be recalculated by the Engineer using the pre-construction beach and borrow area surveys.

25.5 Continuous and Contiguous Progress. Once construction has commenced, the Contractor shall maintain a spatially and temporally continuous filling operation along the project length, with no intervening gaps, except as otherwise approved by the Engineer. Once on site, Contractor shall not remove its equipment, materials, subcontractors, and personnel from the project Site without the written consent of the Owner, unless one or more of the following occurs: the project is complete, weather or sea state conditions require temporary movement from the project site, or a condition exists which threatens the safety and welfare of personnel or threatens equipment.

25.6 Length of Advance. During turtle nest monitoring season, beach fill construction shall not

advance more than 500 ft along the shoreline between dusk and the following day until a daily nesting survey has been completed and the beach cleared for fill advancement.

25.7 Measurement for Control. Requirements for survey measurements are as provided herein and in the Construction Plans. The Contractor shall notify the Engineer of any discrepancies found during the survey of project baseline and control. As indicated on the project Construction Plans, the horizontal coordinate system used for the project and baseline control is the State of Florida State Plane Coordinate System (Florida East Zone, NAD83, ft). Vertical control is reported in the North American Vertical Datum of 1988 (NAVD88, ft).

25.8 Measurement for Payment. Payments to the Contractor shall be as described in Section 3100.

26. EXCAVATION OF MATERIALS

26.1 General. Excavation of the permitted borrow area shall be conducted in accordance with the project permits and Construction Plans. Prior to commencement of work, the Contractor shall submit a Dredge Excavation Plan, including proposed dredge cut lanes (if applicable), and the order in which the sub-areas of the channel borrow area shall be excavated. The anticipated characteristics of the material in the permitted borrow areas are indicated on the Vibracore Logs plotted in the Construction Plans and provided in Appendix C Project Data). The number of cores representative of the borrow areas are limited. Sieve analysis results are likewise included in the Project Data. *The confirmation of these conditions shall be the responsibility of the Contractor*.

26.2 All excavation for beach fill shall be performed within the permitted limits of the borrow areas and to the depths shown on the drawings. The Contractor shall be responsible for establishing such control as may be necessary to ensure that the contract quantity is placed on the beach. In accordance with the Dredge Excavation Plan, the Contractor shall excavate within the borrow area in a uniform and continuous manner such that no irregular features (e.g., holes, valleys, or ridges) are created in the area. The borrow areas shall be dredged to maximize removal of sand from the area, as indicated in the Plans.

26.3 Order of Excavation – It is the Owner's intent that the entire channel borrow area be excavated. The Engineer reserves the right to alter the dimensions of the borrow area, including narrowing the width or reducing the depth, to completely excavate the full length of the borrow area. Dredging operations shall progress from sub-area to sub-area in the order identified in the Contractor's Work Plan. Each sub-area shall be excavated to remove all of the volume in that sub-area, measured to the design lines and grades identified in the Construction Plans and permits, before progressing to the next sub area. There is a +/- 1.0 ft tolerance about the design lines and grades. Should the Contractor fail to proceed in this fashion, acceptance of pay fill sections shall be suspended until dredging operations return to the partially excavated sub-area for completion.

26.4 If directed by the Engineer, the Contractor shall change the location and/or depth of excavation within the borrow area limits when necessary to provide the best fill material available. The Contractor shall be responsible for establishing such control as may be necessary to ensure that the allowable final excavation depths are not exceeded. The Contractor shall not dredge outside the side slope. The Contractor may box-cut dredge within the horizontal limits of the side slopes only to the extent that the post-excavation permit limits are satisfied.

26.5 It is acknowledged that sediment disturbance in the borrow area, including the side slope areas, *may extend below the allowable post-dredge elevations shown on the Construction Plans*, but shall be the minimum required to achieve the permitted final excavation depths,

including the permitted side slope dimensions, shown on the drawings. If rock, clay, or dark materials are encountered in the borrow area, *the location of the dredging shall be immediately changed* by the Contractor and any rock or clay balls deposited on the beach shall be removed from the site of the work and disposed of in areas provided by and at the expense of the Contractor.

26.6 Excavation and filling operations shall be done in a manner that will minimize turbidity of the water at the excavation site and at the fill area and maintain State water quality standards. If excessive turbidity occurs, as determined by the State or the Engineer, the Contractor shall change his operating procedure to reduce the degree of turbidity. The Contractor shall abide by any turbidity requirements addressed by the Permits (Appendix A).

26.7 The Contractor shall set marker buoys which have been approved by the Engineer and will meet U. S. Coast Guard Standards to delineate pipeline locations. The Contractor shall be responsible for the issuance of all required Notice-to-Mariners, prior to initiating mobilization -- as well as any other measures necessary to protect commercial or recreational vessels traversing the work area during day or night.

26.8 Electronic Positioning and Dredge Depth Monitoring Equipment. The Contractor shall continuously operate electronic positioning equipment approved by the Engineer, and as required by project permits, to monitor the cutterhead or dragarm head location and depth. A Differential Global Positioning System (DGPS) or equivalent shall be used to determine the horizontal position and shall be interfaced with an appropriate depth measuring device to determine the depth of the cutterhead or draghead(s). The horizontal positioning equipment shall maintain an accuracy of ±3 feet. The cutterhead/draghead depth positioning device shall maintain a vertical accuracy of ±0.5 feet with applicable continuous tidal corrections to the prescribed project vertical datum. These tidal corrections shall be measured at the project site by a RTK/GPS unit or other suitable tide-gage unit furnished, installed, and maintained by the Contractor and shall be transmitted in real-time to the cutterhead or dragarm head depth-positioning device. The Contractor shall verify daily that the tidal corrections are applied in a continuous and correct manner. Undercutting (overdredging) of the design borrow area depth as represented in the drawings shall not be allowed.

26.9 Reporting of Dredge Location Control. Using the position and monitoring equipment described above, the Contractor shall provide the position data and plots on a daily basis. The electronic positioning equipment shall be installed on the dredge so as to monitor, as closely as possible, the actual location of the bottom of the cutterhead or draghead(s). The location of the master antenna on the dredge and the distance and direction from the master antenna to the cutterhead or draghead(s) shall be reported on the dredge position Daily Reports. A printout of the position of the cutterhead or draghead(s) in State Plane coordinates, the cutterhead or draghead(s) depth corrected for tide elevation and referenced to NAVD88, and time shall be maintained using an interval of one (1) minute for each printed fix. A printed and electronic computer file (in ASCII format) copy of the time-stamped position data shall be provided to the Engineer on a daily basis and again in total at the end of the project. The Contractor shall prepare a color-coded plot of the data that includes the State Plane Coordinate grid system and the borrow area limits. For hopper dredge use, the Contractor shall submit color coded plots of the dredge head track lines. The plots shall indicate the borrow area limits, the locations of the dredge during each dredge/disposal ("load") cycle, and dredge activity outside the vertical or horizontal limits of the borrow areas used for this work. The plots shall be submitted on 8.5"x11" paper or *.PDF equivalent at an appropriate undistorted horizontal scale, and for hopper dredges shall indicate not more than 4 loads per sheet, and shall be submitted within 1 day of each load. The format of the plot shall be subject to approval by the Engineer.

IMPORTANT: No dredging shall take place outside of the borrow area limits (horizontal and vertical limits as shown on the project Construction Plans). The Contractor shall certify this fact to the Engineer in the Daily Reports.

26.9.1 Continuous use of the National Dredging Quality Management (DQM) tracking system is required by permit for this project. The Contractor shall comply with all tracking and data collection and quality requirements of the USACE Permit and the DQM specifications.

26.10 Historical Period Shipwreck Sites. If any shipwreck, artifact, treasure trove, or other objects of antiquity that may have scientific, cultural or historical value, or may be of interest to the State are discovered, located and/or recovered, the Contractor acknowledges and agrees that: (1) The site(s), articles or other material are the property of the State of Florida, (2) They will immediately discontinue operations which may damage or endanger such objects and notify both the Engineer and the State of Florida Deputy State Historic Preservation Officer.

26.11 Potential Obstructions. A survey of the borrow area was conducted to identify magnetic anomalies. Those anomalies found are as marked in the Construction Plans. The Plans likewise indicate avoidance areas in which no dredging or anchoring may occur. The Contractor shall notify the Engineer of the discovery of any unsuitable material within the borrow areas or fill areas, including debris or other obstacles.

27. TRANSPORT OF MATERIALS

27.1 Transport of Excavated Materials - Hydraulic Beach Fill. The Contractor shall maintain a tight discharge pipeline from the dredge to the fill site at all times. The joints shall be so constructed as to prevent spillage and leakage. The development of a leak shall be promptly repaired and the dredge shall be shut down until complete repair has been made to the satisfaction of the Engineer. Failure to repair leaks or to change methods of operation which are resulting in overflow or spillage that exceeds turbidity and water quality standards during transport to the discharge site will result in suspension of dredging operations and require prompt repair or change of operations to prevent overflow or spillage as a prerequisite to the resumption of dredging. The Contractor shall provide and maintain barricades, security guards, warning signals and flagmen as required by local, State or Federal regulations or as directed. Any damages to private or public property, including vegetation, resulting from the Contractor's operations shall be repaired by the Contractor at his expense. All existing dunes, landscaping, stairs, overwalks and other beach access structures, as well as any sand-tube groins or sand bags (if present), shall be protected from direct hydraulic discharge and impact by construction equipment. Upland diking will be utilized to redirect the hydraulic discharge. Backfilling around, or up to such structures, shall be performed by appropriate construction equipment, or by hand, as required to prevent damage.

27.2 Booster Pumps. Booster pumps (if required) shall be equipped with satisfactory mufflers and/or other sound abatement devices to reduce engine noise. Booster pumps shall not be placed along any portion of the Amelia Island beaches. The placement of booster pumps shall be in an offshore location coordinated with and approved by the Owner and Engineer to minimize disruption to the uplands. The Contractor shall conduct his operations so as to comply with all Federal, State, and local laws pertaining to noise.

27.3 Pipeline Avoidance Area. No shorepipe or submerged pipe shall be placed on the dry beach or within 150 ft of the dry beach south of the Amelia Island State Park station limit specified in the project Construction Plans.

28. SAND FILL PLACEMENT

28.1 General. All material excavated from the borrow area shall be transported to and deposited on the beach within the lines, grades, and cross sections shown on the project Construction Plans, except as may be modified by the provisions of this section. *Construction templates determined by survey to be underfilled shall not be eligible for payment. Moreover, payment will not be made for any fill sand which is lost in transit or permitted to flow into the offshore waters beyond the construction template or onto the upland from the point the sand is discharged on the beach.* The fill shall be free of unsuitable material (reference Section 3200). Any existing signs, buoys, or other structures within the work lines shall be protected and/or removed and later replaced by the Contractor as directed.

28.2 Debris Removal. Prior to placement of fill, the Contractor shall remove from the site of the work all snags, driftwood, and similar debris lying within the foundation limits of the beach fill section. All materials removed shall be disposed of in areas provided by and at the expense of the Contractor and approved by the Owner. Grading and other construction equipment will not be permitted outside the construction limits of the project except for ingress and egress to and from the site as provided by the Owner.

28.3 Fill Alignment. The Contractor shall be responsible for maintaining the accurate alignment and configuration of the beach fill. This may require daily surveys of the in-progress portions of the work at no additional cost to the Owner.

28.4 Placement. The excavated material shall be placed and brought to rest on the beach to the lines, grades, and cross sections indicated on the drawings, unless otherwise provided for herein or directed by the Engineer. The beach is subject to changes and the elevations on the beach at the time the work is done may vary from the elevations shown on the drawings.

28.4.1 Uniform Fill. The constructed beach fill between surveyed pay profile lines shall be uniform in grading, dressing and dimensions. Beach sections between pay profile lines shall be filled to the same template requirements tolerances specified in the plan drawings. The constructed beach contour lines between pay profiles, including the specified breaks in the beach berm, will be approximately parallel and straight, indicating that the Contractor has constructed a uniform (non-cuspate) beach section both horizontally and vertically between surveyed pay profiles. If the Engineer or the Owner observe or believe that the beach fill has been underfilled between surveyed pay profiles, the Engineer or the Owner may request additional surveys be conducted by the Contractor at the expense of the Contractor. If found to be deficient, the Contractor shall place additional beach fill to correct the deficiencies. Fill shall be obtained from the specified borrow areas; no fill shall be taken from adjacent beach segments to correct the deficiencies.

28.4.2 Right to Vary Fill Dimensions The Engineer reserves the right to vary the width and grade of the berms from the lines and grades shown on the plans in order to both establish a uniform beach for the entire length of the project and to meet the design volume.

28.4.3 Landward Limit of Fill. The landward limit of fill shall be adjusted in the field as necessary to avoid the burial of well-established vegetation. Significant variations in the position of the landward limit of fill that may affect the fill (pay) volume shall be reported to the Engineer for approval. As depicted in the project Construction Plans, sand placement along the landward limit shall be graded up to meet the top of dune scarp elevation, if present, at a slope no steeper than 1v:3h.

28.4.4 Construction Berm Elevation and Slope. As shown in the project Construction Plans,

the construction berm shall be constructed to an elevation of +10 ft NAVD88 from the landward limit of fill, seaward a varying distance to a sloping segment sloping seaward at a 1v:55h slope to the seaward edge of the fill berm at +6.5 ft. From that point, the construction template dips seaward at a 1:15 slope to the intersection with the seabed (unless modified as described herein).

28.4.5 Spreader Pipe - Spreader and pocket pipe shall be used as necessary to prevent gullying and erosion of the beach and fill and to retain the fill on the beach and the limits of the fill cross section. No undrained pockets shall be left in any fill during or upon completion of the work. The Contractor shall not permit discharge water to flow landward of the fill section or water to pond between the fill and upland, or under buildings. All dunes and other structures within the fill section shall be protected by the Contractor to prevent damage thereof by the Contractor's operations. Nothing herein shall relieve the Contractor of his responsibility to protect existing drainage conditions and he shall be responsible for any damage resulting from his operations.

28.4.6 Any material that is rehandled or moved and placed in its final position by methods other than hydraulic filling shall be placed in horizontal layers not exceeding three (3) feet in thickness. Compaction of the layers will not be required.

28.4.7 Grading and blending for QA/QC Compliance – To comply with the QA/QC plan requirements in the FDEP permits, blending or grading of the beach fill may be required as directed by the Engineer or Engineer's Representative based upon daily inspection of the hydraulic beach fill operations. Blending may be required to mix dredged material with the existing beach sediments. Grading may require the pushing of sediments to the waterline.

28.5 Tolerances. A tolerance of five-tenths (0.5) of one (1) foot below the prescribed berm grade and slopes, above the wave zone (above -3.1 ft NAVD88), will be permitted in the final surface. Any material placed above the prescribed tolerance may be left in place at the discretion of the Engineer; however, this material will not be included in the pay quantities.

28.6 Adjustment of Seaward Slope. The Construction Plans specify a uniform seaward slope of the beach fill template extending to the intersection of the construction template and the seabed. Upon receipt of a written request by the Contractor, the seaward slope of the hydraulic beach fill template may be altered one time from the 1:15 slope (vertical:horizontal) described within the project plans. The Contractor shall select a preferred seaward slope of template of between 1:10 and 1:20, which shall be implemented for the duration of the Contract. The Engineer shall subsequently re-compute all hydraulic fill templates based upon the revised seaward construction slope and the results of the Contractor's pre-construction survey.

28.7 Misplaced Material. If any material is deposited other than in places designated or approved, the Contractor may be required to remove such misplaced material and redeposit it as directed by the Engineer, at the Contractor's expense. Any physical or environmental damages resulting from the misplaced material shall be the responsibility of the Contractor. Material lost due to the negligence of the Contractor shall be replaced by the Contractor at no additional expense to the Owner. Placement or spreading of the fill material landward of the landward limit of fill is specifically prohibited.

28.8 Construction and Grade Stakes, Grade Stake Log Construction and grade stakes, and any other stakes for any purpose, shall be made of steel pipe that can and will be removed intact after filling to cross sections accepted by the Engineer, or as directed by the Engineer. All stakes shall have sufficient length above grade so they may not be accidentally covered by the fill. The Contractor shall consecutively number each piece of pipe used for grade stakes,

shall clearly mark that number upon the pipe, and shall record the location of each numbered pipe in a Grade Stake Log. The removal of each numbered pipe and the length of removed pipe shall be recorded in the Grade Stake Log at the time of the pipe/stake removal. At the request of the Engineer, all of the grade stake pipes shall be displayed after their removal to demonstrate those pipes that have been removed. The Contractor shall make the Grade Stake Log available for review by the Engineer upon request. Upon completion of the project, the Contractor shall furnish the Log to the Engineer. It is the Contractor's responsibility to track, locate, and completely remove all grade stakes in their entirety to the satisfaction of the Engineer. The Contractor shall also remove all temporary marking stakes used for the work layout upon completion of the project.

28.8.1 Grade Stake Recovery. After completion of the project, the Contractor shall provide a letter to the Engineer certifying that all grade stakes have been recovered in accordance with the Contractor's approved Construction and Grade Stake Recovery Plan.

28.9 Dressing. Upon completion of all filling operations within a completion section and prior to surveying for payment, the fill shall be graded and dressed so as to eliminate any undrained pockets and abrupt humps, ridges, or depressions in the beach fill surfaces. The bank or escarpment caused by ocean wave erosion shall be graded down to a slope not steeper than one (1) vertical on ten (10) horizontal to the water's edge throughout the duration of the project. The Contractor is not required to dress the fill below the mean low water line (MLW). The Contractor will not be held responsible for erosion caused by waves after the beach fill has been satisfactorily placed and accepted, however the Contractor shall grade down any and all beach scarps or sand cliffs along the entire restored beach until the Contractor has demobilized from the beach. All grading must be completed by the date of Final Acceptance.

28.10 Beach Tilling/Decompaction – Subsequent to beach fill activities and acceptance of the surveyed fill, the construction berm shall be tilled to minimize compaction impacts to future turtle nesting activities. Authorization to initiate the Work will be given by the Engineer. Tilling operations shall be coordinated with the daily patrols for shorebirds and sea turtle nests (if applicable). Once authorized by the Engineer, the Contractor will till the accepted sections of the beach berm from the landward limit of fill placement seaward to the limit of wave uprush or seaward edge of the construction berm, whichever is farther seaward, or to the existing wrack line, to a depth of at least thirty-six (36) inches in accordance with the terms, conditions, and standards addressed by the applicable State and Federal regulatory permits (see Appendix A). Care must be taken to avoid areas of significant dune vegetation and wrack. Tilling operations shall be restricted to daylight hours only. All costs connected with tilling operations shall be included in Pay Item No. 4 Tilling/Decompaction of the Contract.

28.10.1 Tilling shall be conducted in overlapping passes to assure that no uncompacted areas of the beach fill berm are left between tilling tines. Immediately subsequent to or during tilling, the tilled beach shall be graded smooth so as to eliminate all ruts and berms created by the tilling. The manner of smoothing may be by a pipe or beam dragged behind a bulldozer or similar equipment, acceptable to the Engineer. The smoothing operation shall be undertaken so as to avoid re-compaction of the tilled beach, to as great a degree as practical. Smoothing activities which result in a significant re-compaction of the tilled beach shall be re-tilled and re-smoothed at the direction of the Engineer, and at no additional expense to the Owner.

28.10.2 Scarp Adjustments. Throughout the construction period, the Contractor shall be responsible for grading scarps that form along all filled and accepted sections of the beach until Final Acceptance of the entire project by the Owner. Any scarp that exceeds eighteen (18) inches in height along one hundred (100) feet of shoreline

shall be graded to a slope no steeper than 1:10 (V:H) at the direction of the Engineer. All costs connected with scarp adjustment during the period of construction shall be included in Item No. 2 “Sand Fill” of the Contract.

28.10.3 Progress Payments. If authorized, monthly progress payments shall be based upon the lineal footage, by Acceptance Section, of shoreline satisfactorily tilled and smoothed by the Contractor as authorized by the Engineer.

27.12 Beach Fill Berm Sediment Sampling. Sediment samples of the fill material shall be collected by the Engineer’s Representative from the center of the fill berm at 500-ft increments (or when sediments appear to be out of specification). These samples shall be clearly labeled by the Engineer’s Representative and shall be archived by the Contractor over the course of the project to demonstrate the continued quality of the beach fill material placed. The quality of the sample shall be described in the daily report. Should the quality of the placed material be in question, the sample may be sieved or otherwise analyzed to determine compliance with the specifications outlined in the Sediment QA/QC Plan in the project permits. The final disposition of the samples shall be determined by the Engineer.

29. PROTECTION OF EXISTING STRUCTURES FROM PLACEMENT ACTIVITY

29.1 Bulkheads, revetments, upland structures, cables, ducts, anchor points, outfalls, piers, groins, trees, and other structures or infrastructure within the fill sections and all Work areas shall be protected by the Contractor to prevent damage thereto by the Contractor’s operations. It is anticipated that manual labor (shovels, etc.) may be required to distribute fill sand around structures within the fill sections

29.1.1 Structures that impede lateral access within the fill area may be temporarily removed and replaced upon completion of the Work. Such structures shall not be removed without the advance approval of the Owner and the Engineer.

29.2 Public Access. Fill shall not be placed in a manner which restricts public access to the beach adjacent to the immediate work area. The Engineer reserves the right to make final determination regarding accessibility following fill placement and may direct Contractor to improve access in accordance with the aforementioned specifications regarding misplaced materials.

29.3 Pipe Stockpiling. The temporary stockpiling of shore pipe on the beach shall be minimized and performed in such a manner that it does not adversely affect any ocean-front commercial establishment or areas of mature salt tolerant vegetation. The Contractor shall move any stockpile considered to be impactive in size or extent of duration, at the direction of the Engineer.

29.4 Work Stoppage. The Contractor shall be responsible for any costs associated with Work stoppage or changes in the Contractor’s means and methods that result from monitoring, inspection, and/or damage avoidance activities.

29.5 Damages. In the event that damage is caused by the Contractor, the Contractor shall restore all damage to sidewalks, roads, seawalls, vegetation, buildings, pavers, or any other structure, infrastructure, or natural feature to pre-construction conditions or better. No fill will be placed against or within five (5) feet of any building without prior written approval from the Engineer. All damages to private or public property resulting from the Contractor's operations shall be repaired by the Contractor at the Contractor's expense. The Engineer and Owner shall determine if repairs are required and the Contractor shall not receive final payment until all damage is restored to the satisfaction of the Owner.

3400 ENVIRONMENTAL PROTECTION

30. SCOPE

The Environmental Protection section of the Contract Documents addresses Contractor responsibilities for the prevention of pollution and other environmental damage as the result of construction operations under the Contract Documents, including those measures set forth in these Specifications and Requirements. For the purpose of this specification, pollution and other environmental damage are defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural, and/or historical purposes, or damage/destroy upland and marsh habitats. The control of pollution and damage requires consideration of air, water, land and the marine environment and includes management of construction activities, visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants. The Contractor shall fulfill these specifications at the Contractor's expense.

29.1 Environmental Protection Plan – Contractor shall prepare and submit an Environmental Protection describing compliance with the project permits and these specifications and requirements shall be achieved. The plan shall include the Contractor’s spill prevention and cleanup plan.

31. QUALITY CONTROL

The Contractor shall establish and maintain quality control for environmental protection for all items set forth herein. The Contractor shall record on Daily Quality Control reports any problems in complying with laws, regulations and ordinances, as well as project permits, and corrective action taken.

32. PERMITS

The Contractor shall comply with all requirements under the terms and conditions set out in all permits applicable to the Work. Specifically, the Contractor shall familiarize himself/herself with the general and special conditions of the Florida Department of Environmental Protection (FDEP) and U.S. Army Corps of Engineers (USACE) Permits and their attachments, including the U.S. Fish and Wildlife Service and National Marine Fisheries Service Biological Opinions (BOs), and other approvals for the project, as well as all applicable provisions of the Corps of Engineers Manual, EM 385-1-1, entitled "Safety and Health Requirements Manual", in effect on the date of solicitation. Any other licenses, easements or approvals required, including, but not limited to those that may be required by the Owner shall be secured and paid for by the Contractor.

33. SUBCONTRACTORS

Compliance with all sections of the contract by subcontractors shall be the responsibility of the Contractor, including strict compliance with all environmental permit requirements.

34. PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his/her activities to areas defined by the Construction Plans and Specifications. Environmental protection shall be as stated in the following subparagraphs.

34.1 Protection of Water Resources The Contractor shall comply with all conditions specified in the USACE and State FDEP permits.

34.1.1 The Contractor will not discharge or permit discharge into the waters of swashes, waterways, ditches, outfalls, etc., any fuels, oils, bitumens, garbage, sewage, or other material which may be harmful to fish, wildlife, or vegetation, or that may be detrimental to outdoor recreation or beach use activities. The Contractor will be responsible for investigating and complying with all applicable federal, state, and local laws and regulations governing pollution of waters. All work under this Contract shall be performed in such a manner that objectionable conditions will not be created in waters through or adjacent to the project areas.

34.1.2 The Contractor is warned that pumping oil or bilge water containing oil into navigable waters, or into areas which would permit the oil to flow into such waters, is prohibited. June, 1924, (re Stat. 604 et. seq.; 33 U.S.C. 431 et seq.) and Section 13 of the Rivers and Harbors Act of 1899, approved 3 March, 1899 (30 stat. 1152; 33 U.S.C. 407). Violation of this prohibition is subject to penalties provided under the referenced acts.

34.1.3 Turbidity The Contractor shall utilize best management practices at all times, including the diking of the sand fill, to minimize the return of turbid water to the waters of the Atlantic Ocean and maintain State water quality standards. If excessive turbidity occurs, as determined by the State or the Engineer, the Contractor shall change his operating procedure to reduce the degree of turbidity. ***The Contractor shall abide by any turbidity requirements addressed by the Permits***. The Project is located immediately adjacent to the Nassau River – St. Johns River Marshes Aquatic Preserve, a designated Outstanding Florida Water.

(a) The Contractor shall subcontract with an independent, qualified third party to perform all turbidity sampling and reporting required by State and Federal Regulatory Permits issued for the project discussed herein (Appendix A).

(b) Payment. All costs connected with turbidity monitoring and reporting shall be included in Pay Item #3.

(c) Turbidity Violations. As described in the State and Federal Regulatory Permits issued for the project, if measured turbidity levels exceed the permitted limits, dredging shall cease immediately and shall not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Construction delays occasioned by such stoppages of Work shall not be grounds for modification of the Project Schedule.

34.2 Protection of Land Resources Prior to the beginning of any construction, and at the request of the Contractor, the Engineer shall identify land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including sand dune or berm vegetation, trees, shrubs, vines, grasses, top soil, and land forms without direct written permission from Engineer and Owner. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically

authorized. Where such special emergency use is allowed, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following paragraphs. The Contractor will be responsible for the replacement of any damaged or destroyed vegetation, to the satisfaction of the Owner and Engineer. Failure to replace damaged or destroyed vegetation by the Contractor will result in replacement by the Owner; cost of replacement will be deducted from monies due to the Contractor, or from monies which will be due to the Contractor by the Owner.

34.2.1 Work Area Limits. Isolated areas (if any) within the work area, which are to be saved and protected, shall also be identified by the Engineer or Owner and marked or fenced by the Contractor. All monuments and markers shall be protected before construction operations commence. The Contractor shall convey to all subcontractors and personnel the purpose of marking and/or protection for all necessary objects.

34.2.2 Protection of Landscape. Trees, shrubs, vines, grasses, land forms, and other landscape features within the work area to be preserved shall be identified by the Engineer or Owner, and clearly delineated by the Contractor, by marking, fencing, or wrapping with boards, or any other techniques approved by the Engineer. Unless otherwise approved by the Engineer or Owner, no trees, shrubs, vines, grasses or other vegetation shall be harmed or destroyed by the Contractor for any purpose. The Contractor shall relocate or replace any sea oats or other dune vegetation that may be affected by construction activities.

34.2.3 The Contractor shall also restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with a plan submitted by the Contractor for approval by the Engineer. This work will be accomplished at the Contractor's expense. Final payment to the Contractor shall not occur until the Engineer and the Owner are satisfied with the Contractor's effort to restore landscape or any other damage caused by the Contractor or its subcontractors.

34.2.4 Temporary Excavations. Embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

34.2.5 Disposal of Solid Wastes. Solid wastes (including clearing debris) shall be placed in containers, which are removed from the beach area and emptied on a regular schedule. The Contractor will empty containers when three-quarters full and will avoid overflow conditions. All handling and disposal shall be conducted to prevent contamination. Contractor shall utilize predator (animal)-proof trash and debris receptacles with appropriate seals and lids.

34.2.6 Disposal of Chemical Waste. Chemical waste shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and Local regulations. The Contractor shall perform all maintenance of equipment, including but not limited to refueling, filter changes, and replacement of hydraulic lines in a manner so as not to contaminate soils, ground or surface waters, or any other natural resources.

34.2.7 Disposal of Discarded Materials. Discarded materials, other than those which can be included in the solid waste or chemical category, will be handled by the Contractor as directed by the Engineer or Owner.

34.3 Protection of Fish and Wildlife Resources. The Contractor shall keep construction activities under continued surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife, including Endangered and Threatened species.

34.3.1 General. The Contractor shall abide by and implement all safeguards, reporting criteria, lighting requirements and other measures required by State and Federal permits to protect threatened and/or endangered species during the period of project construction (see Appendix A). Specific requirements set forth by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Florida Fish and Wildlife Commission are included in the State and Federal Permits. These biological opinions address the protection of sea turtles and shorebirds, among other species. The Contractor is referred to these documents for specific requirements for the protection of endangered and threatened species. All occurrences of endangered or threatened species at the beach fill site shall be recorded on the appropriate observation sheets and on the daily report.

34.3.2 Nesting Sea Turtles. The FDEP and USACE permits included herein provide permit terms and conditions for the protection of nesting sea turtles and deposited sea turtle nests on the existing beach and constructed beach fill. These permits allow for construction at any time of the year, including turtle nesting season, under the terms and conditions contained therein. Monitoring and relocation efforts shall be conducted during the period from April 15 through November 15, or as deemed required by the local marine sea turtle permit holder. In particular:

a) Monitoring. **The Contractor shall contract with the local marine sea turtle permit holder to provide sea turtle nest monitoring and relocation services.** Between April 15 and November 15, the Contractor shall coordinate with that marine turtle permit holder, who will conduct all required monitoring and relocation services, as described in the project permits.

b) The Contractor shall coordinate with the marine turtle permit holder on a daily basis during the nesting season to preclude any interference between the construction activities and the turtle monitoring and relocation activities. The Contractor shall provide lateral access through the work zone as required to allow sea turtle patrols to pass. The Contractor shall note in the daily report that contact was made with the monitoring personnel and the appropriate clearance was provided.

c) Beach fill construction shall not advance more than five hundred (500) feet along the shoreline between dusk and the following day until a daily nesting survey has been completed and the beach cleared for fill advancement.

34.3.3 Shorebirds. The FDEP and USACE permits included herein provide permit terms and conditions for the protection of various species of shorebirds. In particular: Monitoring.

a) **The Contractor shall contract with the locally-authorized shorebird monitoring personnel to provide shorebird monitoring services to conduct all required monitoring services described in the project permits**. Monitoring efforts for nesting shorebirds shall be conducted daily within the project limits during the period from February 15 through August 31. Monthly or bi-monthly surveys may occur throughout the year, and the Contractor shall make arrangements for bird monitors to transit through the beach work area as needed, with appropriate notice and identification.

b) Throughout the period of construction, the Contractor shall coordinate with the shorebird monitor on a daily basis during project construction during the nesting season to preclude any interference between the construction activities and the shorebird monitoring and relocation activities. The Contractor shall note in the daily report that contact was made with the monitoring personnel and that the appropriate clearance was provided. Work each day on the beach shall not commence until clearance is provided by the shorebird inspector.

34.4 Protection of Air Resources. The Contractor shall keep construction activities under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the applicable air pollution standards of the State of Florida and all Federal emission and performance laws and standards. Further, the Contractor shall be required to maintain all access roads and all other work areas within or without the project boundaries free from dust which would cause a hazard or nuisance to others.

34.5 Protection of Sound Intrusions. The Contractor shall keep construction activities under surveillance, and control to minimize damage to the environment by noise. The Contractor shall provide and maintain adequate muffler systems on all vehicles used during project construction. The use of horns, bells, or the use of whistle signals shall be held to the minimum necessary in order to insure as safe and as quiet an operation as possible. The Contractor shall conduct his operations so as to comply with all federal, state, and local laws or ordinances pertaining to noise abatement.

34.6 Dispensing of Fuel. The Contractor for each fuel storage tank must provide secondary containment, which is capable of holding at minimum 110% of the tank contents. Fuel dispensers shall have a 4-foot square, 16-gauge metal pan with borders banded up and welded at corners right below the bibb. Edges of the pans shall be 8-inch minimum in depth to ascertain that no contamination of the ground takes place. Pans shall be cleaned by an approved method immediately after every dispensing of fuel and wastes disposed of offsite in an approved area. Should any spilling of fuel occur, the Contractor shall immediately contain the spill and contact the appropriate local authorities. The Contractor will be solely responsible for any fines, penalties or other legal activities related to fuel spills.

34.7 Temporary Sanitary Facility. The Contractor shall supply and maintain, at minimum, one (1) temporary sanitary facility for the use of land based employees and subcontractors. The facility shall be conveniently located in the vicinity of the beach disposal operation, but away from residential buildings along the coastline. The facility shall be removed at the end of the project.

34.8 Storage of Lubricants. All lubricants and other potential liquid pollutants shall be stored in sealed, non-corrosive containers. Individual containers shall be stored in metal pans with borders banded up and welded at the corners right below the bibb. Pans shall be deep enough to prevent contamination of the ground. Pans shall be kept clean of all spillage or leakage.

35. MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

36. TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

The Contractor shall train all subcontractors and personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities to insure adequate and continuous environmental pollution control. Quality Control and supervisory personnel shall be thoroughly trained in the proper use of monitoring devices and abatement equipment, and shall be thoroughly knowledgeable of Federal, State, and local laws, regulations, and permits.

37. PAYMENT

Unless otherwise noted, no separate or direct payment will be made for the items covered by this section of the specifications and all costs thereof shall be considered incident to and included in the total Contract price.

USACE Department of the Army (DA) Permit #SAJ-2001-03870

Attachments to DA Permit:

1. Permit Drawings: 15 pages
2. **Water Quality Certification: Specific Conditions of the FDEP Joint Coastal Permit #0187721-013-JN** / Water Quality Certification in accordance with General Condition number #5 on page 2 of the DA permit
    a. FDEP-approved permit drawings
    b. FDEP-approved Physical Monitoring Plan
    c. FDEP-approved Sediment QA/QC Plan
3. EASTERN INDIGO SNAKE CONDITIONS: 6 pages
4. P3BO May 22, 2013: 64 pages
5. SPBO March 13, 2015: 242 pages
6. SARBO Pre and Post Construction Reporting: 2 pages
7. SARBO Take Reporting: 1 page
8. AS-BUILT CERTIFICATION FORM: 2 pages
9. RECORD PERMIT FORM: 2 pages

Florida Park Service Upland Land Use Agreement U0470

DEPARTMENT OF THE ARMY PERMIT

Permittee: Mr. Andrew L. Wallace
South Amelia Island Shore Stabilization Association, Inc. (SAISSA)
Amelia Island Management, Inc.
5440 First Coast Highway
Amelia Island, Florida 32034

Mr. Taco Pope
Nassau County, Florida, Board of County Commissioners
Acting as Head of the South Amelia Island Shore Stabilization
Municipal Services Benefit Unit
96135 Nassau Place, Suite 1
Yulee, Florida 32097

Mr. Michael Foster
Division of Recreation and Parks
Florida Department of Environmental Protection (FDEP)
3900 Commonwealth Boulevard, MS 500
Tallahassee, Florida 32399-3000

Permit No: SAJ-2001-03870(SP-PRJ)

Issuing Office: U.S. Army Engineer District, Jacksonville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U.S. Army Corps of Engineers (Corps) having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The Permittee is granted a 15-year authorization to perform a beach restoration and maintenance project along South Amelia Island. The project consists of the placement of 2.2 million cubic yards of sand along the southern 3.6 miles of shoreline of Amelia Island from Florida Department of Environmental Protection R-monument R-59 southward to R-79. The project includes dune features along the landward limits of the project area. The dunes will be maintained through sand placement, dune vegetation, and sand fencing as need. The borrow area for the beach restoration is located in the adjacent Nassau Sound. The applicant proposes to use a hydraulic cutterhead/pipeline for the dredge. The primary borrow area lies within the ebb shoal complex located offshore of the southern and southeastern areas of Amelia

Permit Conditions

General Conditions:

1. The time limit for completing the work authorized ends on
. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature and the mailing address of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. Reporting Address: The Permittee shall submit all reports, notifications, documentation and correspondence required by the general and special conditions of this permit to either (not both) of the following addresses:

a. For electronic mail (preferred): SAJ-RD-Enforcement@usace.army.mil (not to exceed 15 MB).

b. For standard mail: U.S. Army Corps of Engineers, Regulatory Division, Enforcement Section, P.O. Box 4970, Jacksonville, FL 32232-0019.
The Permittee shall reference this permit number, SAJ-2001-03870(SP-PRJ), on all submittals.

2. Commencement Notification: Within 10 days from the date of initiating the work authorized by this permit the Permittee shall complete and submit the enclosed "Commencement Notification" Form.

3. Points of Contact: The Permittee shall provide a list of all points of contact associated with the project within 10 days from initiation of work to the address identified in Reporting Address Special Condition. The list should include area of responsibility and contact information for each point of contact.

4. Statewide Programmatic Biological Opinion (SPBO): The Permittee provided information to the U. S. Fish and Wildlife Service (FWS) for review. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the SPBO dated March 13, 2015, and agreed to follow the measures included to minimize impacts to Loggerhead sea turtle, Green sea turtle, Leatherback sea turtle, Hawksbill sea turtle, Kemp's Ridley sea turtle, and Manatee. The FWS provided concurrence the maintenance dredging activities and sand placement activities are consistent with the SPBO provide the Permittee follows the term and conditions of the enclosed SPBO.

5. Programmatic Piping Plover Biological Opinion (P3BO): The Permittee provided information to the U. S. Fish and Wildlife Service (FWS) for review. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the P3BO dated May 22, 2013, and agreed to follow the measures included to minimize impacts to the Rufa Red Knot and Piping Plover. The FWS provided concurrence that the sand placement activities are consistent with the P3BO with the Permittee follows the term and conditions of the enclosed P3BO.

6. South Atlantic Regional Biological Opinion (SARBO) 2020: The Permittee is responsible for complying with the South Atlantic Regional Biological Opinion (SARBO) 2020:

Reporting requirements:

a. Commencement Notification: At least 45 days prior to the date of initiating the work authorized by this permit, the Permittee shall complete and submit the enclosed "Commencement Notification" form to SAJ-RD-Enforcement@usace.army.mil and RD.SARBO.GRBO@usace.army.mil. Upon receipt of the notification email, the Corps will provide a list of the Corps primary points of contact for reporting species take/incidents. If the permit authorizes multiple work events, the Permittee must submit the SARBO Pre-Construction Notification 45 days prior to each event. In addition to the Commencement Notification form, the Permittee will include the following in the email:

i. A statement indicating the Permittee has reviewed the completed Pre-Construction Notification form located in attachment 6 of this permit. The Permittee will also include any changes or updates to that form in the body of the email.

ii. If relocation trawling is proposed include when trawling will begin, expected project length, and notify the Corps when it is completed.

b. Take Reporting: All lethal and nonlethal take associated with a project covered under SARBO will be reported within 24 hours. Project details related to take will be reported by completing "SARBO Take Reporting" form attachment 7 and sent to the following emails: RD.SARBO.GRBO@usace.army.mil and SERODredge@noaa.gov.

c. North Atlantic right whale: All observations of North Atlantic right whales observed while completing the authorized work be reported within 24 hours of the observation. The process to report a North Atlantic right whale observation is outlined in the North Atlantic Right Whale Plan (SARBO Appendix F) and applies to all work covered under SARBO.

d. Other Reporting: Any reporting requirements outlined in the PDCs including surveys conducted under the Coral PDCs (SARBO Appendix C), surveys conducted under the Johnson's seagrass PDCs (SARBO Appendix D), and PSO responsibilities outlined in SARBO Appendix H shall be emailed to RD.SARBO.GRBO@usace.army.mil.

e. Relocation Trawling: At least 48 hours prior to the start of relocation trawling, notify the Corps by email at RD.SARBO.GRBO@usace.army.mil if the project will be using relocation trawling. The email should contain when trawling will begin, expected project length, and when it is complete.

f. Post-Construction Reporting: Within 30 days of completing the work authorized by this permit, the Permittee shall submit a completed "SARBO Post-Construction Notification" form attachment 6, to RD.SARBO.GRBO@usace.army.mil.
South Atlantic Regional Biological Opinion: The authorized work is approved under the current National Marine Fisheries Service (NMFS) South Atlantic Regional Biological Opinion (SARBO) and its references, which can be viewed on the following website in the folder titled Information:
https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast

Note – Please use an alternate browser in the event you have trouble opening the above website.

The Permittee is responsible for obtaining and complying with the SARBO. If the Permittee is unable to view the SARBO at this website, the Permittee shall contact the Corps to receive a copy of the SARBO. The Permittee shall implement all reasonable and prudent measures and terms and conditions identified in the SARBO. NMFS has issued the SARBO to the Corps for projects that limit the take of listed turtles, whales, sturgeon, sawfish, and any other species listed in the SARBO. Authorization under this permit is conditional upon compliance with all the mandatory terms and conditions associated with the SARBO, which terms and conditions are incorporated by reference in this permit. The mandatory terms and conditions include adherence to the Project Design Criteria (PDC) applicable to the authorized project. Failure to comply with the terms and conditions associated with the SARBO, where a take of the listed species occurs, would constitute noncompliance with this permit. Failure to comply with this permit will be the basis for suspension and revocation of this permit and may be the basis for other enforcement action. NMFS has directed that this SARBO issued to the Corps serve as the formal consultation for all projects in the area covered by the SARBO; however, where the terms and conditions of the SARBO differ from the special conditions of this permit, the special conditions of this permit will take precedence as the more stringent condition.

Incidental Take Statement: This permit does not authorize the Permittee to take an endangered species, in particular sea turtles, sturgeon, whales, or any other endangered species listed in the SARBO. The SARBO includes an Incidental Take Statement (ITS) issued to the Corps. The Permittee understands and agrees that, even where it is in full compliance with the terms and conditions of the SARBO ITS and this permit, incidental take by the Permittee or other hopper dredging operations within the area covered by the SARBO may result in suspension or modification of this permit by the Corps. The amount of incidental take that will trigger suspension, and the need for any such suspension, shall be determined at the discretion of the Corps. The Permittee

understands and agrees on behalf of itself, its agents, contractors, and other representatives, no claim, legal action in equity or for damages, adjustment, or other entitlement against the Corps shall arise as a result of such suspension or related action.

Project timing: The USACE and/or BOEM will determine project timing and necessary minimization measures to reduce the risk of take of ESA-listed species through the Risk Based Adaptive Management process outlined in the SARBO Section 2.9.2.2 and Appendix J. Additional timing requirements apply within the range of certain species, as outlined in the North Atlantic Right Whale Conservation Plan (Appendix F) and sturgeon PDCs (SARBO Appendix E). The Permittee is responsible for coordinating with the Corps using email address RD.SARBO.GRBO@usace.army.mil when initial project planning begins to ensure project timing and minimization measures are considered.

7. Eastern Indigo Snake Protection Measures and Inspection: Permittee shall comply with the enclosed U.S. Fish and Wildlife Service's "Standard Protection Measures for the Eastern Indigo Snake" dated August 12, 2013. All gopher tortoise burrows, active or inactive, shall be evacuated prior to site manipulation in the vicinity of the burrow. If excavating potentially occupied burrows, active or inactive, individuals must first obtain state authorization via a Florida Fish and Wildlife Conservation Commission (FWC) Authorized Gopher Tortoise Agent permit. The excavation method selected shall minimize the potential for injury of an indigo snake. The Permittee shall follow the excavation guidance provided in the most current FWC Gopher Tortoise Permitting Guidelines found at http://myfwc.com/gophertortoise. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Holes, cavities, and snake refugia other than gopher tortoise burrows shall be inspected each morning before planned site manipulation of a particular area, and if occupied by an indigo snake, no work shall commence until the snake has vacated the vicinity of the proposed work.

8. Fill Material: The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, debris, automotive parts, asphalt, construction materials, concrete block with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts in accordance with Section 307 of the Clean Water Act.

9. As-Built Certification: Within 60 days of completion of the work authorized by this permit, the Permittee shall submit as-built drawings of the authorized work and complete and submit the enclosed "As-Built Certification By Professional Engineer" form to the Corps. The as-built drawings shall be signed and sealed by a registered professional engineer and include the following:

a. A plan view drawing of the location of the authorized work footprint, as shown on the permit drawings, with transparent overlay of the work as constructed in the same scale as the permit drawings on 8½-inch by 11-inch sheets. The plan view drawing should show all "earth disturbance," including wetland impacts and water management structures.

b. A list of any deviations between the work authorized by this permit and the work as constructed. In the event that the completed work deviates, in any manner, from the authorized work, describe on the attached “As-Built Certification By Professional Engineer” form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or “As-Built Certification By Professional Engineer” form does not constitute approval of any deviations by the Corps.

c. Include the Department of the Army permit number on all sheets submitted.

10. Notice of Permit: The Permittee shall complete and record the enclosed “Notice of Department of the Army Authorization” form with the Clerk of the Circuit Court, Registrar of Deeds or other appropriate official charged with the responsibility of maintaining records of title to or interest in real property within the county of the authorized activity. Within 90 days from the effective date of this permit, the Permittee shall provide a copy of the recorded Notice of Permit to the Corps clearly showing a stamp from the appropriate official indicating the book and page at which the Notice of Permit is recorded and the date of recording.

11. Historic Resources: The Permittee shall maintain a 50 meter protective buffer around the cluster of anomalies identified in the Cultural Resource Assessment that was performed between February and March of 2019, there will be no ground disturbing activities in the 50 meter protective buffer area.

12. Cultural Resources/Historic Properties:

a. No structure or work shall adversely affect impact or disturb properties listed in the *National Register of Historic Places* (NRHP) or those eligible for inclusion in the NRHP.

b. If during the ground disturbing activities and construction work within the permit area, there are archaeological/cultural materials encountered which were not the subject of a previous cultural resources assessment survey (and which shall include, but not be limited to: pottery, modified shell, flora, fauna, human remains, ceramics,

stone tools or metal implements, dugout canoes, evidence of structures or any other physical remains that could be associated with Native American cultures or early colonial or American settlement), the Permittee shall immediately stop all work and ground-disturbing activities within a 100-meter diameter of the discovery and notify the Corps within the same business day (8 hours). The Corps shall then notify the Florida State Historic Preservation Officer (SHPO) and the appropriate Tribal Historic Preservation Officer(s) (THPO(s)) to assess the significance of the discovery and devise appropriate actions.

c. Additional cultural resources assessments may be required of the permit area in the case of unanticipated discoveries as referenced in accordance with the above Special Condition; and if deemed necessary by the SHPO, THPO(s), or Corps, in accordance with 36 CFR 800 or 33 CFR 325, Appendix C (5). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume on non-federal lands without written authorization from the SHPO for finds under his or her jurisdiction, and from the Corps.

d. In the unlikely event that unmarked human remains are identified on non-federal lands, they will be treated in accordance with Section 872.05 Florida Statutes. All work and ground disturbing activities within a 100-meter diameter of the unmarked human remains shall immediately cease and the Permittee shall immediately notify the medical examiner, Corps, and State Archeologist within the same business day (8-hours). The Corps shall then notify the appropriate SHPO and THPO(s). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume without written authorization from the State Archeologist and from the Corps.

13. Agency Changes/Approvals: Should any other agency require and/or approve changes to the work authorized or obligated by this permit, the Permittee is advised that a modification to this permit instrument is required prior to initiation of those changes. It is the Permittee's responsibility to request a modification of this permit from the Jacksonville Permits Section. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for the modification of this permit.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344)

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413)

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Wallace — May 5, 2021
(PERMITTEE) (DATE)

Andrew L. Wallace, President SAISSA
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(DISTRICT ENGINEER) (DATE)
Andrew D. Kelly, Jr.
Colonel, U.S. Army
District Commander

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

_____ _____
(PERMITTEE) (DATE)

_____
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

_____ _____
(DISTRICT ENGINEER) (DATE)
Andrew D. Kelly, Jr.
Colonel, U.S. Army
District Commander

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

_____ _____
(PERMITTEE) (DATE)

_____
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

_____ _____
(DISTRICT ENGINEER) (DATE)
Andrew D. Kelly, Jr.
Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____ _____
(TRANSFEREE-SIGNATURE) (DATE)

_____
(NAME-PRINTED)

_____
(ADDRESS)

_____
(CITY, STATE, AND ZIP CODE)

Attachments to Department of the Army Permit Number SAJ-2001-03870

1. PERMIT DRAWINGS: 15 pages

2. WATER QUALITY CERTIFICATION: Specific Conditions of the water quality permit/certification in accordance with General Condition number 5 on page 2 of this DA permit. 31 pages.

3. EASTERN INDIGO SNAKE CONDITIONS: 6 pages

4. P3BO May 22, 2013: 64 pages

5. SPBO March 13, 2015: 242 pages

6. SARBO Pre and Post Construction Reporting: 2 pages

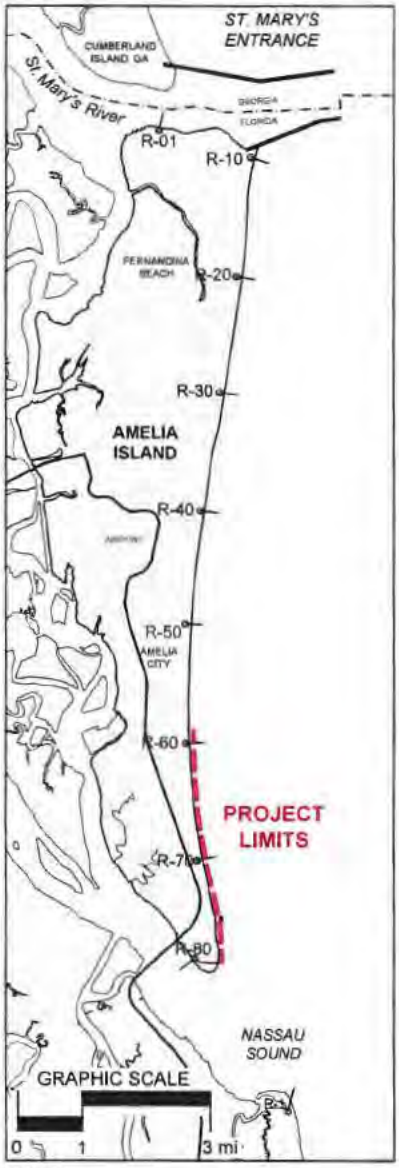
7. SARBO Take Reporting: 1 page

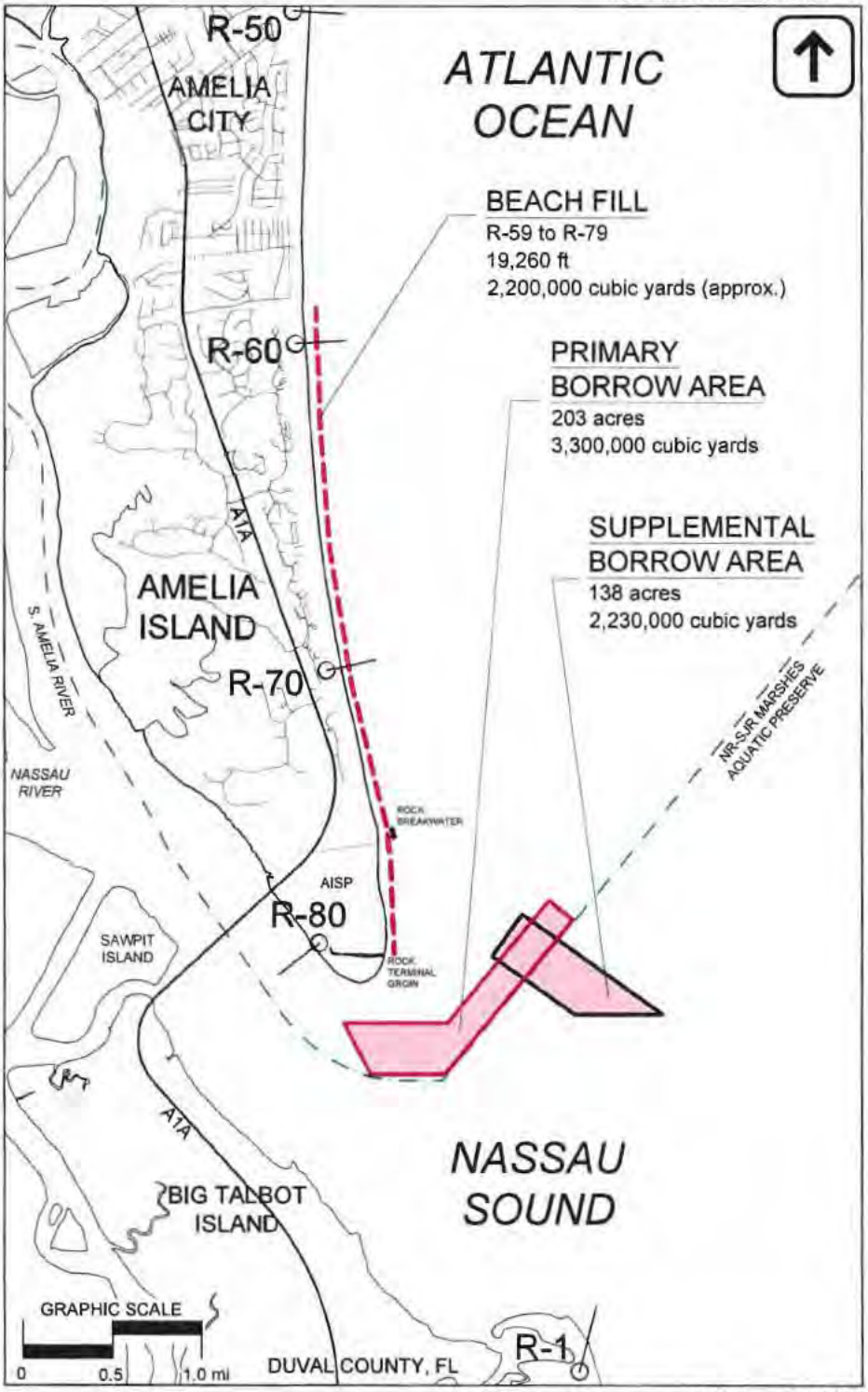
8. AS-BUILT CERTIFICATION FORM: 2 pages

9. RECORD PERMIT FORM: 2 pages

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION





NOTES:

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PROJECT SITE LOCATION

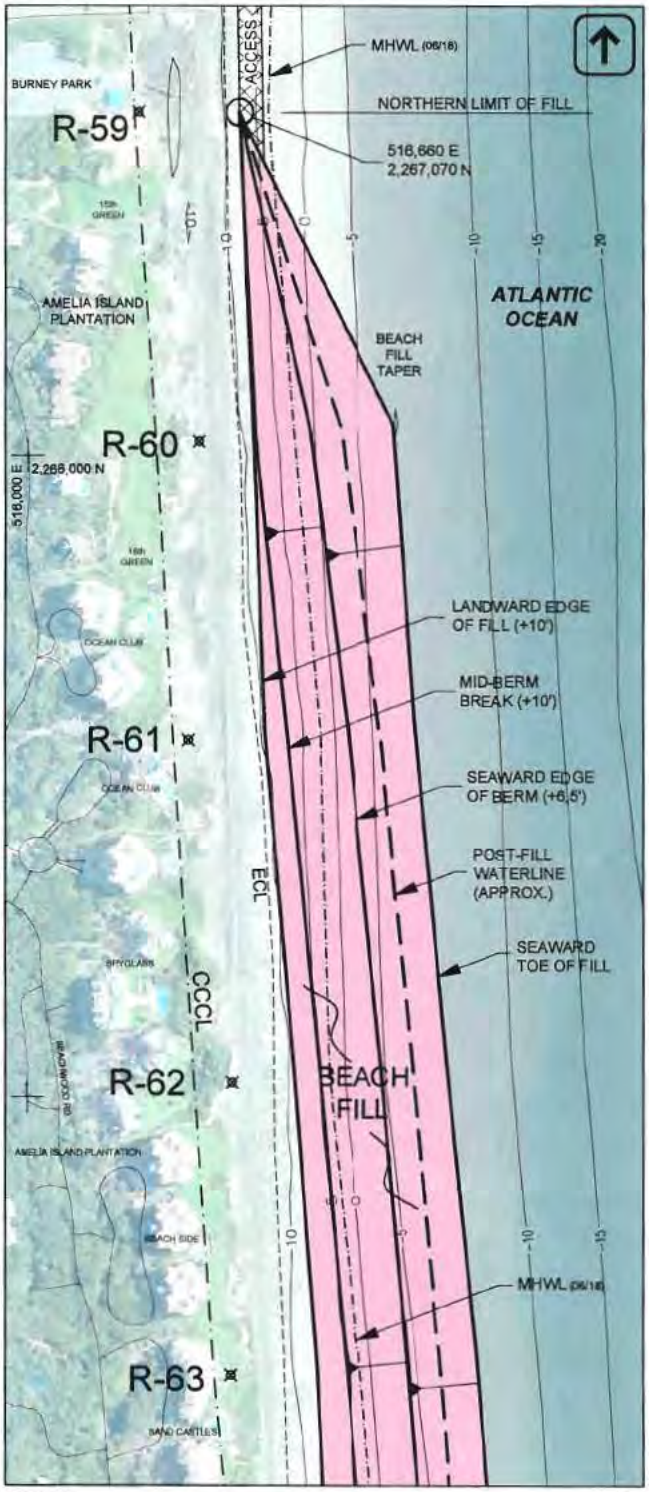
Albert E. Browder, P.E. FL #57403

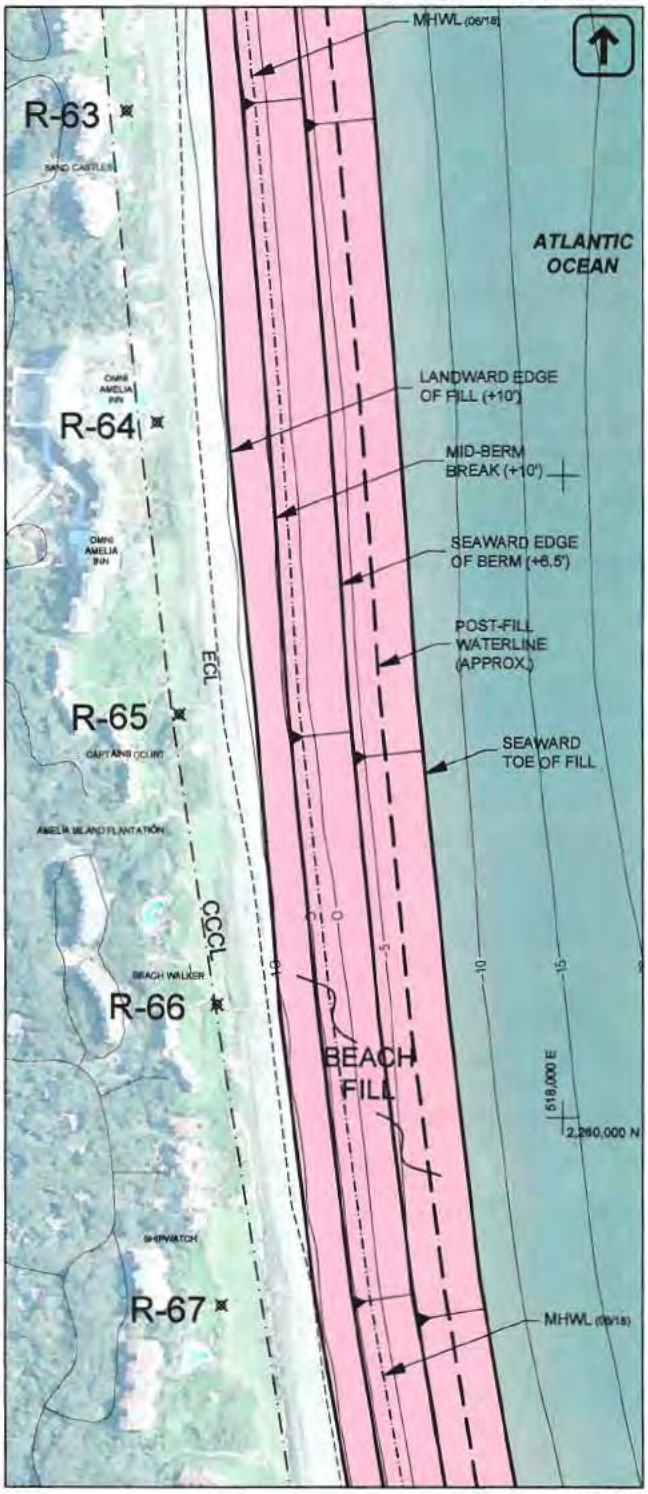
DATE: 12/14/2018
DRAWN BY: ML
SHEET 1 OF 15

14 Dec '18

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION





NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
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(FAX) 384-7368
COA 00003491

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403
14 Dec '18

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 2 OF 15

NASSAU COUNTY, FL

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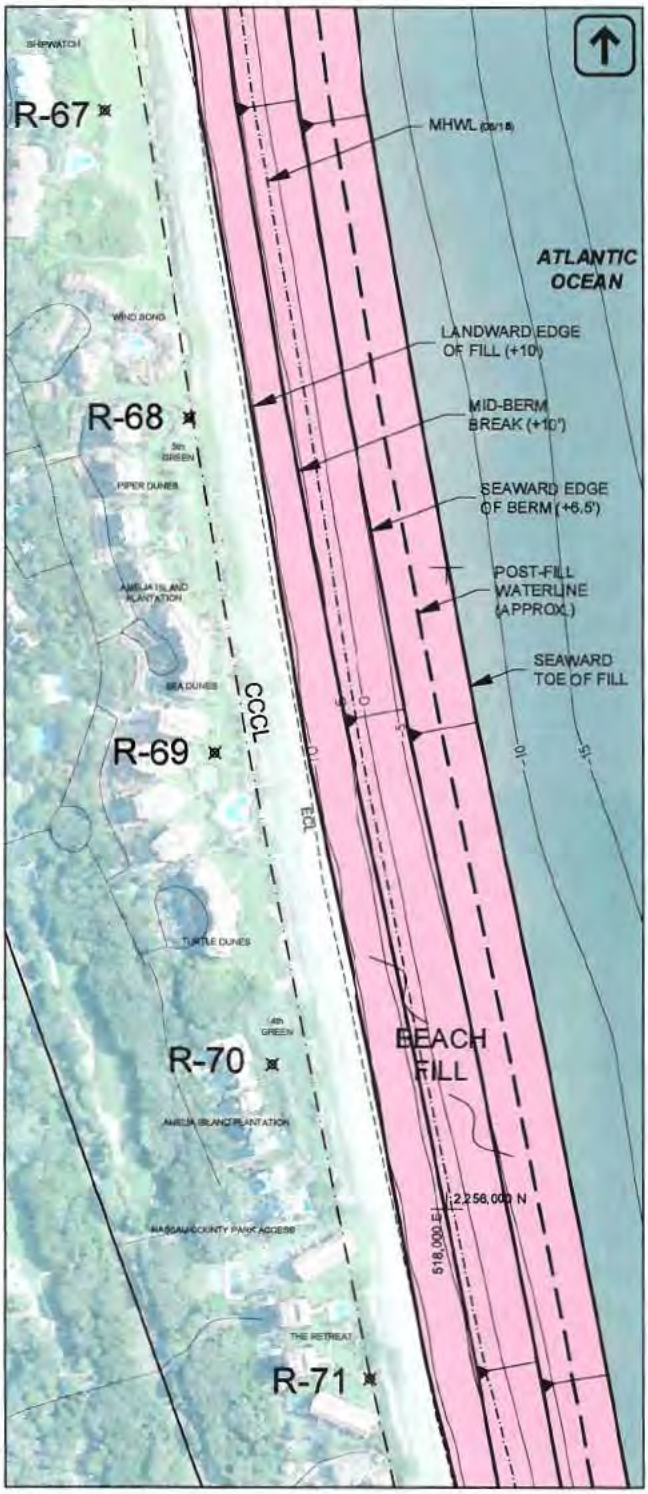
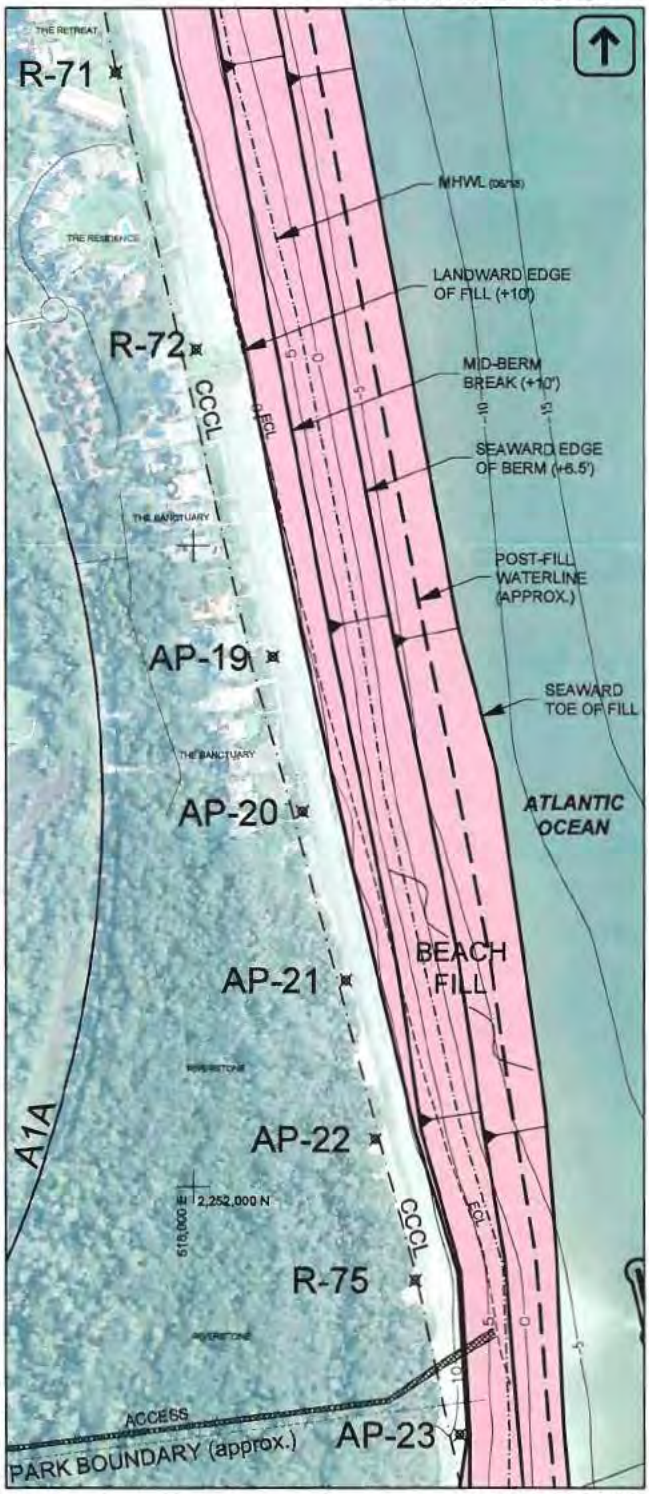
NOT FOR CONSTRUCTION





NOTES:
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2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
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Sect: 18, 22
Township: 2 N
Range: 28 E

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec 18

DATE: 12/14/2018

DRAWN BY: ML

SHEET 3 OF 15

NASSAU COUNTY, FL

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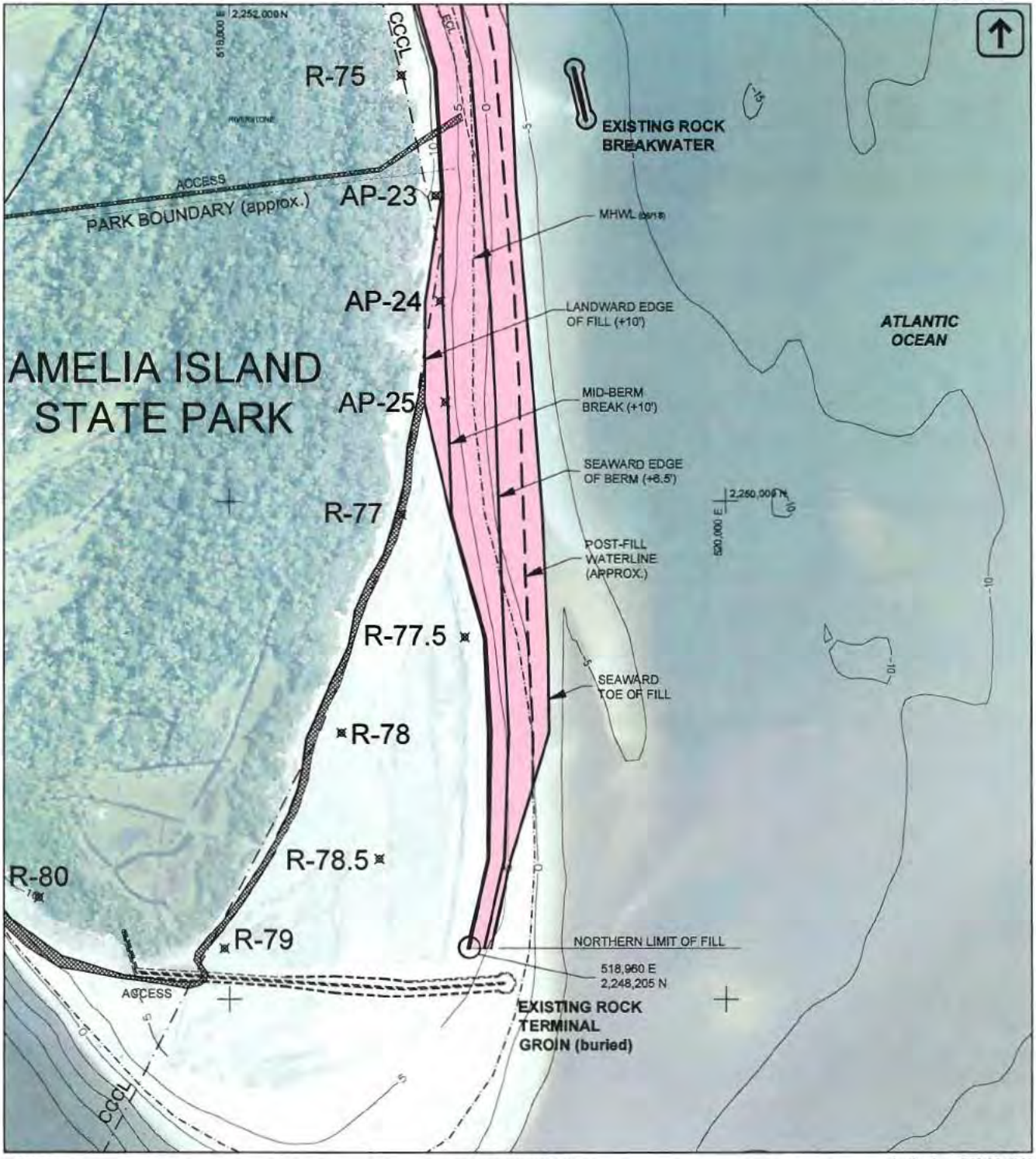
NOT FOR CONSTRUCTION



NOTES:
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2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

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Sect: 18, 22
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DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec 18

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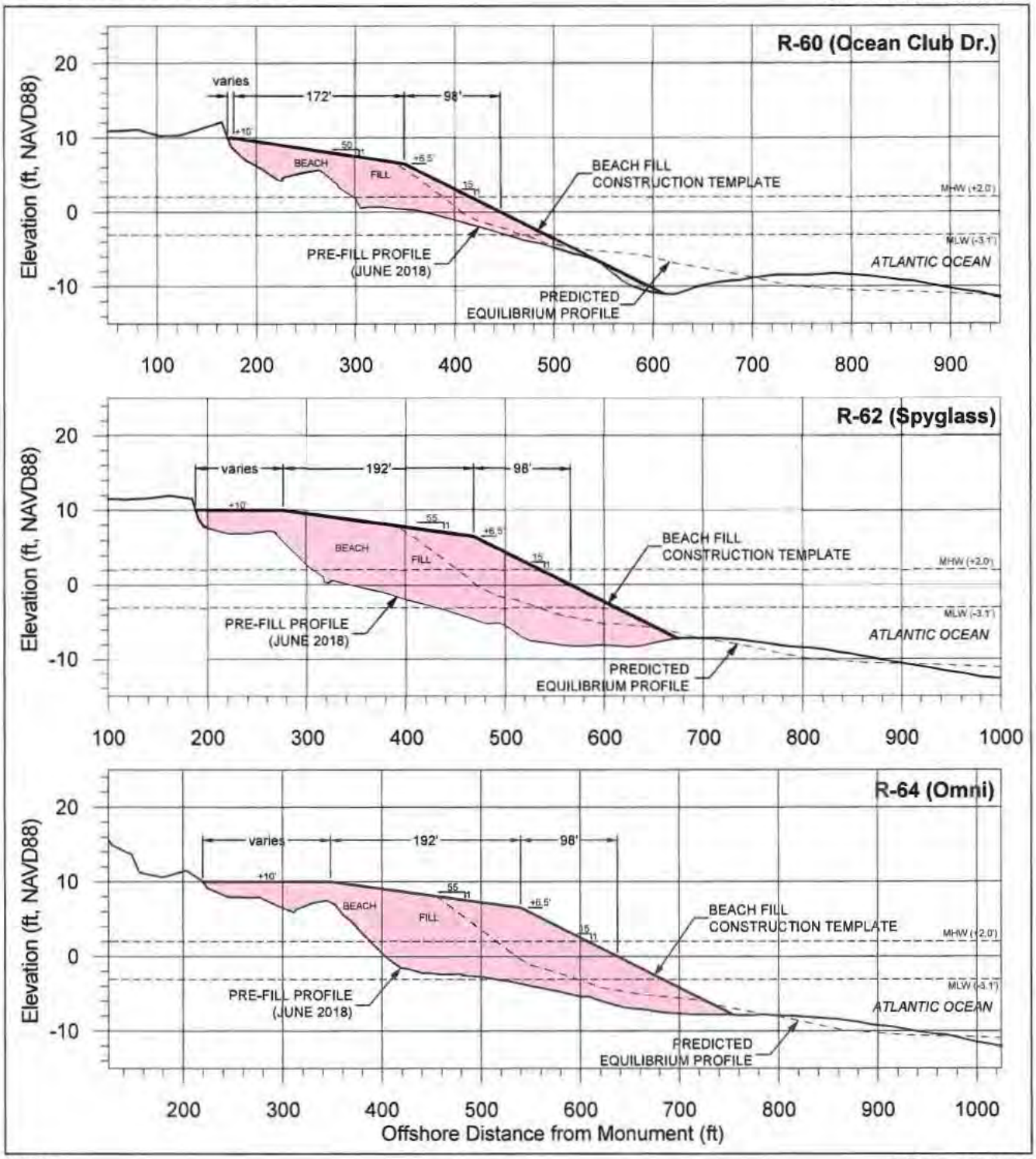
AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 4 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
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(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

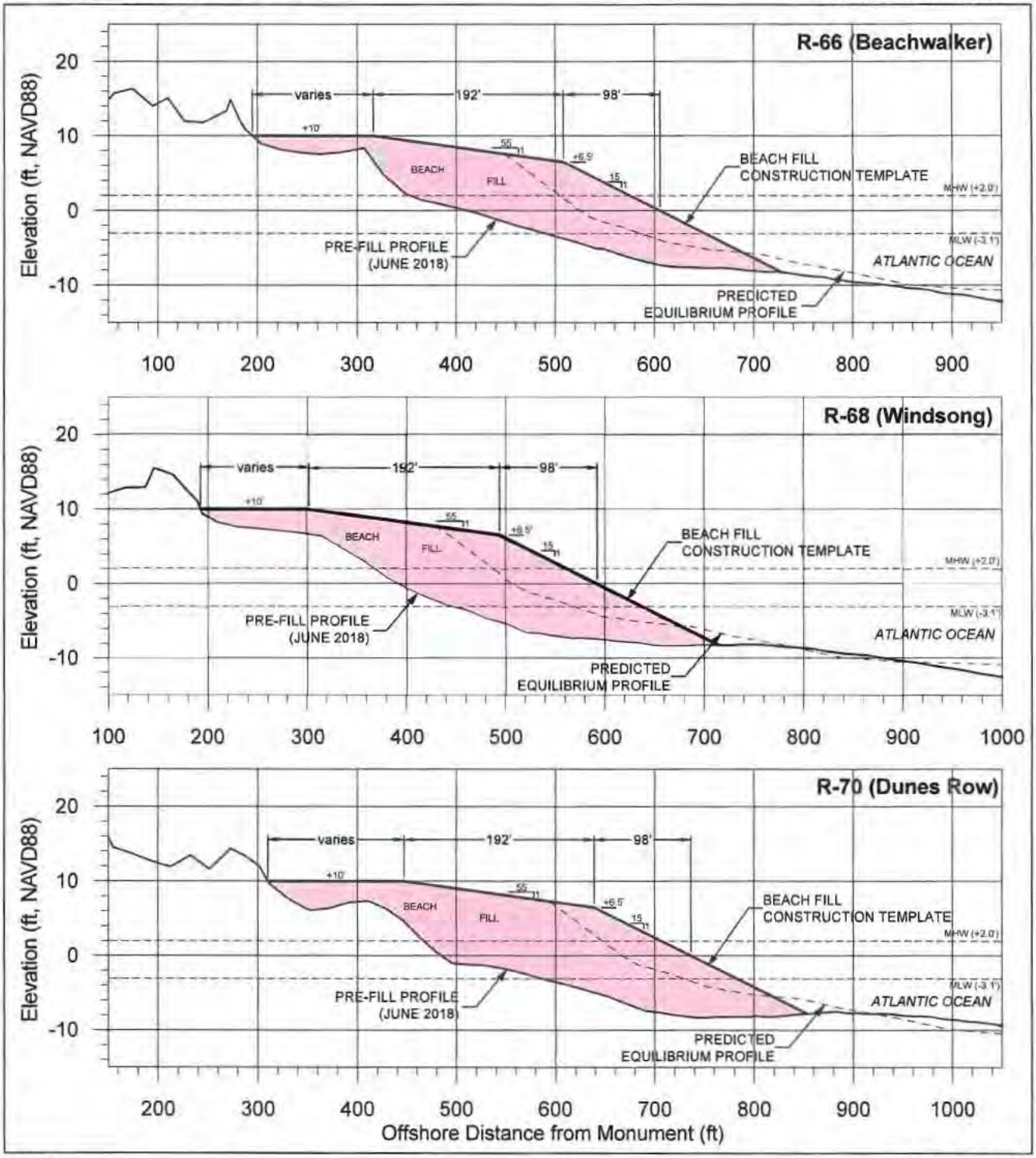
Albert E. Browder, P.E. FL #57403

14 Dec 18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 5 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
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2) SURVEY: JUNE 2018
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Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
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Jacksonville, FL 32204
(904) 387-6114
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

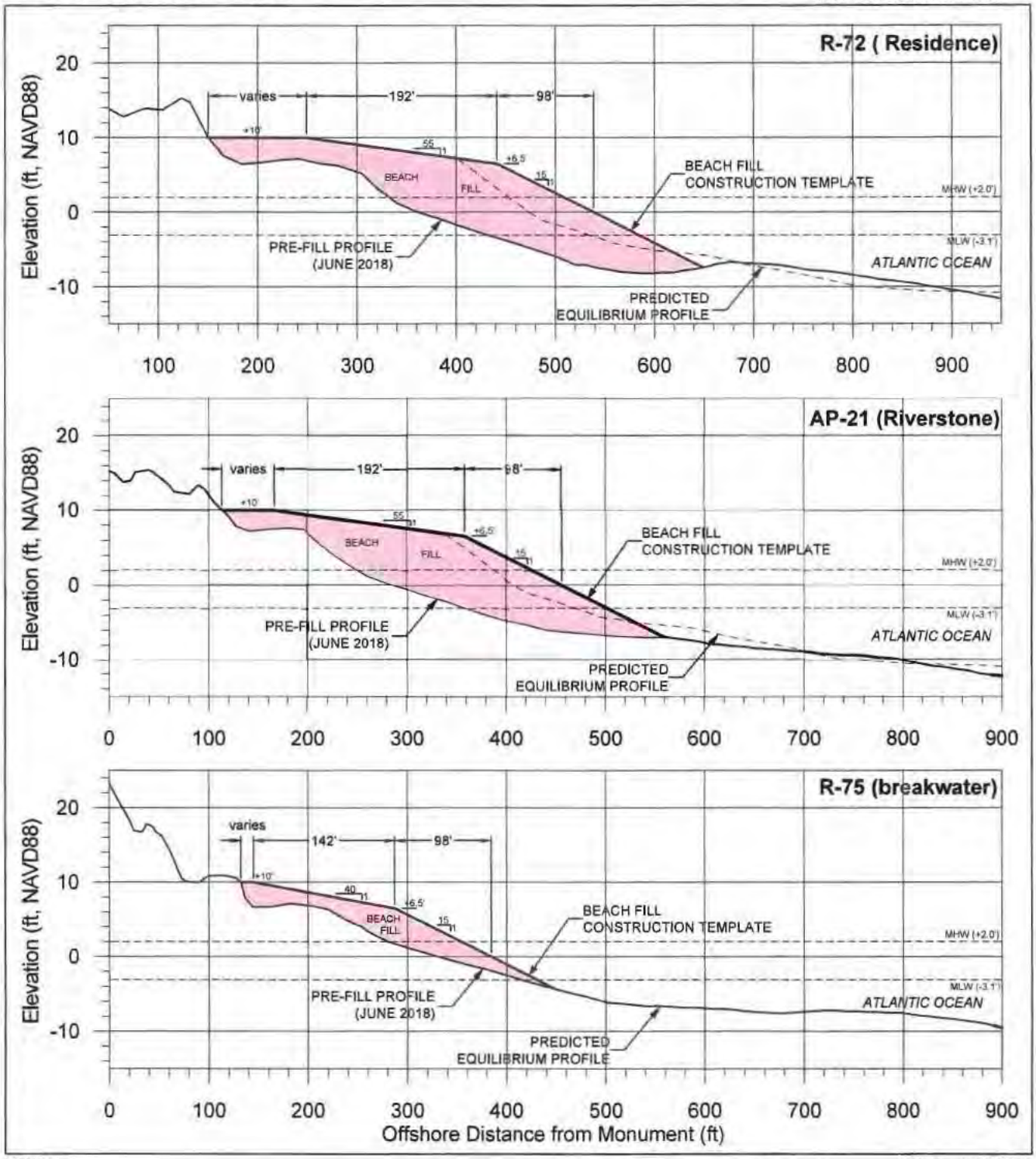
BEACH FILL SECTIONS

Albert E. Browder, P.E. FL #57403
14 Dec 18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 6 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER
Albert E. Browder, P.E. FL #57403
14 Dec 18

olsen associates, inc.
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Jacksonville, FL 32204
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(FAX) 384-7368
COA 00003491

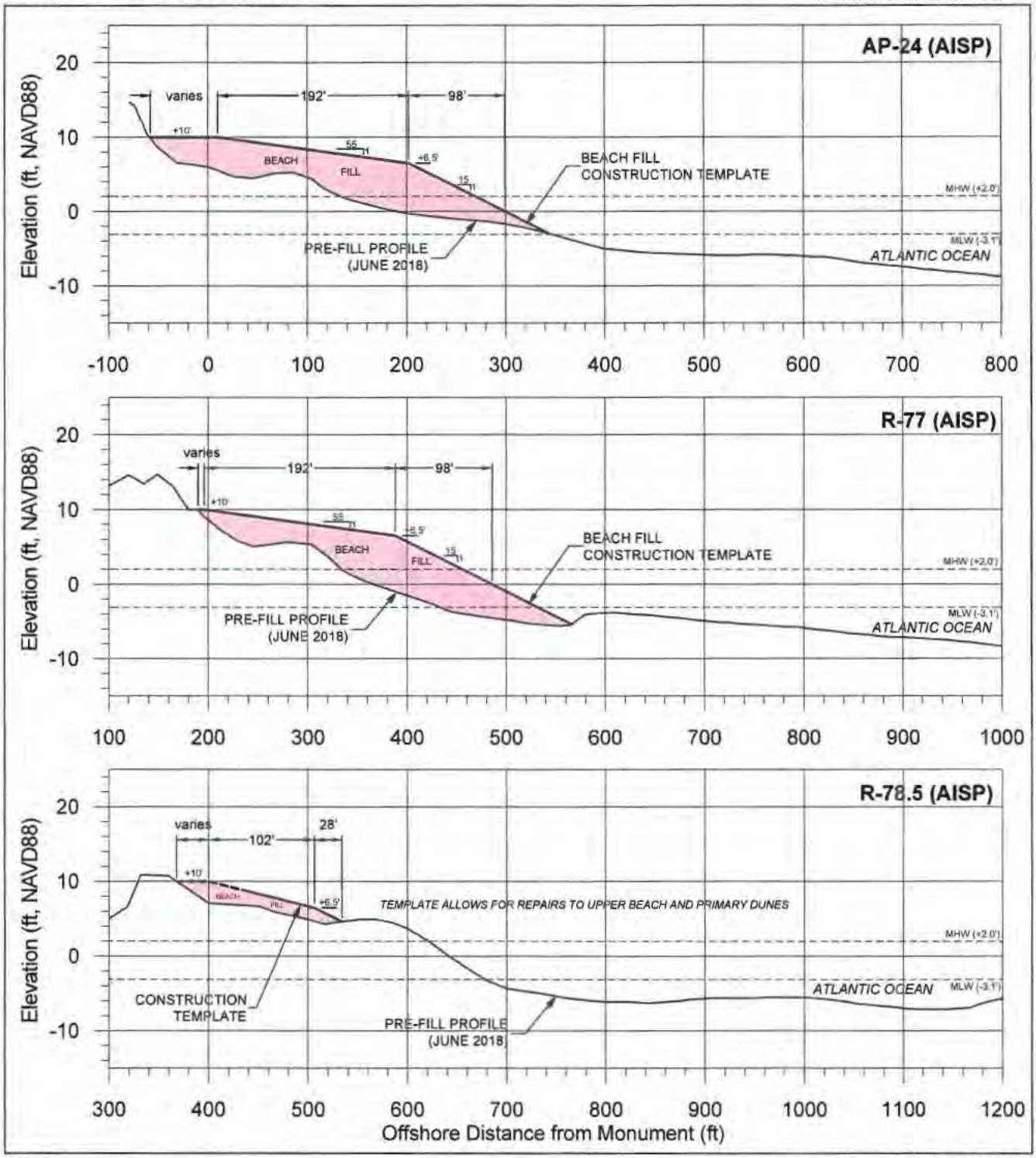
AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 7 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
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2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

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Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

olsen associates, inc.
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 8 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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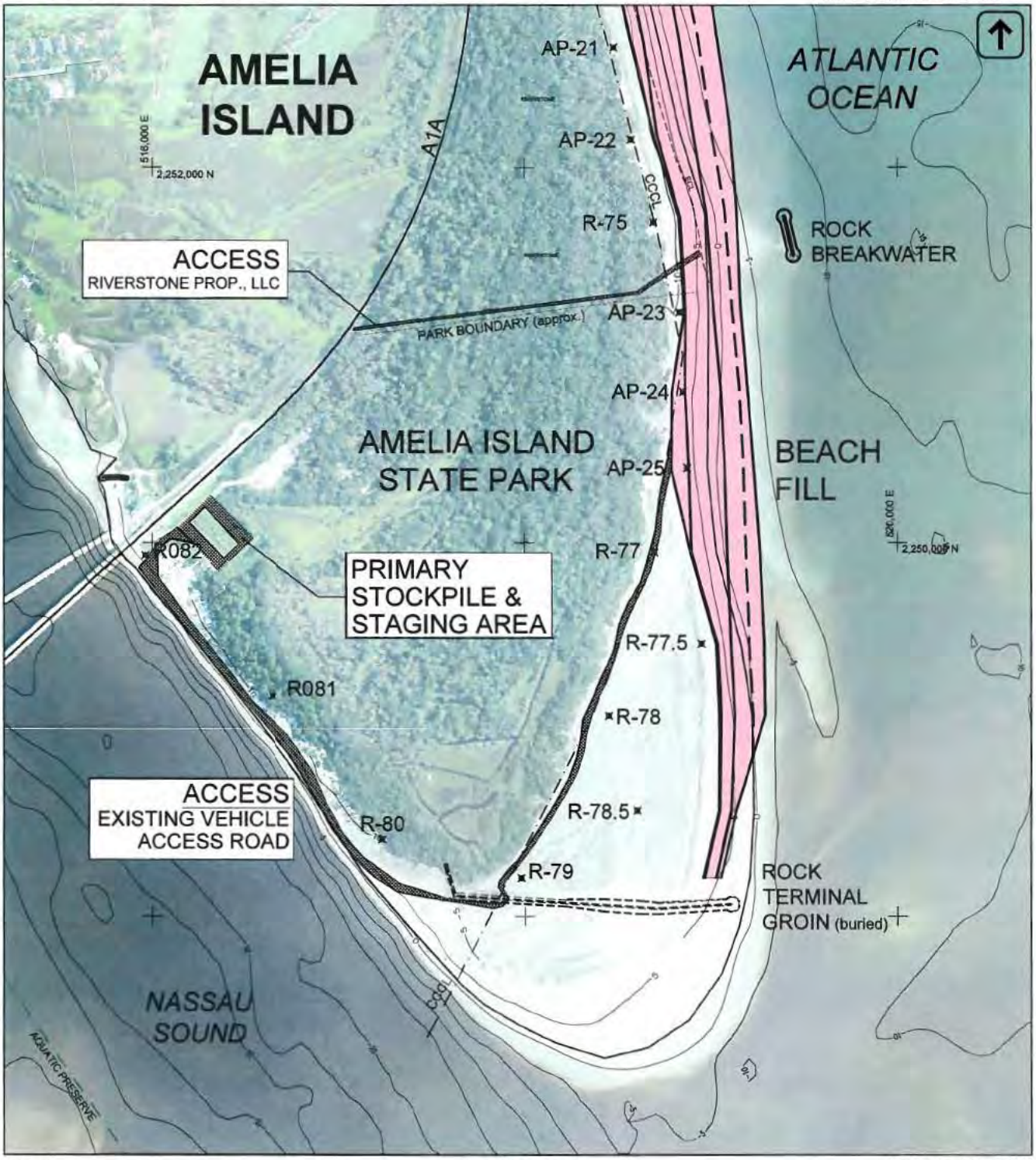

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 400 800 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SOUTH ACCESS

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 9 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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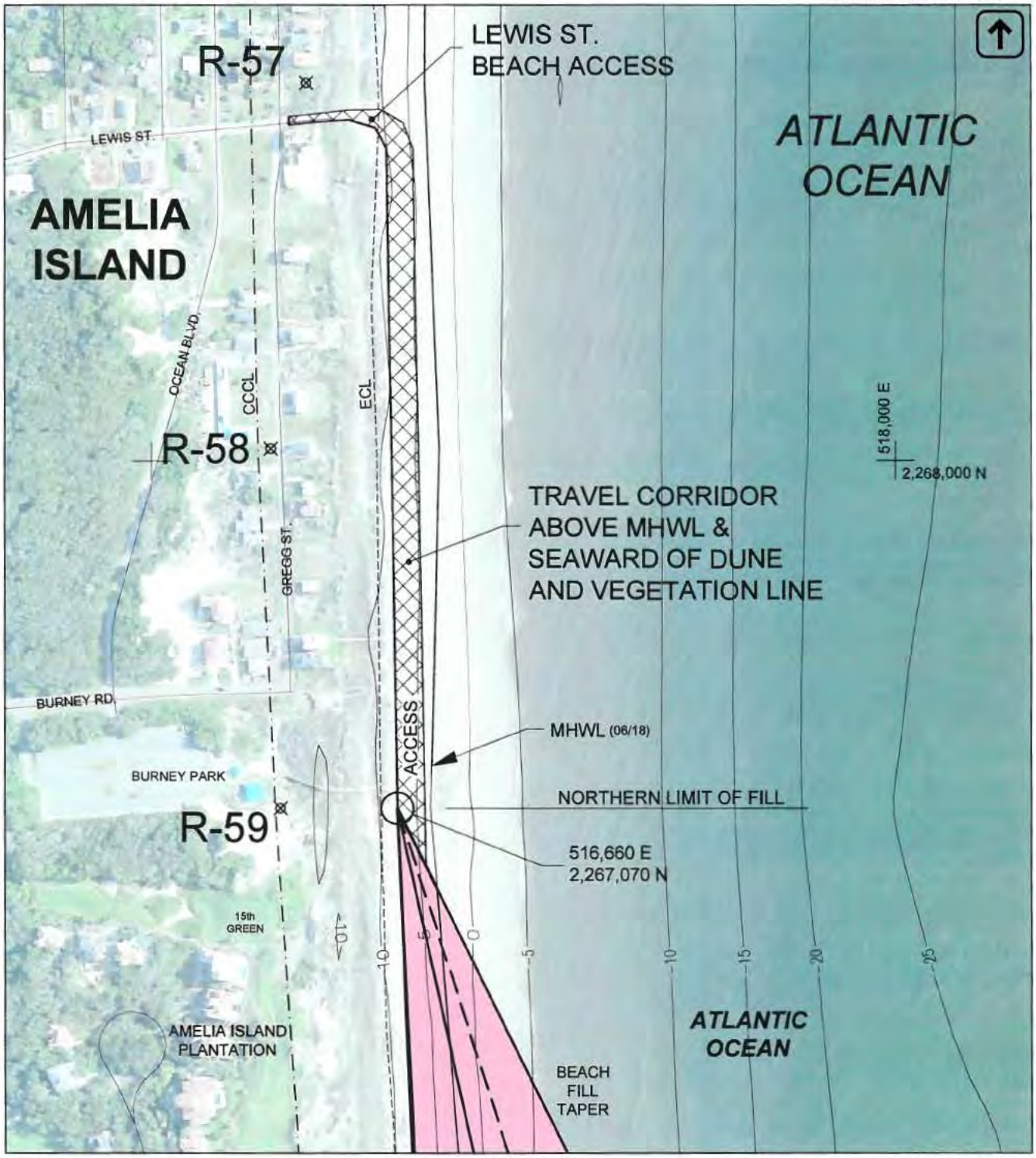

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 200 400 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL
NORTH ACCESS

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 10 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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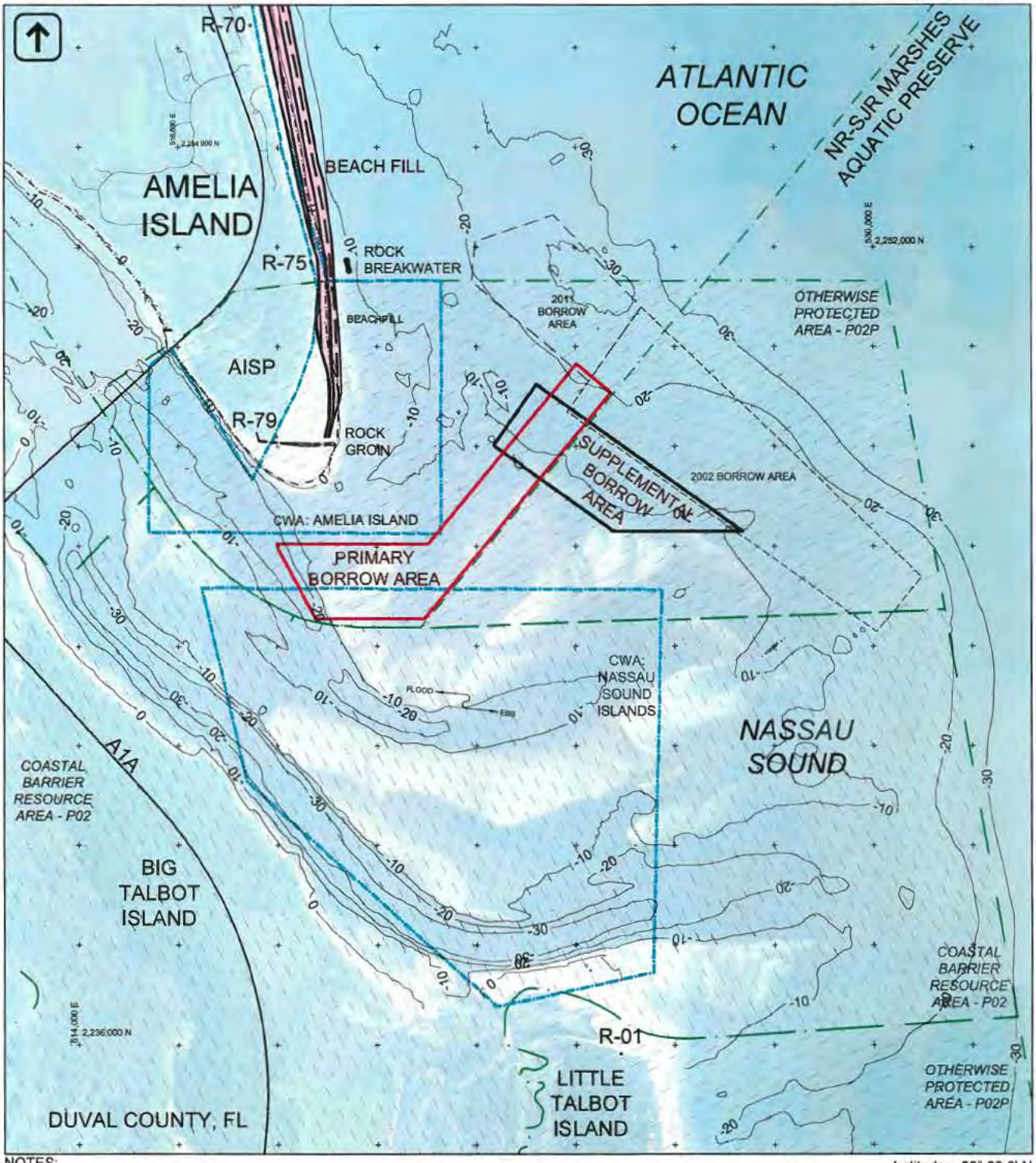

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 1,000 3,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
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COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BORROW AREAS GENERAL LOCATION

ALBERT EDWARD BROWDER LICENSE No. 57403
STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 11 OF 15

NASSAU COUNTY, FL

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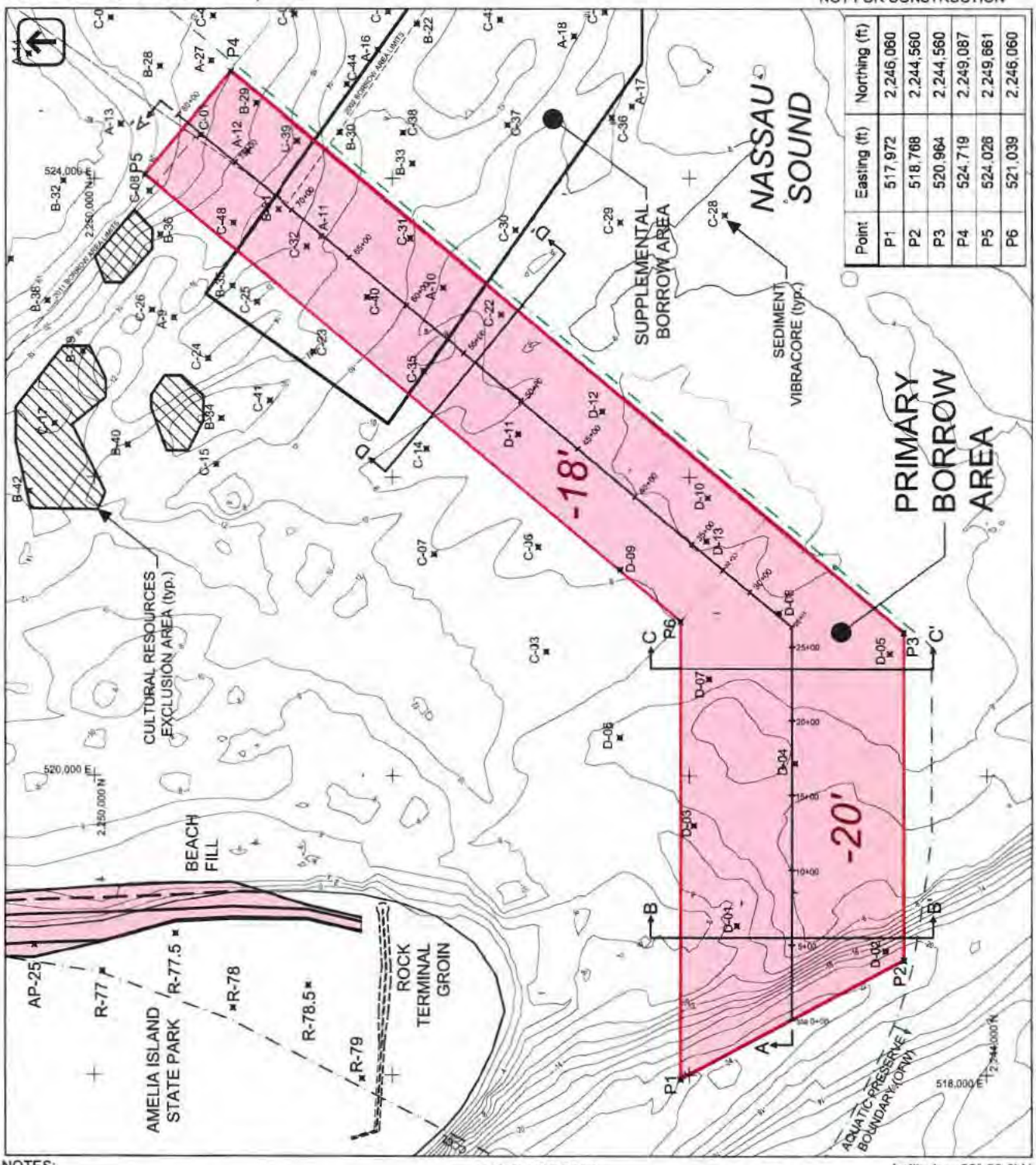

Point	Easting (ft)	Northing (ft)
P1	517,972	2,246,060
P2	518,768	2,244,560
P3	520,964	2,244,560
P4	524,719	2,249,087
P5	524,026	2,249,661
P6	521,039	2,246,060

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) VIBRACORE DATES VARY (2001, 2007, 2017, 2018)

GRAPHIC SCALE
0 500 1,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403
14 Dec '18

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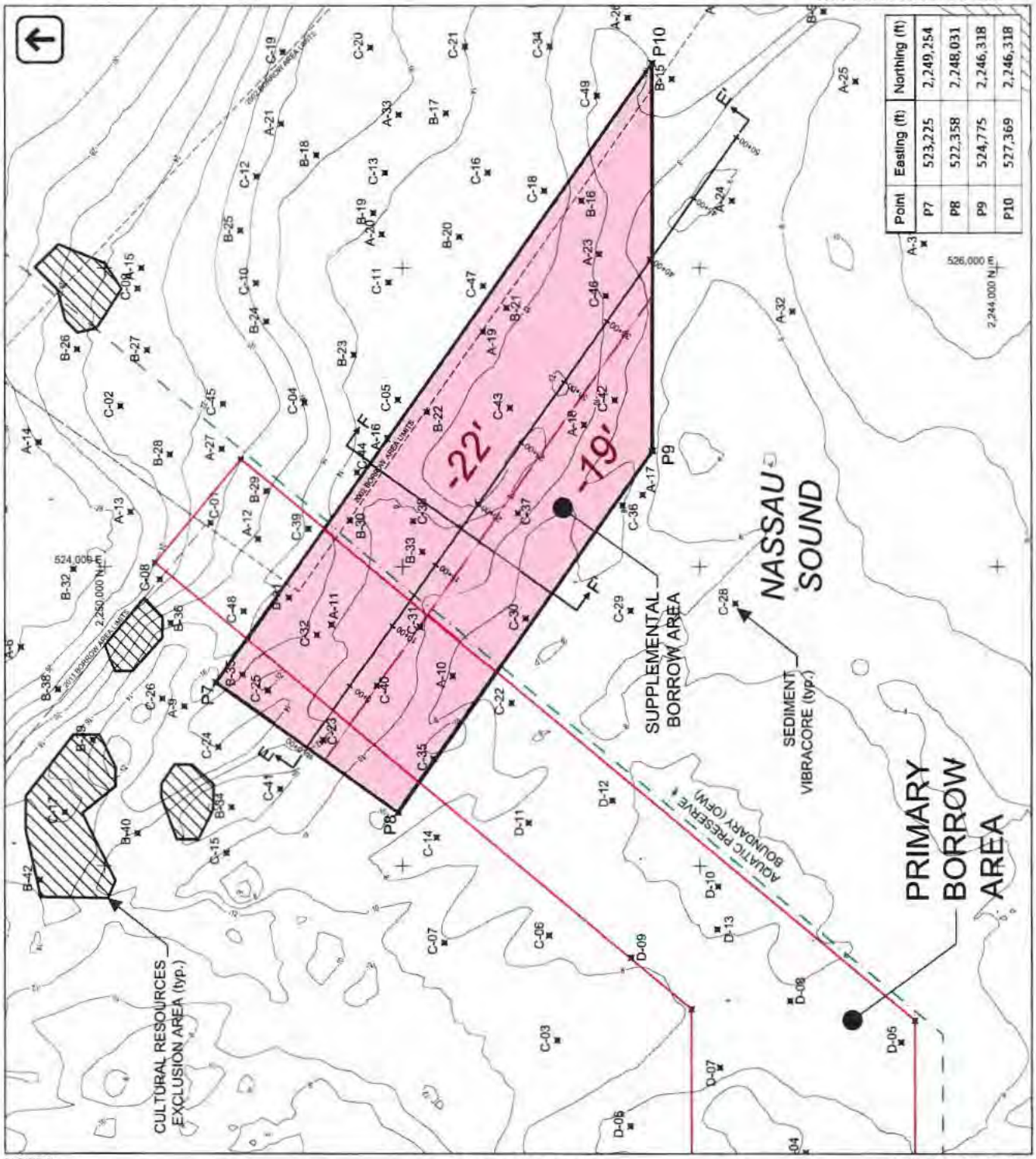
AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PRIMARY BORROW AREA PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 12 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



Point	Easting (ft)	Northing (ft)
P7	523,225	2,249,254
P8	522,358	2,248,031
P9	524,775	2,246,318
P10	527,369	2,246,318

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) VIBRACORE DATES VARY (2001, 2007, 2017, 2018)

GRAPHIC SCALE
0 500 1,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
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ALBERT EDWARD BROWDER LICENSE No. 57403
STATE OF FLORIDA PROFESSIONAL ENGINEER

DATE	APPR	REVISION	DATE	APPR	REVISION

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

SUPPLEMENTAL BORROW AREA PLANVIEW

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 13 OF 15

NASSAU COUNTY, FL

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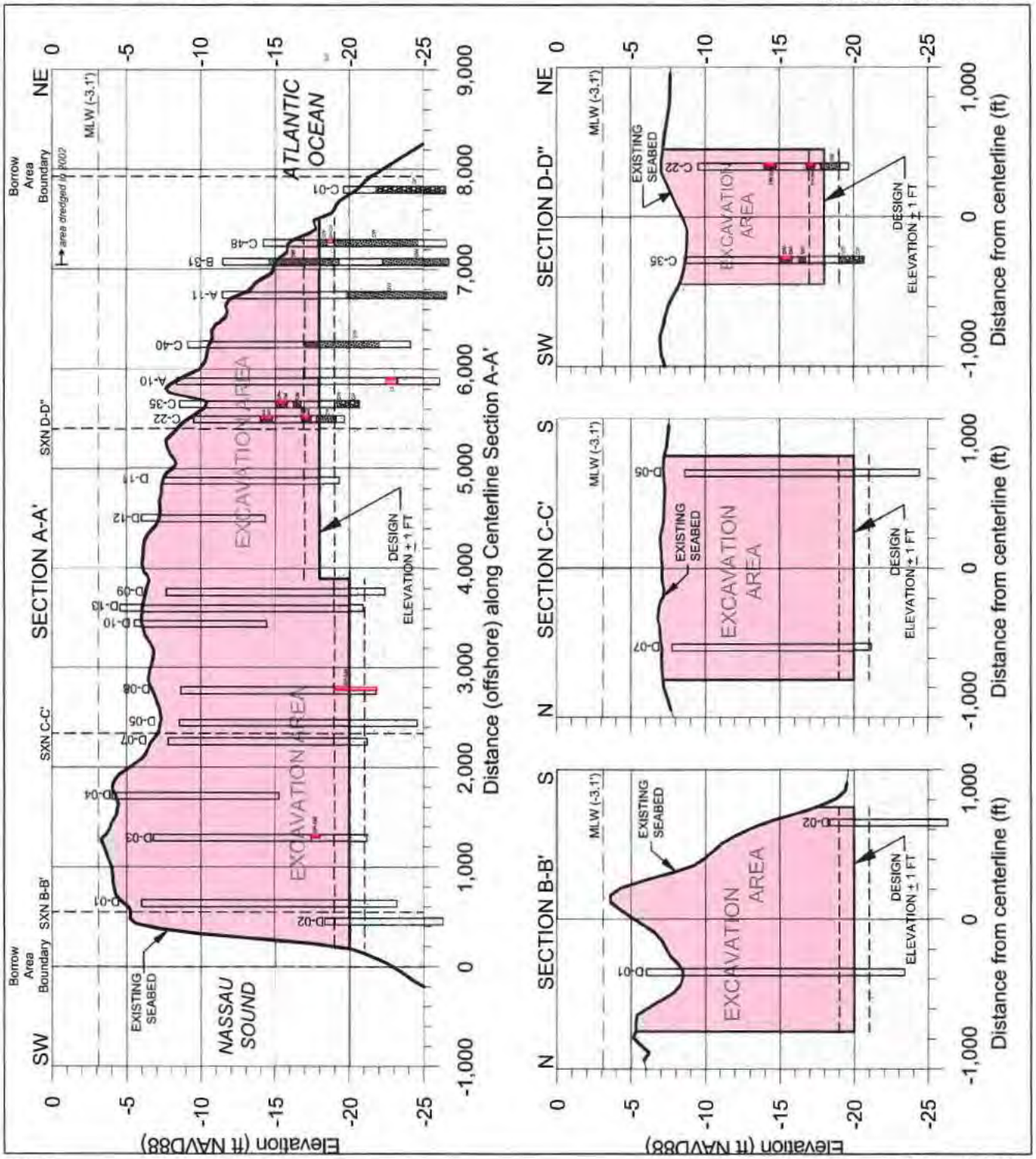

NOTES:
1) DISTORTED SCALE 1v:150h
2) Vert. - NAVD88, feet, SURVEY: JUNE 2018
3) See planview sheets for offsets from section lines
4) SP sediments unless otherwise noted

Latitude: 30 33.0' N
Longitude: 81 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

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Jacksonville, FL 32204
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PRIMARY BORROW AREA SECTIONS

ALBERT EDWARD BROWDER LICENSE No. 57403
STATE OF FLORIDA PROFESSIONAL ENGINEER
Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 14 OF 15

NASSAU COUNTY, FL

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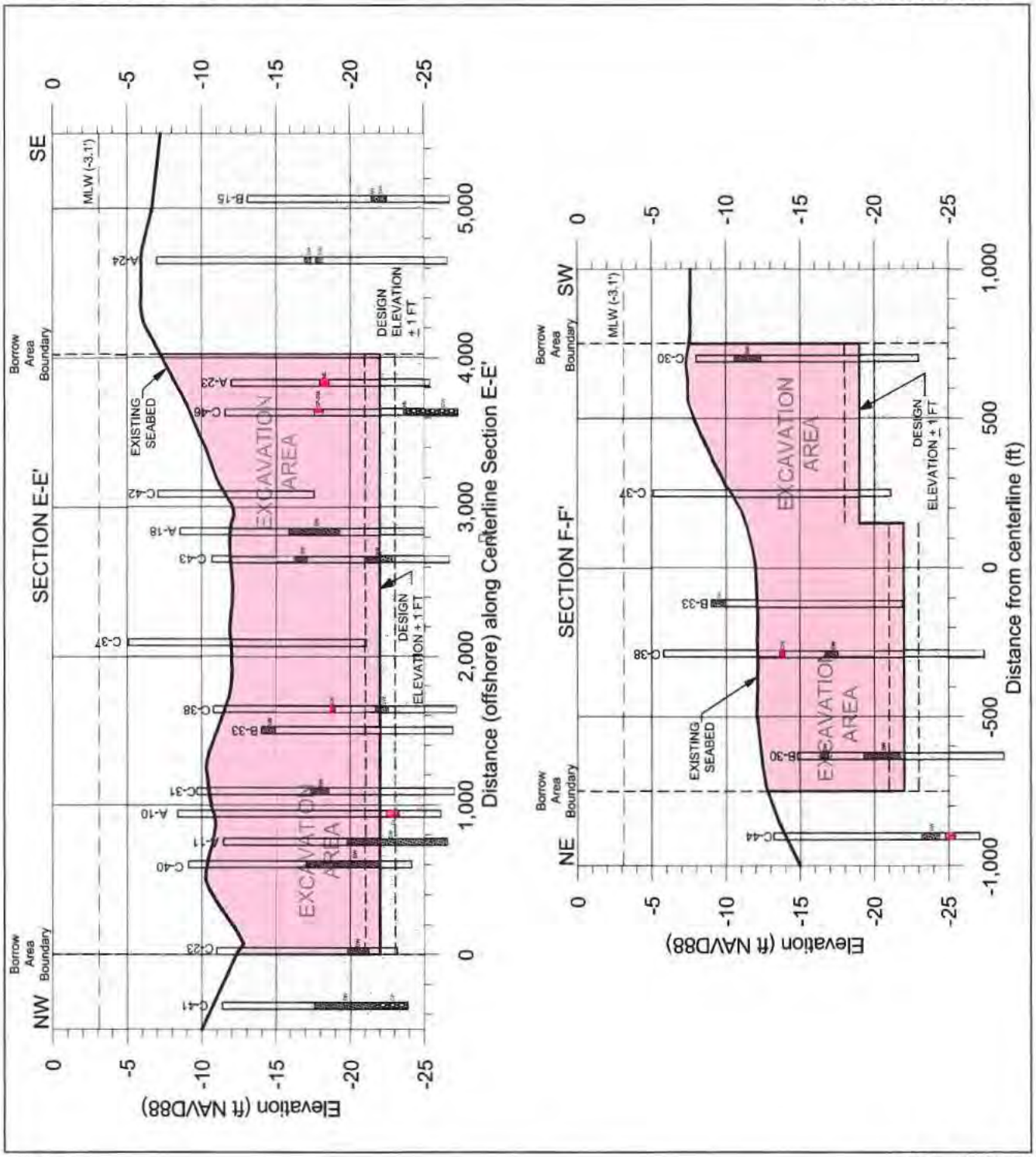

NOTES:
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

SUPPLEMENTAL BORROW AREA SECTIONS

ALBERT EDWARD BROWDER LICENSE No. 57403
Albert E. Browder, P.E. FL #57403
STATE OF FLORIDA PROFESSIONAL ENGINEER
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 15 OF 15

FLORIDA DEPARTMENT OF Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

CONSOLIDATED JOINT COASTAL PERMIT AND SOVEREIGN SUBMERGED LANDS AUTHORIZATION

PERMITTEE:
South Amelia Island Shore Stabilization Assoc.
c/o Amelia Island Management, Inc.
Attn: William R. Moore
5440 First Coast Highway
Amelia Island, FL 32034
Moor1706@bellsouth.net

Nassau County Board of County Commissioners
Attn: Taco Pope, County Manager
96135 Nassau Place
Yulee, FL 32097
countymanager@nassaucountyfl.com

Division of Recreation and Parks
Florida Department of Environmental Protection
Attn: Michael W. Foster, P.E. Chief, Bureau of Design and Construction, Florida Park Service
3900 Commonwealth Blvd., MS 500
Tallahassee, FL 32399-3000
Michael.Foster@floridadep.gov

AGENT:
Olsen Associates, Inc.
Attn: Albert E. Browder, Ph.D., P.E.
2618 Herschel St.
Jacksonville, FL 32259
abrowder@olsen-associates.com

PERMIT INFORMATION:
Permit Number: 0187721-013-JC

Project Name: South Amelia Island Beach Nourishment

County: Nassau

Issuance Date: March 22, 2021

Expiration Date: March 22, 2036

REGULATORY AUTHORIZATION:

This permit is issued under the authority of Chapter 161 which includes consideration of the provisions contained in Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the

Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

PROJECT DESCRIPTION:

The project consists of beach nourishment along approximately 3.6 miles of shoreline at the southern end of Amelia Island using beach compatible material obtained from Nassau Sound. The primary borrow area, which is the only authorized borrow area for the project, lies within the Nassau Sound ebb shoal complex. The beach fill template ties directly into the upland dune system along the landward limits of the template. This authorization is for one nourishment event only.

The landward fill areas will be variable with a maximum elevation of +10.0 feet North Atlantic Vertical Datum (NAVD). The landward portion of the beach berm will be flat with a berm elevation of +10.0 feet NAVD and a variable width ranging from 10 feet to 120 feet. The seaward portion of the berm will be 192 feet wide with a seaward slope of 1V:55H to an elevation of +6.5 NAVD. The foreshore slope of the berm will be 1V:15H until it ties into the existing grade. The construction berm template also includes a +0.5-foot elevation tolerance. Sand fencing and planting of dune vegetation is also authorized within the approved project template.

PROJECT LOCATION:

The beach placement site is located between Department Range Monuments R-59 and R-79 at the (buried) terminal rock groin on the Amelia Island State Park property near the southern tip of Amelia Island, Nassau County, Sections 1, 6, 38, 39, 18, 22, Township 1 North and 2 North, Range 29 East and 28 East. The borrow area is located within the Nassau Sound ebb shoal complex, in the Atlantic Ocean, Class III Waters. The primary borrow area is located north of the Nassau River-St. Johns River Marshes Aquatic Preserve and Outstanding Florida Waters (OFW) and borders the northern boundary of the FWC Nassau Sound Islands Critical Wildlife Area (CWA) and partially within the FWC Amelia Island CWA.

PROPRIETARY AUTHORIZATION:

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands held in trust by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Board of Trustees delegated, to the Department, the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. This proprietary authorization has been reviewed in accordance with Chapter 253, F.S., Chapter 18-21 and Section 62-330.075, F.A.C., and the policies of the Board of Trustees.

The Department has determined that the use of the borrow area, for five years or less, and the placement of sand qualify for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Chapter 253.77, F.S., to perform the activity on the specified sovereign submerged lands.

COASTAL ZONE MANAGEMENT:

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

WATER QUALITY CERTIFICATION:

This permit constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341.

OTHER PERMITS:

Authorization from the Department does not relieve you from the responsibility of obtaining other permits (Federal, State, or local) that may be required for the project. When the Department received your permit application, a copy was sent to the U.S. Army Corps of Engineers (Corps) for review. The Corps will issue their authorization directly to you, or contact you if additional information is needed. If you have not heard from the Corps within 30 days from the date that your application was received by the Department, contact the nearest Corps regulatory office for status and further information. Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.

AGENCY ACTION:

The above named Permittee is hereby authorized to construct the work that is outlined in the Project Description and Project Location of this permit and as shown on the approved permit drawings, plans and other documents attached hereto. This agency action is based on the information submitted to the Department as part of the permit application, and adherence with the final details of that proposal shall be a requirement of the permit. **This permit and authorization to use sovereign submerged lands are subject to the General Conditions, General Consent Conditions, Specific Conditions, and the attached plans, which are a binding part of this permit and authorization.** Both the Permittee and their Contractor are responsible for reading and understanding this permit (including the permit conditions and the approved permit drawings) prior to commencing the authorized activities, and for ensuring that the work is conducted in conformance with all the terms, conditions and drawings.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the project description, permit drawings, plans and specifications approved as a part of this permit, and all conditions and requirements of this permit. The Permittee shall notify the Department in writing of any anticipated deviation from the permit prior to

implementation so that the Department can determine whether a modification of the permit is required pursuant to Rule 62B-49.008, F.A.C.

2. If, for any reason, the Permittee does not comply with any condition or limitation specified in this permit, the Permittee shall immediately provide the Department and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; and, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits that may be required by federal, state, local or special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project that are not addressed in this permit.

4. Pursuant to Sections 253.77 and 373.422, F.S., prior to conducting any works or other activities on state-owned submerged lands, or other lands of the state, title to which is vested in the Board of Trustees, the Permittee must receive all necessary approvals and authorizations under Chapters 253 and 258, F.S. Written authorization that requires formal execution by the Board of Trustees shall not be considered received until it has been fully executed.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under Section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the Permittee or create in the Permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the Permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The Permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The Permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the

permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

9. At least 48 hours prior to commencement of activity authorized by this permit, the Permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the Permittee and the contractor, if one is to be used, have read the general and specific conditions of the permit and understand them.

10. If any prehistoric or historic artifacts, such as pottery or ceramics, stone tools or metal implements, shipwreck remains or anchors, dugout canoes or other physical remains that could be associated with Native American cultures, or early Colonial or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the immediate vicinity of such discoveries. The Permittee, or other designee, shall contact the Florida Department of State, Division of Historical Resources, Compliance and Review Section at (850)245-6333 or (800)847-7278, as well as the appropriate permitting agency office. Project activities shall not resume without verbal and/or written authorization from the Division of Historical Resources. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, F.S.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the Permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specifications, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on as-built drawings electronically submitted to the Department, by email at JCPCompliance@dep.state.fl.us.

GENERAL CONSENT CONDITIONS:

1. Authorizations are valid only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use shall constitute a violation. Violation of the authorization shall result in suspension or revocation of the grantee's use of the sovereignty submerged land unless cured to the satisfaction of the Board.

2. Authorizations convey no title to sovereignty submerged land or water column, nor do they constitute recognition or acknowledgment of any other person's title to such land or water.

3. Authorizations may be modified, suspended or revoked in accordance with their terms or the remedies provided in Sections 253.04 and 258.46, F.S., or Chapter 18-14, F.A.C.

4. Structures or activities shall be constructed and used to avoid or minimize adverse impacts to sovereignty submerged lands and resources.

5. Construction, use or operation of the structure or activity shall not adversely affect any species that is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004 and 68A-27.005, F.A.C.

6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity shall be modified in accordance with the court's decision.

7. Structures or activities shall not create a navigational hazard.

8. Structures shall be maintained in a functional condition and shall be repaired or removed if they become dilapidated to such an extent that they are no longer functional. This shall not be construed to prohibit the repair or replacement subject to the provisions of Rule 18-21.005, F.A.C., within one year, of a structure damaged in a discrete event such as a storm, flood, accident or fire.

9. Structures or activities shall be constructed, operated and maintained solely for water dependent purposes, or for non-water dependent activities authorized under paragraph 18-21.004(1)(f), F.A.C., or any other applicable law.

SPECIFIC CONDITIONS:

1. Unless otherwise specified in the specific conditions of this permit all submittals required herein (e.g., progress reports, water-quality reports etc.) shall be electronically submitted (via e-mail, file transfer site or hard drive). Email submittals shall be sent to the Department's JCP Compliance Officer (e-mail address: JCPCompliance@dep.state.fl.us). If a file transfer site is used, a link shall be e-mailed to the JCP Compliance Officer. If data are too large to be submitted via e-mail or file transfer site, the Permittee may submit the data via an external hard drive, provided by the Permittee. The external hard drive shall be mailed to:

   Department of Environmental Protection
   Office of Resilience and Coastal Protection

Attn: JCP Compliance Officer
2600 Blair Stone Road, Mail Station 3566
Tallahassee, FL 32399-2400

2. The Permittee shall not store or stockpile tools, equipment, materials, etc., within littoral zones or elsewhere within surface waters of the state without prior written approval from the Department. Storing, stockpiling or accessing equipment on, in, over or through areas with benthic biological resources (including beds of submerged aquatic vegetation [SAV], wetlands, oyster reefs or hardbottom) is prohibited unless it occurs within a work area or ingress/egress corridor that is specifically approved by this permit and is shown on the approved permit drawings. Anchoring or spudding of vessels and barges within areas with benthic biological resources is also prohibited.

3. The Permittee shall not conduct project operations or store project-related equipment in, on or over dunes, or otherwise impact dune vegetation, outside the approved staging, beach access and dune restoration areas designated in the permit drawings.

4. No work shall commence until the Permittee has satisfactorily submitted all information noted in this condition. At least 45 days prior to commencement of construction, the Permittee shall submit the following items for review by the Department. Unless otherwise notified by the Department within 15 days of receipt of all information specified below, the Permittee shall assume the submittals are satisfactory:

    a. An electronic copy of detailed ***final construction plans and specifications*** for all authorized activities. The plans and specifications must be consistent with the project description, conditions and approved drawings of this permit. These documents shall be certified by a professional engineer (P.E.), who is registered in the State of Florida. The Permittee shall point out any deviations from the Project Description of this permit (as stated above) or the approved permit drawings (attached to this permit), and any significant changes that would require a permit modification. The plans and specifications shall include a description of the dredging and construction methods to be utilized and drawings and surveys that show all biological resources and work spaces (e.g., anchoring areas, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project.

    b. ***Turbidity Monitoring:*** In order to assure that turbidity levels do not exceed the compliance standards established in this permit, construction at the project site shall be monitored closely by an independent third party with formal training in water quality monitoring and professional experience in turbidity monitoring for coastal construction projects. Also, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when turbidity generating activities are occurring. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit.

i. ***Qualifications***. The names, credentials (demonstrating experience and qualifications) and 24-hour contact information of those individuals performing these functions;

ii. A ***Scope of Work*** for the turbidity monitoring to ensure that the right equipment is available to conduct the monitoring correctly at any location, and under any conditions;

iii. ***Draft turbidity sampling map.*** An example of the geo-referenced map that will be provided with turbidity reports, including aerial photography and the boundaries of biological resources and/or OFW (pursuant to Specific Condition 25)

c. Documentation from the U.S. Fish and Wildlife Service (FWS) that this work will be covered under a Statewide Programmatic **Biological Opinion** or a Biological Opinions (BO) issued for construction on this project site. If the BO contains conditions that are not already contained herein, a permit modification may be required prior to construction to include those additional conditions.

d. **Fish & Wildlife Monitoring Qualifications:** To ensure that individuals conducting monitoring of fish and wildlife resources have appropriate qualifications, the Permittee shall provide documentation demonstrating expertise/experience in surveying the types of resources that are present in the project. The Department and the Florida Fish and Wildlife Conservation Commission (FWC) will review this information for confirmation that the monitors are capable of meeting the requirements in Specific Conditions 8 through 22. This documentation shall include the following:

i. *Marine Turtle Protection:* A list of the names and FWC permit numbers for the Marine Turtle Permit Holders.

ii. *Shorebird Protection:* A list of Bird Monitors with their contact information, summary of qualifications including bird identification skills, and avian survey experience, proposed locations of shorebird survey routes, and the locations of travel routes.

e. ***Pre-Construction Conference.*** **After all items required by a through d above have been submitted to the Department,** the Permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with the Permittee's contractors, the engineer of record, those responsible for turbidity monitoring, those responsible for protected species monitoring, staff representatives of the Fish and Wildlife Conservation Commission (FWC) and the JCP Compliance Officer (or designated alternate) prior to each construction event. In order to ensure that appropriate representatives are available, at least twenty-one (21)

days prior to the intended commencement date for the permitted construction, the Permittee is advised to contact the Department, and the other agency representatives listed below:

DEP, JCP Compliance Officer
e-mail: JCPCompliance@dep.state.fl.us

FWC, Imperiled Species Management Section
e-mail: marineturtle@myfwc.com

FWC Regional Biologist
See Contact list for phone numbers
(http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/contacts)

The Permittee is also advised to schedule the pre-construction conference at least a week prior to the intended commencement date. At least seven (7) days in advance of the pre-construction conference, the Permittee shall provide written notification, advising the participants of the agreed-upon date, time and location of the meeting, and also provide a meeting agenda and a teleconference number.

If the actual construction start date is different from the expected start date proposed during the preconstruction conference, at least 48 hours prior to the commencement of each dredging event, the Permittee shall ensure that notification is sent to the FWC, at marineturtle@myfwc.com, indicating the actual start date and the expected completion date. The Permittee shall also ensure that all contracted workers and observers are provided a copy of all permit conditions.

5. When discharging slurried sand onto the beach from a pipeline, the Permittee shall employ best management practices (BMPs) to reduce turbidity. At a minimum, these BMPs shall include the following:

   a. Use of shore-parallel sand dike to promote settlement of suspended sediment on the beach before return water from the dredged discharge reenters the Atlantic Ocean; and

   b. A minimum set-back of 50 feet from open water, or at the landward end of the beach berm (without disturbing the dune), whichever is less, for the pipeline discharge location.

6. **Borrow Area:** The primary borrow area is the only borrow area authorized for the project. Authorization of the secondary borrow area or subsequent use of the primary borrow area will be dependent on the effects of the excavation on the primary borrow

area, as depicted/observed/demonstrated by physical monitoring and would require a modification to this permit.

7. Sediment quality shall be assessed as outlined in the offshore or upland Sediment QA/QC Plan (as appropriate for the source), dated August 14, 2019. Placement of material that is not in compliance with the Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. The sediment testing result shall be submitted to The Department within 90 days following the completion of beach construction. The following requirements are included in the Sediment QA/QC Plan:

   a. If, during construction, the Permittee determines that the beach fill material does not comply with the sediment compliance specifications, the Permittee shall take measures to avoid further placement of noncompliant fill, and the sediment inspection results shall be reported to the Department.

   b. The Permittee shall submit post-construction sediment testing results and an analysis report as outlined in the Sediment QA/QC plan to the Department within 90 days following beach construction. The sediment testing results will be certified by a P.E. or P.G. from the testing laboratory. A summary table of the sediment samples and test results for the sediment compliance parameters as outlined in Table 1 of the Sediment QA/QC plan shall accompany the complete set of laboratory testing results. A statement of how the placed fill material compares to the sediment analysis and volume calculations from the geotechnical investigation shall be included in the sediment testing results report.

   c. A post-remediation report containing the site map, sediment analysis, and volume of noncompliant fill material removed and replaced shall be submitted to the Department within 7 days following completion of remediation activities.

FISH AND WILDLIFE CONDITIONS

8. **In-water Activity.** The Permittee shall adhere to the following requirements for all in- water activity:

   a. The Permittee shall instruct all personnel associated with the project about the presence of marine turtles and manatees, and the need to avoid collisions with (and injury to) these protected marine species. The Permittee shall be responsible for harm to these resources and shall require their contractors to advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees or marine turtles, which are protected under the Endangered Species Act, the Marine Mammal Protection Act, the Marine Turtle Protection Act and the Florida Manatee Sanctuary Act.

   b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate project area and while in water where

the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

c. Siltation or turbidity barriers (if used) shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers shall not impede manatee or marine turtle movement or travel.

d. The Permittee is responsible for all on-site project personnel and shall require them to observe water-related activities for the presence of marine turtles and manatee(s). All in-water operations shall be immediately shall be shut down if a marine turtle or manatee comes within 50 feet of the operation. For unanchored vessels, operators shall disengage the propeller and drift out of the potential impact zone. If drifting would jeopardize the safety of the vessel then idle speed may be used to leave the potential impact zone. Activities shall not resume until the animal(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the animal(s) has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving.

e. Any collision with (or injury to) a marine turtle or manatee shall be reported immediately to the FWC Hotline at 1-888-404-3922, and to FWC at ImperiledSpecies@myFWC.com. Any collision with (and/or injury to) a marine turtle shall also be reported immediately to the Sea Turtle Stranding and Salvage Network (STSSN) at SeaTurtleStranding@myfwc.com.

f. Temporary signs concerning manatees shall be prominently posted prior to and during all in-water project activities, at sufficient locations to be regularly and easily viewed by all personnel engaged in water-related activities. Two temporary signs, which have already been approved for this use by the FWC, shall be posted at each location. One sign shall read "Caution Boaters – Watch for Manatees". A second sign measuring at least 8 ½" by 11", shall explain the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations. All signs shall be removed by the Permittee upon completion of the project. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to ImperiledSpecies@myFWC.com.

9. **Hopper Dredging.** If a hopper dredge is used for this project, the following requirements shall be met:

a. Handling of captured marine turtles during hopper dredging activities shall be conducted only by persons with prior experience and training in these activities, and who are duly authorized to conduct such activities through a valid Marine Turtle Permit issued by the FWC, pursuant to Chapter 68E-1, F.A.C. The Permittee

shall forward documentation of these qualifications to FWC for review, as required in Specific Condition 4.

b. In order to minimize impingement or entrainment of marine turtles within the water column, dredging pumps shall be disengaged by the operator, or the draghead bypass valve shall be open and in use when the dragheads are not firmly on the bottom. This precaution is especially important during the cleanup phase of dredging operations.

c. A state-of-the-art rigid deflector draghead shall always be used on all hopper dredges.

d. The Sea Turtle Stranding and Salvage Network (STSSN) Coordinator shall be notified of the start-up and completion of hopper dredging operations at 1-904-573- 3930 or via e-mail at Allen.Foley@myfwc.com. If a marine turtle is captured or marine turtle parts are recovered, the STSSN shall be contacted at seaturtlestranding@myfwc.com.

10. **Trawling**. If relocation trawling or non-capture trawling for marine turtles is required as per applicable NMFS Biological Opinions and Incidental Take authorizations, the following is required:

a. Any activity involving the use of nets to harass and/or to capture and handle marine turtles in Florida waters requires a Marine Turtle Permit from FWC prior to trawling.

b. The Permittee or their contractor shall e-mail (MTP@MyFWC.com) reports to the FWC's Imperiled Species Management Section on Friday of each week that trawling is conducted in Florida waters. These weekly reports shall include the species and number of turtles captured, their general health, and release information. A summary of all trawling activity (including non-capture trawling) shall be submitted to MTP@myfwc.com by January 15 of the following year, or at the end of the project. The summary shall be recorded/documented on the FWC-provided Excel spreadsheet (available at http://myfwc.com/media/33168/Trawl-Report-Template.pdf), and shall list all turtles captured in Florida waters, the measurements of all captured turtles, the location of captures (latitude and longitude in decimal degrees), the location of tow start-stop points (latitude and longitude in decimal degrees), and times for the start- stop points of the tows (including tows when no turtles are captured).

11. **Construction Area Project Lighting.** During the marine turtle nesting season (May 1 through October 31), direct lighting of the beach and nearshore waters shall be limited to the immediate area of active construction .

Lighting on offshore and onshore equipment shall be minimized by reducing the number of fixtures, shielding, lowering the height and appropriately placing fixtures to avoid excessive illumination of the water's surface and nesting beach. The intensity of lighting shall be reduced to the minimum standard required for general construction area safety. Shields shall be affixed to the light housing on dredge and on land-based lights and shall be large enough to block lamp light from being transmitted outside the construction area or to the adjacent marine turtle nesting beach. (Figure 1 below).

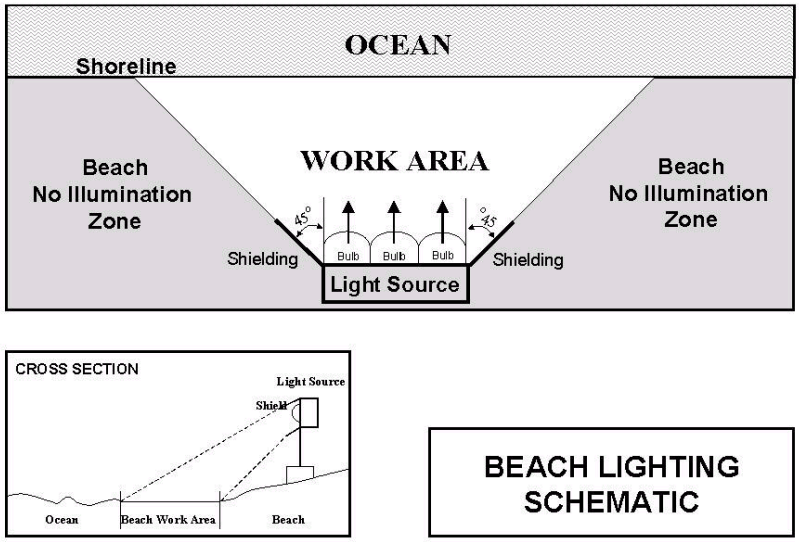


Figure 1

12. **Wildlife Conditions for All Beach Related Activities.** The Permittee shall adhere to the following requirements for all beach-related activities during marine turtle and shorebird nesting/breeding seasons March 1 through October 31.

a. **Beach Maintenance:**

i. The Permittee shall require their contractor and protected species monitors to inspect all work areas that have excavations and temporary alterations of beach topography each day, to determine which areas have deviations (such as depressions, ruts, holes and vehicle tracks) capable of trapping flightless shorebird chicks or marine turtle hatchlings. If so, the deviations shall be filled or leveled from the natural beach profile prior to 9:00 p.m. each day. The beach surface shall also be inspected subsequent to completion of the project, and all tracks, mounds, ridges or impressions, etc. left by construction equipment on the beach shall be smoothed and leveled.

ii. All debris, including derelict construction or coastal armoring material,

concrete and metal, found on the beach placement site, shall be removed from the beach to the maximum extent practicable prior to any placement of fill material. If debris removal activities will take place during protected species nesting seasons, the work shall be conducted during daylight hours only, and shall not commence until completion of daily monitoring surveys.

b. **Equipment Storage and Placement.**

i. Staging areas and temporary storage for construction equipment and pipes shall be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment that is not in use shall be located off the beach. If staging and storage areas off the beach are not possible, then additional marine turtle and shorebird protective measures shall be implemented. Such protective measures shall be determined in coordination with the Department and FWC prior to beginning of construction. All construction pipes that are in use on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune.

ii. If it is necessary to extend construction pipes past a known shorebird nesting site, then those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season. If such placement is not feasible for the project, FWC's Regional Biologist shall be contacted for alternative measures. See contacts available at http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/contacts.

c. **Beach Driving.** All vehicles operated on the beach shall operate in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at speeds less than 6 mph and run at or below the high-tide line. All personnel associated with the project shall be instructed about the potential presence of protected species, and the need to avoid injury and disturbance to these species. *Note: when flightless chicks are present within or adjacent to travel corridors, construction-related vehicles shall not be driven through the corridor unless a Bird Monitor is present pursuant to Specific Condition 22.*

13. **Marine Turtle Protection Conditions.** Construction-related activities are authorized to occur on the nesting beach (sandy beach seaward of existing coastal armoring structures or dune crest and all areas used for beach access) during marine turtle nesting season (May 1 through October 31) under the following conditions:

a. Daily early morning marine turtle nest surveys shall start two weeks prior to

marine turtle nesting season (April 15) or 65 days prior to beach placement whichever is later. Daily nesting surveys shall continue through November 30, or until two weeks after the last crawl in the project area, whichever is earlier.

b. Daily nesting surveys shall be conducted beginning ½ hour prior to sunrise, and no construction activity may commence outside of the nightly restricted zone until completion of the marine turtle survey each day.

c. The Permittee shall ensure that marine turtle nesting surveys are conducted as required in this authorization, and only conducted by personnel with a valid FWC Marine Turtle Permit, that covers all project activities as required by Chapter 68E-1, F.A.C. For information on the authorized Marine Turtle Permit Holders in the project area, contact FWC at MTP@myfwc.com.

d. Only those nests laid in the area where sand placement will occur shall be relocated, and nest relocation shall cease after the sand placement is completed. Nests requiring relocation shall be moved no later than 9 a.m., the morning following deposition (no longer than 12 hours from the time the eggs are laid), to a nearby self-release beach site in a secure setting, where artificial lighting will not interfere with hatchling orientation. The relocation site shall be determined in conjunction with and approved by FWC prior to nest relocations. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of beach settings that are not expected to experience any of the following: inundation by high tides; severe erosion; previous egg loss; or illumination by artificial lighting.

e. Nests deposited within areas where construction activities will not occur for 65 days, or nests laid in the nourished berm prior to tilling, shall be marked and left in place. The Marine Turtle Permit Holder shall install on-beach markers at the nest site to establish a minimum 5-foot radius around the approximate clutch location and shall also install a secondary marker at a point as far landward as possible to assure that the nest can be located should the on-beach marker be lost. No activity shall occur within the marked area, nor shall any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

14. **Fill Restrictions.** During the marine turtle nesting season, the contractor shall not advance the beach fill more than 500 feet along the shoreline between dusk and the following day, until the daily nesting survey is completed, and the beach has been cleared for fill advancement. If the 500-foot advancement limitation is not feasible for the project, an alternative distance shall be established during the preconstruction meeting, if a distance can be agreed upon in consultation with FWC. If the work area is extended, nighttime nesting surveys are required, and a Marine Turtle Permit Holder is required to be present on-site to ensure that no nesting and hatching marine turtles are

present. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the Marine Turtle Permit Holder responsible for nest monitoring has relocated the nest.

15. **Marine Turtle or Nest Encounters.** Upon locating a dead or injured marine turtle adult, hatchling, or egg that may have been harmed or destroyed as a result of the project, the Permittee shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922). Care shall be taken in handling injured marine turtles or exposed eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials for later analysis. If a marine turtle nest is excavated during construction activities, but not as part of the authorized nest relocation process outlined in these specific conditions, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

16. **Tilling, Compaction and Escarpment Remediation Requirements.** For the years after the first-year sand placement (out-year), compaction monitoring, tilling and escarpment monitoring are not required if placed material no longer remains on the dry beach.

    a. **Compaction Sampling.** Sand compaction shall be monitored in the area of sand placement immediately after completion of the nourishment event, and two weeks prior to the beginning of marine turtle nesting season, for three (3) subsequent years. The requirement for compaction monitoring may be eliminated if the placed sand is tilled, regardless of post-construction compaction levels. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled prior to the beginning of marine turtle nesting season. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required. Compaction monitoring shall be in accordance with the following protocol:

        i. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high-water line (normal wrack line).

        ii. At each station, the cone penetrometer shall be pushed to depths of 6, 12 and 18 inches three times (i.e., three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final

values for each depth at each station. Reports shall include all 18 values for each transect line, and the final 6 averaged compaction values.

iii. If values exceeding 500 psi are distributed throughout the project area, but in no case do those values exist at two adjacent stations at the same depth, then the Permittee shall consult with the FWC to determine if tilling is required. A request for a tilling waiver based on these compaction values shall be submitted to the FWC at marineturtle@myfwc.com.

b. **Tilling Requirements.** If tilling is performed regardless of post-construction compaction levels or tilling is required based on compaction measurements, the area shall be tilled to a depth of 24 inches. Tilling shall be in accordance with the following protocol:

i. All tilling activity shall be completed prior to the marine turtle nesting season. If the project is completed during the marine turtle nesting season, tilling shall not be performed in areas where nests have been left in place or relocated.

ii. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling. Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling.

iii. Tilling shall occur landward of the wrack line and shall avoid all naturally vegetated areas that are at least 3 square feet in size, as well as any planted areas that have been authorized by the Department. A 3-foot-wide No-Tilling buffer shall be maintained around vegetated areas. The slope between the mean high-water line and the mean low water line shall be maintained to approximate natural slopes.

c. **Escarpment Surveys.** Visual surveys for escarpments along the project area shall be made immediately after completion of sand placement, within 30 days prior to April 15 and weekly throughout the marine turtle season for three (3) subsequent years, each year placed sand remains on the dry beach. Escarpment remediation shall be as follows:

i. Prior to marine turtle nesting season, escarpments that interfere with marine turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled to the natural beach contour or the beach profile shall be reconfigured to minimize scarp formation. Any escarpment removal shall be reported relative to R- monument location to FWC at marineturtle@myfwc.com, with a copy sent to the JCP Compliance Officer.

ii. If weekly surveys during the marine turtle nesting season document escarpments that exceed 18 inches in height for a distance of at least 100 feet and have persisted for more than two weeks, the FWC shall be contacted immediately to determine the appropriate action to be taken. The Permittee shall provide locations and measurements of the escarpments to the closest R monument as well as the coordinates for the location of marine turtle nests located within 20 feet of the escarpments (latitude and longitude in decimal degrees), with photographs when possible. Upon written notification by FWC that the escarpment needs to be leveled, the Permittee shall level the escarpment. If nests are located nearby, to minimize impacts to any existing nest the Permittee shall also coordinate with the marine turtle permit holder prior to leveling the escarpments. An annual summary of escarpment surveys and actions taken shall be submitted electronically to FWC (marineturtle@myfwc.com) by December 31 of each year.

Note for Shorebird Protection: If compaction sampling, tilling or escarpment removal occurs during shorebird breeding season, the Shorebird Conditions (including surveys) included in this authorization shall be followed. No heavy equipment shall operate, and no compaction sampling or tilling shall occur within 300 feet of any shorebird nest. If flightless shorebird chicks are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that no heavy equipment operates within 300 feet of the flightless young or within a site-specific corridor established per Specific Condition 22. It is the responsibility of the Permittee to ensure that their contractors avoid tilling, scarp removal or dune vegetation planting in areas where nesting birds are present.

17. **Post-Construction Lighting Surveys.** The Permittee shall ensure that lighting surveys be conducted from the nourished berm and the following actions taken to address potential adverse impacts expected with artificial lights visible from any dry portion of the newly elevated beach. The surveys shall be conducted from the top of the foreshore slope (i.e., the seaward edge of the filled berm before it slopes into the water), facing landward. The survey shall follow standard techniques for such a survey, such as including the number and type of visible lights, location of lights, and photo documentation (see additional techniques as per the 2015 USFWS Statewide Programmatic Biological Opinion).

a. The first survey shall be conducted between May 1 and May 15 for the first nesting season following construction. For each visible light source, the Permittee shall document that the property owners have been notified and has been provided with recommendations for correcting the light as soon as possible. Recommendations shall be in accordance with local lighting ordinances. A report summarizing all visible lights and the recommendations for correcting the light shall be forwarded to local code enforcement. If no lighting ordinances exist, the recommendations to the property owners shall be consistent with FWC lighting guidelines, which

include no lights or light sources shall be visible from the newly elevated beach. The second survey shall be conducted between July 15 and August 1 to assess any remaining visible lights requiring corrective action.

b. A summary report of the surveys and what corrective actions or local enforcement actions have been taken shall be submitted to FWC at marineturtle@myfwc.com and copied to JCPCompliance@dep.state.fl.us by December 31 of the year in which surveys are conducted. Upon request by the FWC, the Permittee shall set up and hold a meeting with the those responsible for code enforcement (when applicable), FWC and the USFWS to discuss the report and potential additional corrective action needed, as well as any documented marine turtle disorientations in or adjacent to the project area.

18. **Post-Construction Monitoring and Reporting Marine Turtle Protection Conditions**

a. For each sand placement event, reports for all required marine turtle nesting surveys shall be provided for the post construction (partial or remaining) nesting season and for two full nesting seasons post construction in accordance with the Table 1 (below). If nesting and reproductive success is less than the criteria in the table below, an additional year of monitoring and reporting may be required. If criteria is not met, additional conditions prior to the next sand placement on this beach may be required by the Department and FWC.

b. Data shall be reported and summarized for the nourished areas in accordance with Table 1 (below). Reports shall summarize all crawl activity, hatching success of a representative sampling of nests left in place (if any) by species, project name and applicable project permit numbers and dates of construction. Data shall be submitted in electronic format (Excel spreadsheets) which are available upon request from marineturtle@myfwc.com. Reports shall be sent to the FWC Imperiled Species Management section at marineturtle@myfwc.com and **copied to** JCPCompliance@dep.state.fl.us. All summaries should be submitted by January 15th of the following year.

Table 1. Marine Turtle Monitoring for Beach Placement of Material

Date	Duration	Variable	Criterion
Nesting Success	Year of in-season construction and two entire nesting seasons post construction, with possible additional year[1 & 2]	Number of nests and non-nesting emergences by day by species	40 percent or greater

Hatching success	Year of in-season construction and one entire nesting season post construction, with possible additional year[1 & 2]	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in-season construction and one entire nesting season post construction, with possible additional year[1 & 2]	Number of hatchlings by species to emerge from nest onto beach	Average must not be significantly different than the average hatching success
Disorientations	Year of in-season construction and two entire nesting seasons post construction[1]	Number of nests and/or individuals that misorient or disorient	
Nests affected by erosion or inundation	Year of construction and two years post construction if placed sand remains on the beach	Number of nests lost and/or affected, by species	
Lighting Surveys	Two in-season surveys the year following construction; First survey between May 1 and May 15 and second survey between July 15 and August 1[1]	Number, location and photographs of lights visible from nourished berm, corrective actions recommended, and notifications made	Lighting survey and possible meeting resulting with plan for reduction in lights visible from nourished berm
Compaction	Three nesting seasons beginning with the year of construction. Not required if the beach is tilled prior to nesting season[1]	Shear resistance	Less than 500 psi

Escarpment Surveys	Weekly during nesting season for three years beginning with year of construction[1]	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed
[1] If placed sand remains on the beach [2] Additional years may be required if variable does not meet criterion based on previous year			

19. **Shorebird Protection.** The term "shorebird" is used here to refer to all solitary nesting shorebirds and colonial nesting seabirds that nest on Florida's beaches. These conditions are intended to avoid direct impacts associated with the construction of the project and may not address all potential take incidental to the operation and use related to this authorization. The Permittee shall adhere to the shorebird protection conditions during the shorebird breeding cycle, which includes nesting.

    a. Shorebird breeding season dates for this project area are **March 1 through September 1** (note that while most species have completed the breeding cycle by September 1, flightless young may be present through September and must be protected if present).

    b. Any parts of the project where "project activities" on the beach take place *entirely outside the breeding season*, do not require shorebird surveys. The term "project activities" includes operation of vehicles on the beach, movement or storage of equipment on the beach, sand placement or sand removal, and other similar activities that may harm or disturb shorebirds. Bird survey routes must be established and monitored throughout the entire breeding season in any parts of the project area where: 1) potential shorebird breeding habitat occurs, and 2) project activities are expected to occur at any time within the breeding season. Breeding season surveys shall begin on the first day of the breeding season or 10 days prior to project commencement (including survey activities and other pre-construction presence on the beach), whichever is later.

    c. Bird surveys shall be conducted in all potential beach-nesting bird habitats within the project boundaries that may be impacted by construction or pre-construction activities. One or more shorebird survey routes shall be established by the Permittee to cover project areas which require shorebird surveys. These routes shall be determined in coordination with the FWC Regional Biologist prior to the initiation of construction. Routes shall not be modified without prior notification to FWC.

d. During the pre-construction and construction activities associated with the project, the Permittee shall ensure that surveys for detecting breeding activity and the presence of flightless chicks shall be completed **on a daily basis** by a qualified bird monitor. This shall be completed prior to movement of equipment, operation of vehicles, or other activities that could potentially disrupt breeding behavior or cause harm to the birds or their eggs or young. If all project activities are completed and all personnel and equipment have been removed from the beach prior to the end of the breeding season, route surveys shall continue to be conducted at least weekly through the end of the breeding season. If breeding or nesting behavior is confirmed by the presence of a scrape, eggs or young, the Permittee (or their designee) shall establish a 300-foot buffer around the site and shall notify the FWC Regional Biologist within 24 hours. **Smaller, site-specific buffers may be established if approved in writing by the FWC Regional Biologist.** The posts and materials for the shorebird buffer zones shall be removed once all breeding or nesting behavior has ceased.

e. The Permittee shall require the Bird Monitor to conduct a shorebird education and identification program (and/or provide educational materials) with the on-site staff to ensure protection of precocial (mobile) chicks. All personnel are responsible for watching for shorebirds, nests, eggs and chicks. If the Bird Monitor finds that shorebirds are breeding within the project area, the Permittee shall place and maintain a bulletin board in the construction staging area with the location map of the construction site showing the bird breeding areas and a warning, clearly visible, stating that "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE and FEDERAL MIGRATORY BIRD ACTS".

20. **Shorebird Monitor Requirements.**

a. The Permittee shall ensure that nesting and breeding shorebird surveys are conducted by trained, dedicated individuals (Bird Monitors) with proven shorebird identification skills and avian survey experience.

b. Bird Monitor(s) shall be required to review and become familiar with the general information, employ the data collection protocol, and implement data entry procedures outlined on the FWC's FSD website (http://www.flshorebirddatabase.org or Florida Shorebird Database). They shall use the data-collection protocol and implement data entry procedures as outlined in that website.

c. The Permittee shall submit a list of Bird Monitors, with their contact information and a summary of qualifications, including bird identification skills and avian survey experience to the FWC Regional Biologist and JCPCompliance@dep.state.fl.us, prior to any construction or shorebird surveys. The determination that the selected

Bird Monitor(s) meet the required qualifications shall be coordinated between the Permittee and the FWC Regional Biologist. Once approved, the Permittee shall submit the names and contact information of the Bird Monitor(s) who have been approved by FWC to JCPCompliance@dep.state.fl.us, prior to any construction or shorebird surveys. The Bird Monitor(s) shall meet the following minimum qualifications:

i. Has previously participated in beach-nesting shorebird surveys in Florida (provide references or resume). Experience with previous projects must document the ability to 1) identify all species of beach-nesting birds by sight and sound, 2) identify breeding/territorial behaviors, and find nests of shorebirds that occur in the project area, and 3) identify habitats preferred by shorebirds nesting in the project area.

ii. Have a clear working knowledge of, and adhere to, the *Breeding Bird Protocol for Florida's Seabirds and Shorebirds.* https://publictemp.myfwc.com/crossdoi/shorebirds/resources.aspx

iii. Have completed full-length webinars: Route-Surveyor Training and Rooftop Monitoring Training, including the annual refresher training. Training resources can be found on the *Florida Shorebird Database* (FSD) website. https://publictemp.myfwc.com/crossdoi/shorebirds/index.aspx

iv. Familiar with FWC beach driving guidelines. (https://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

v. Experience posting beach-nesting bird sites, consistent with *Florida Shorebird Alliance (FSA) Guidelines.* http://flshorebirdalliance.org/resources/instructions-manuals.aspx

vi. Has registered as a contributor to the FSD.

21. **Shorebird Survey Protocols.** Bird survey protocols, including downloadable field data sheets, are available on the FSD website. All breeding activity shall be reported to the FSD website within one week of data collection. If the use of this website is not feasible for data collection, the FWC Regional Biologist shall be contacted for alternative methods of reporting. The Permittee shall ensure that the Bird Monitors use the following survey protocols:

a. Surveys shall be conducted by walking the length of all survey routes and visually surveying for the presence of shorebirds exhibiting breeding behavior, shorebird chicks or shorebird juveniles, as outlined in the FSD Breeding Bird Protocol for Shorebirds and Seabirds. Use of binoculars (minimum 8x40) is required and use of a spotting scope may be necessary to accurately survey the area. If an ATV or other

vehicle is needed to cover large survey routes, the Bird Monitor shall stop at intervals of no greater than 600 feet to visually inspect for breeding activity.

b. Once breeding or nesting behavior is confirmed by the presence of a scrape, eggs or young, the Permittee (or their designee) shall notify the FWC Regional Biologist within 24 hours.

22. **Shorebird Buffer Zones and Travel Corridors.** The Permittee shall require the Bird Monitor(s) and Contractor(s) to meet the following:

a. The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where the Bird Monitor has observed shorebirds engaged in breeding behavior, including territory defense. A 300-foot buffer shall be established around each nest or around the perimeter of each colonial nesting area. A 300-foot buffer shall also be placed around the perimeter of areas where shorebirds are seen digging nest scrapes or defending nest territories. All construction activities, movement of vehicles, stockpiling of equipment, and pedestrian traffic are prohibited in the buffer zone. **Smaller, site-specific buffers may be established if approved in writing by the FWC Regional Biologist.** Travel corridors shall be designated and marked outside the buffer areas for pedestrian, equipment or vehicular traffic.

b. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall immediately widen the buffer zone to a sufficient size to protect breeding birds.

c. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be allowed when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success. These site-specific buffers must be determined in coordination with the FWC Regional Biologist.

d. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones shall be marked according to FSA Posting Guidelines available at: http://flshorebirdalliance.org/resources/instructions-manuals.aspx) with posts, twine and FWC-approved signs stating “Do Not Enter, Important Nesting Area” or similar language around the perimeter (see example of signage for marking designated

buffer zones at http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/). Posts shall not exceed 3 feet in height once installed. Symbolic fencing (twine, string or rope) should be placed between all posts at least 2.5 feet above the ground and rendered clearly visible to pedestrians. If pedestrian pathway and/or equipment travel corridor modifications are approved by the FWC Regional Biologist, these shall be clearly marked. **Posting shall be maintained in good repair until no active nests, eggs, or flightless young are present.** Although solitary nesters may leave the buffer zone temporarily with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

e. The Permittee shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

f. The Permittee shall ensure that the Bird Monitor(s) designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may transit past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

g. When flightless chicks are present within or adjacent to travel corridors, construction related vehicles shall not be driven through the corridor unless a Bird Monitor is present to adequately monitor the travel corridor.. The Permittee shall require the contractor with the oversight of the Bird Monitor(s) to avoid any chicks that may be in the path of moving vehicles. The Permittee shall also require the contractor with the oversight of the Bird Monitor(s) to level any tracks, ruts, or holes that may be capable of trapping flightless chicks, while avoiding any impacts to the chicks.

h. *Notification.* Any injury or death of a shorebird (including crushing eggs or young) resulting from project activities shall be reported immediately to the FWC Regional Biologist.

MONITORING REQUIRED:

23. Water Quality - Turbidity shall be monitored as follows:

Units: Nephelometric Turbidity Units (NTUs).

Frequency: Monitoring for dredging and sand placement activities shall be conducted 3 times daily, approximately 4 hours apart during daylight hours, and at any other time that there is a likelihood of an exceedance of the turbidity standard. Sampling shall be conducted **while the highest project-related turbidity levels are crossing the edge of the mixing zone**. Since

turbidity levels can be related to pumping rates, the dredge pumping rates shall be recorded, and provided to the Department upon request. The compliance samples and the corresponding background samples shall be collected at approximately the same time, i.e., background sample shall immediately follow the compliance sample.

Location: Background: Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet). **All background sampling shall occur clearly outside the influence of any artificially generated turbidity plume** or the influence of an outgoing inlet plume.

Dredge Site: Samples shall be collected at least 300 meters up-current from the source of turbidity at the dredge site.

Beach Site: Samples shall be collected at least 300 meters up-current from any portion of the beach that has been, or is being, filled during the current construction event, at the same distances offshore as the associated compliance samples.

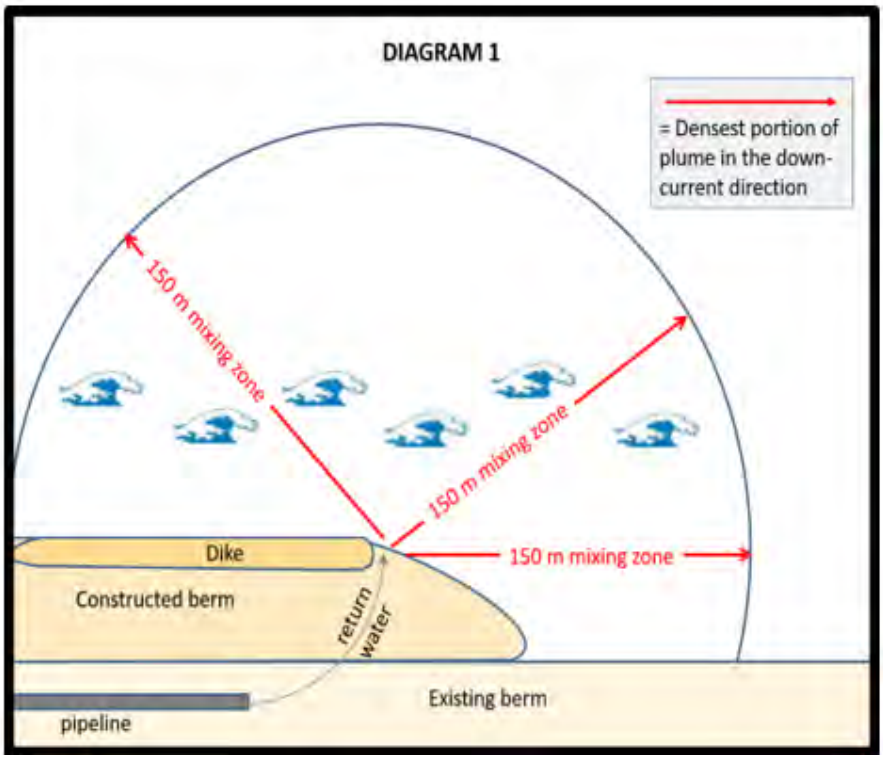
Compliance: Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet).

Dredge Sites more than 1,000 meters from the Nassau River-St. Johns River Aquatic Preserve boundary: 150 meters downcurrent from the cutterhead or the hopper dredge overflow point, **and** from any other source of turbidity generated by the dredge, in the densest portion of any visible turbidity plume. If no plume is visible, follow the likely direction of flow.

Dredge Sites within 1,000 meters of the Nassau River-St. Johns River Aquatic Preserve boundary: 1,000 meters downcurrent from the cutterhead or the hopper dredge overflow point, **and** from any other source of turbidity generated by the dredge, in the densest portion of any visible turbidity plume. If no plume is visible, follow the likely direction of flow.

Beach Site: Samples shall be collected 150 meters down-current from the point where the return water from the dredged discharge reenters the Atlantic Ocean. *Note: If the plume flows parallel to the shoreline, the densest portion of the plume may be close to shore, in shallow water. In*

that case, it may be necessary to access the sampling location from the shore, in water that is too shallow for a boat. See Diagram 1.



Intermediate Monitoring (required when using a mixing zone that exceeds 150 meters in size): Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet). At points approximately150, 500, and 750 meters downcurrent from the point where the return water from the dredged discharge reenters the Atlantic Ocean (if those points are located inside the mixing zone), within the densest portion of any visible turbidity plume generated by this project. These measurements will be used to calibrate the size of the mixing zone for future events.

Calibration: The instruments used to measure turbidity shall be fully calibrated with primary standards within one month of the commencement of the project, and at least once a month throughout the project. Calibration with secondary standards shall be verified each morning prior to use, after each time the instrument is turned on, and after field sampling using two secondary turbidity "standards" that bracket the anticipated turbidity samples. If the post-sampling calibration value deviates more than 8% from the previous calibration value, results shall be reported as estimated and a description of the problem shall be included in the field notes.

Analysis of turbidity samples shall be performed in compliance with DEP-SOP-001/01 FT 1600 Field Measurement of Turbidity: http://publicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/ft1600.pdf

If the turbidity monitoring protocol specified above prevents the collection of accurate data, the person in charge of the turbidity monitoring shall contact the JCP Compliance Officer to establish a more appropriate protocol. Once approved in writing by the Department, the new protocol shall be implemented through an administrative permit modification.

24. The **compliance** locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the **compliance** sites that are greater than **29 NTUs** above the corresponding background turbidity levels **outside of the Nassau River-St. Johns River Aquatic Preserve,** or **17 NTUs** above the corresponding background turbidity levels when the plume extends into **the Nassau River-St. Johns River Aquatic Preserve**, construction activities shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Any such occurrence shall also be immediately reported to the JCP Compliance Officer via email at JCPCompliance@dep.state.fl.us and include in the subject line, "TURBIDITY EXCEEDANCE", and the Project Name and Permit Number. Also notify the Department's Northeast District office.

Any project-associated turbidity source other than dredging or fill placement for beach nourishment (e.g., scow or pipeline leakage) shall be monitored as close to the source as possible. If the turbidity level exceeds 29 NTUs above background, or 17 NTUs within the Aquatic Preserve, the construction activities related to the exceedance shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. This turbidity monitoring shall continue every hour until background turbidity levels are restored or until otherwise directed by the Department. The Permittee shall notify the Department, by separate email to the JCP Compliance Officer, of such an event within 24 hours of the time the Permittee first becomes aware of the discharge. The subject line of the email shall state "OTHER PROJECT-ASSOCIATED DISCHARGE, TURBIDITY EXCEEDANCE".

a. When reporting a turbidity exceedance, the following information shall also be included:

   i. the Project Name;

   ii. the Permit Number;

   iii. location and level (NTUs above background) of the turbidity exceedance;

iv. the time and date that the exceedance occurred; and

v. the time and date that construction ceased.

b. Prior to re-commencing the construction, a report shall be emailed to the Department with the same information that was included in the "Exceedance Report", plus the following information:

i. turbidity monitoring data collected during the shutdown documenting the decline in turbidity levels and achievement of acceptable levels;

ii. corrective measures that were taken; and

iii. cause of the exceedance.

25. **Turbidity Reports:** All turbidity monitoring data shall be submitted within one week of analysis. The data shall be presented in tabular format, indicating the measured turbidity levels at the compliance sites for each depth, the corresponding background levels at each depth and the number of NTUs over background at each depth. Any exceedances of the turbidity standard (29 NTUs above background or 17 NTUs within the Aquatic Preserve) shall be highlighted in the table. In addition to the raw and processed data, the reports shall also contain the following information:

a. time of day samples were taken;

b. dates of sampling and analysis;

c. coordinates of sample and source. *When possible, coordinates should be provided in decimal degrees with a 5 decimal level of precision (i.e., 0.00001). Please also indicate the datum*;

d. depth of water body;

e. depth of each sample;

f. antecedent weather conditions, including wind direction and velocity;

g. tidal stage and direction of flow;

h. water temperature;

i. a geo-referenced map, overlaid on an aerial photograph, indicating the sampling locations (background and compliance), location of active construction, the visible

plume pattern and direction of flow. The map shall also include the boundaries of any benthic resources and the Aquatic Preserve, where applicable. A sample map shall be submitted to and reviewed by the Department prior to construction;

j. a statement describing the methods used in collection, handling, storage and analysis of the samples;

k. a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection, calibration of the meter, accuracy of the data and precision of the GPS measurements; and

l. When samples cannot be collected, include an explanation in the report. If unable to collect samples due to severe weather conditions, include a copy of a current report from a reliable, independent source, such as an online weather service.

Monitoring reports shall be submitted by email to the Department's JCP Compliance Officer. In the subject line of the reports, include the Project Name, Permit Number and the dates of the monitoring interval. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the Department's JCP Compliance Officer, on the cover page to the submittal and at the top of each page, please state: **"This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0187721-013-JC, for the South Amelia Island Beach Nourishment"**

26. Monitoring and reporting of the permitted project shall be conducted in accordance with the Physical Monitoring Plan dated October 26, 2020. The approved Physical Monitoring Plan can be revised at any later time by written request of the Permittee and with the written approval of the department. If subsequent to approval of the plan there is a request for modification of the permit, the department may require revised or additional monitoring requirements as a condition of approval of the permit modification.

27. **Post-Construction Meeting.** Within 60 days following each construction activity authorized by this permit, the Permittee shall hold a post-construction conference. Attendees shall include at minimum, the Permittee, Agent, Department representative, and FWC representative.

EXECUTION AND CLERKING:
Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

_____
Gregory W. Garis.
Program Administrator
Beaches, Inlets and Ports Program
Office of Resilience and Coastal Protection

Attachment(s):

1. Approved Permit Drawings (15 pages, signed and sealed October 26, 2020)
2. Physical Monitoring Plan (dated October 26, 2020)
3. Sediment QA/QC Plan (dated August 24, 2019)

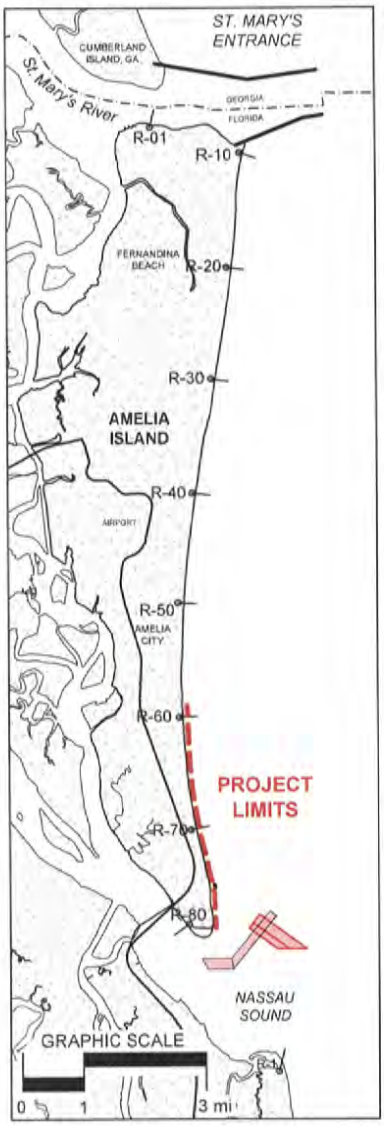
CERTIFICATE OF SERVICE
The undersigned duly designated deputy clerk hereby certifies that this permit and all attachments were sent on the filing date below.

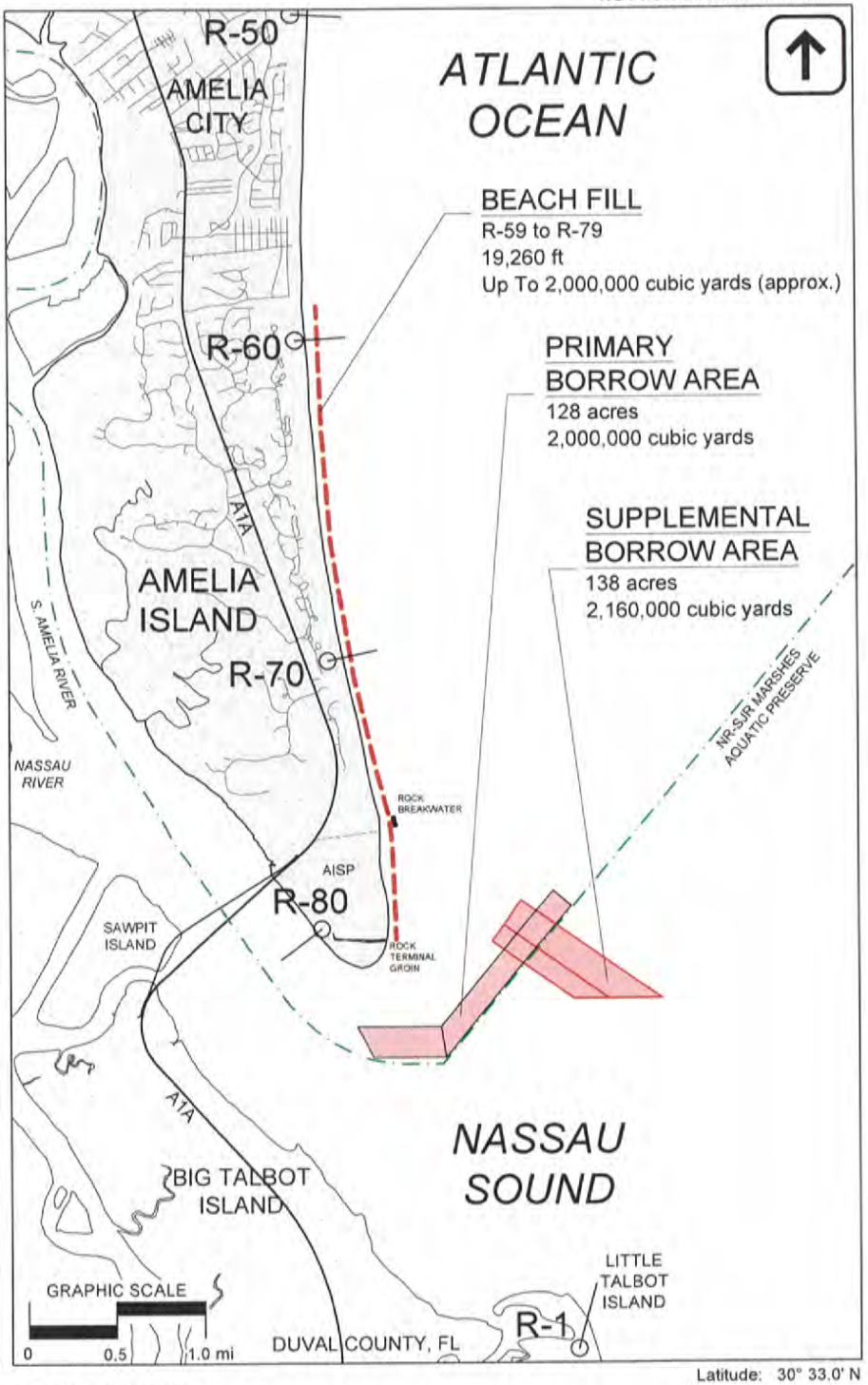
FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to Section 120.52, F. S., with the designated Department Clerk, receipt of which is hereby acknowledged.

Jacob Koerner _____ 3/22/2021 _____
Clerk **Date**

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION





NOTES:
1. EXCAVATION VOLUMES BASED ON JUNE 2018 CONDITIONS

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION
08/20/19	AEB	RAI revs.			
07/01/20	AEB	RAI2 revs.			

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COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PROJECT SITE LOCATION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

This item has been digitally signed and sealed by Albert Edward Browder, P.E. on 26 October 2020 using a digital signature. Printed copies of this document are not considered signed and sealed and the SHA authentication code must be verified on any electronic copies.

DATE: 12/14/2018
DRAWN BY: ML
SHEET 1 OF 15

NASSAU COUNTY, FL

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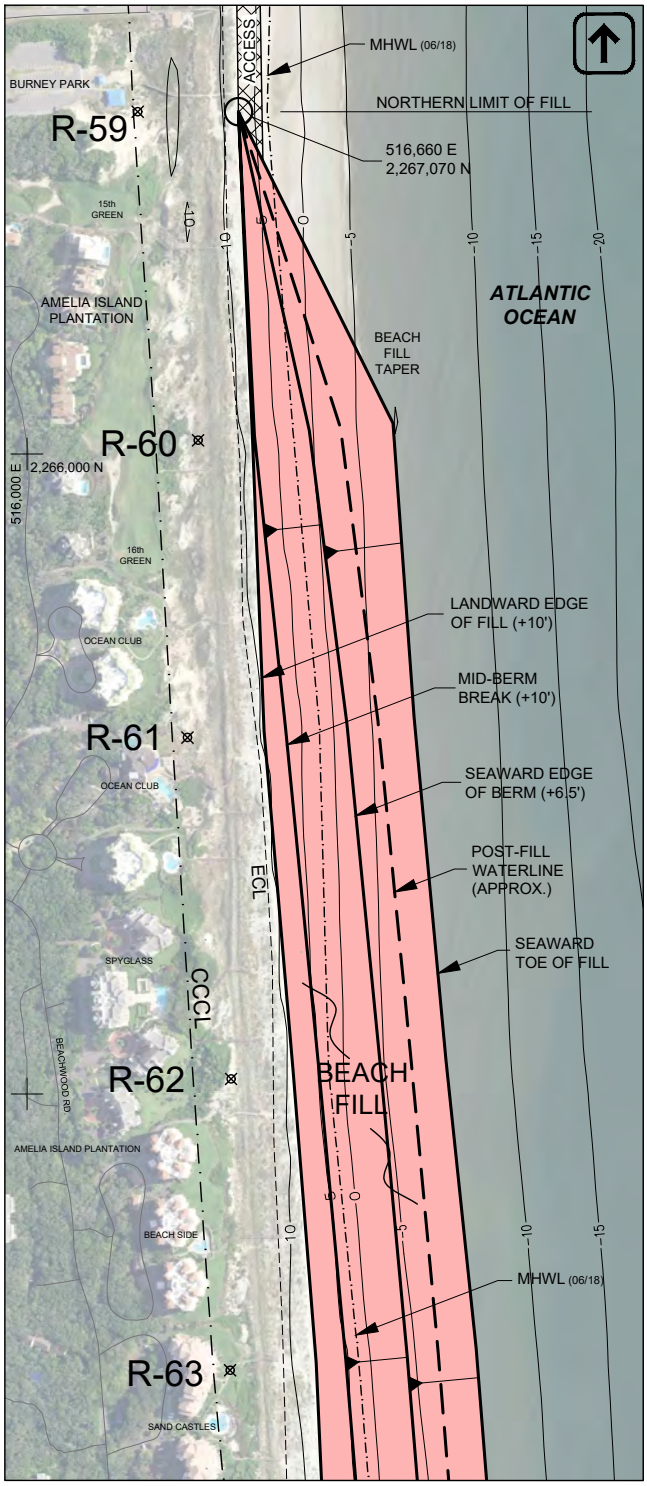

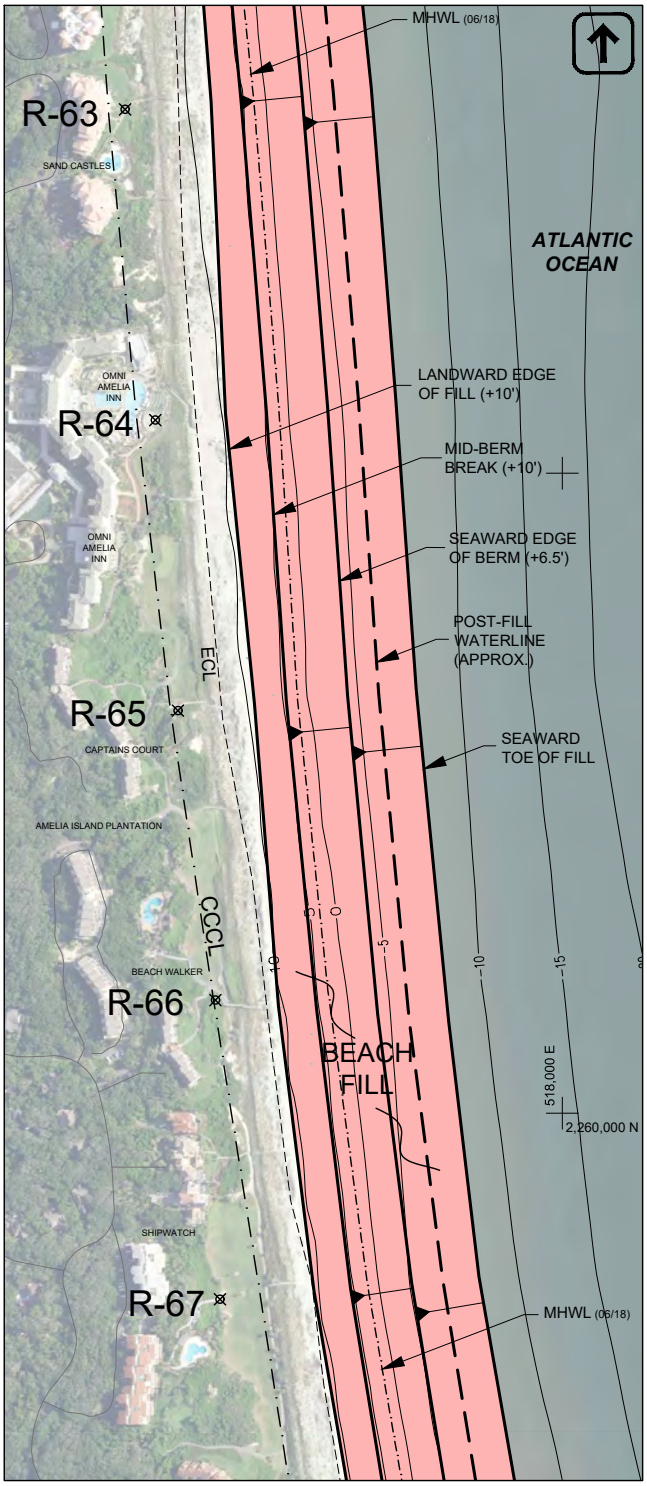

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 2 OF 15

NASSAU COUNTY, FL

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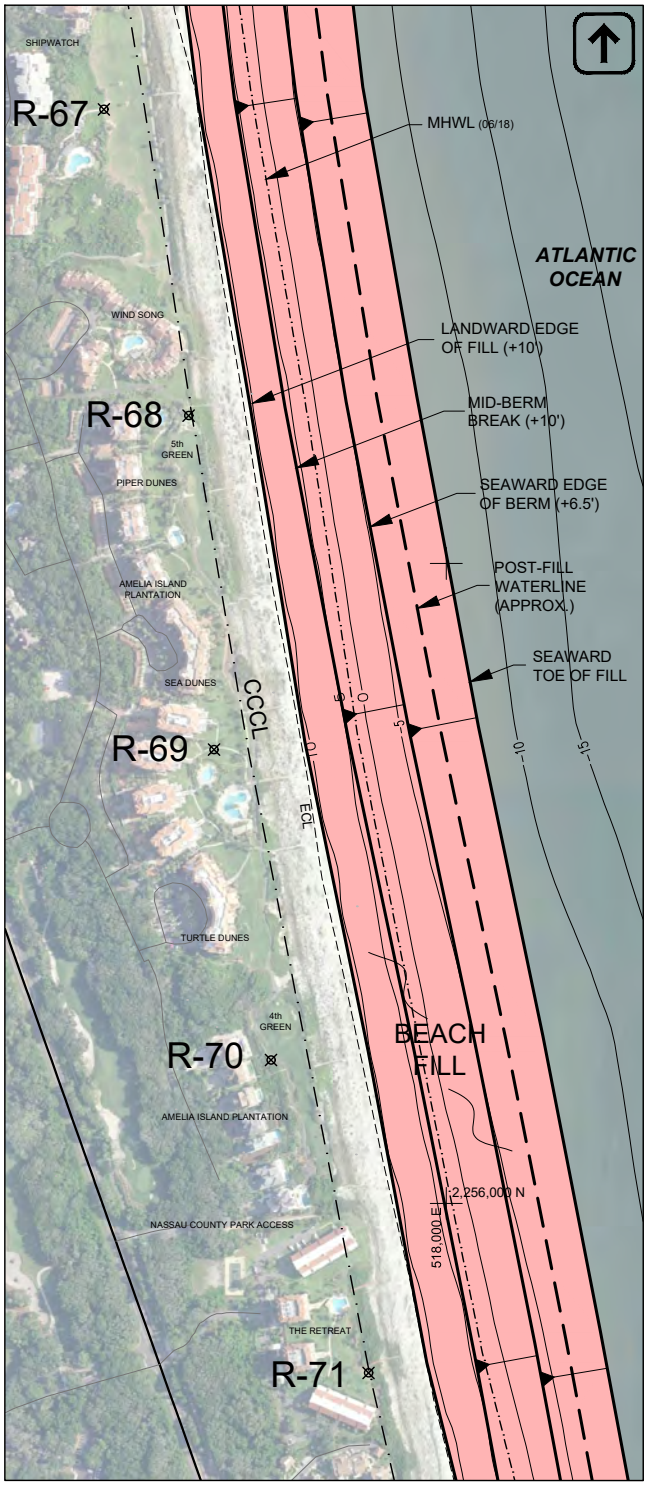

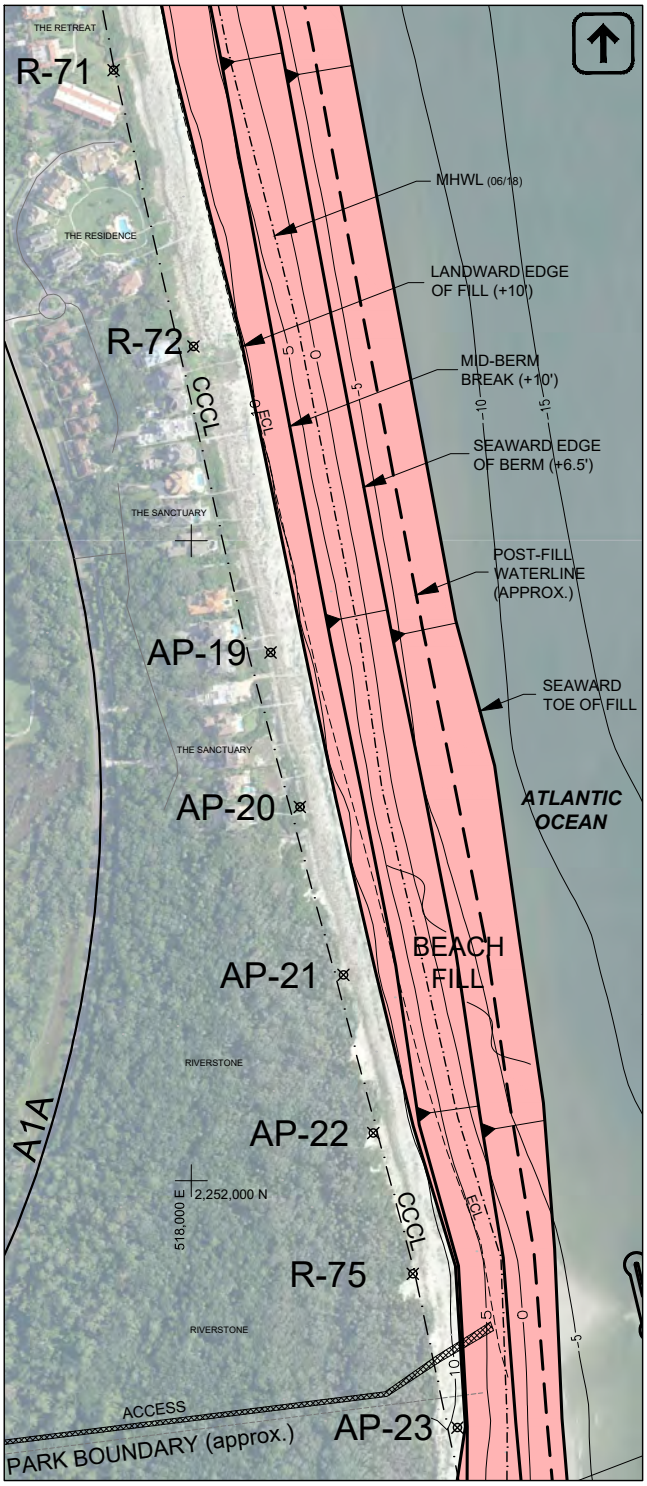

NOTES:
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2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 3 OF 15

NASSAU COUNTY, FL

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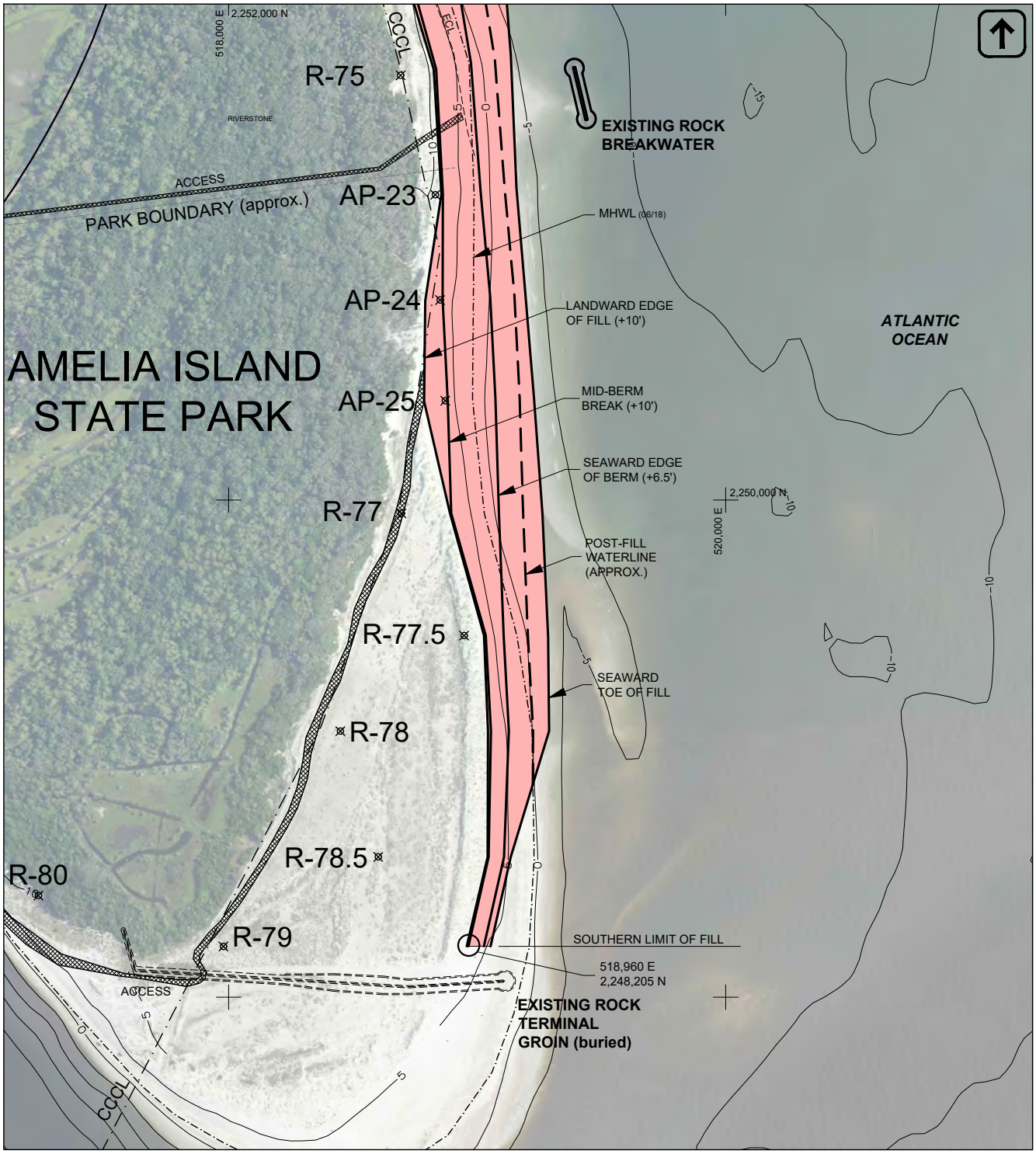

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

Latitude: 30° 33.0' N
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Sect: 1, 6, 38, 39
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 4 OF 15

NASSAU COUNTY, FL

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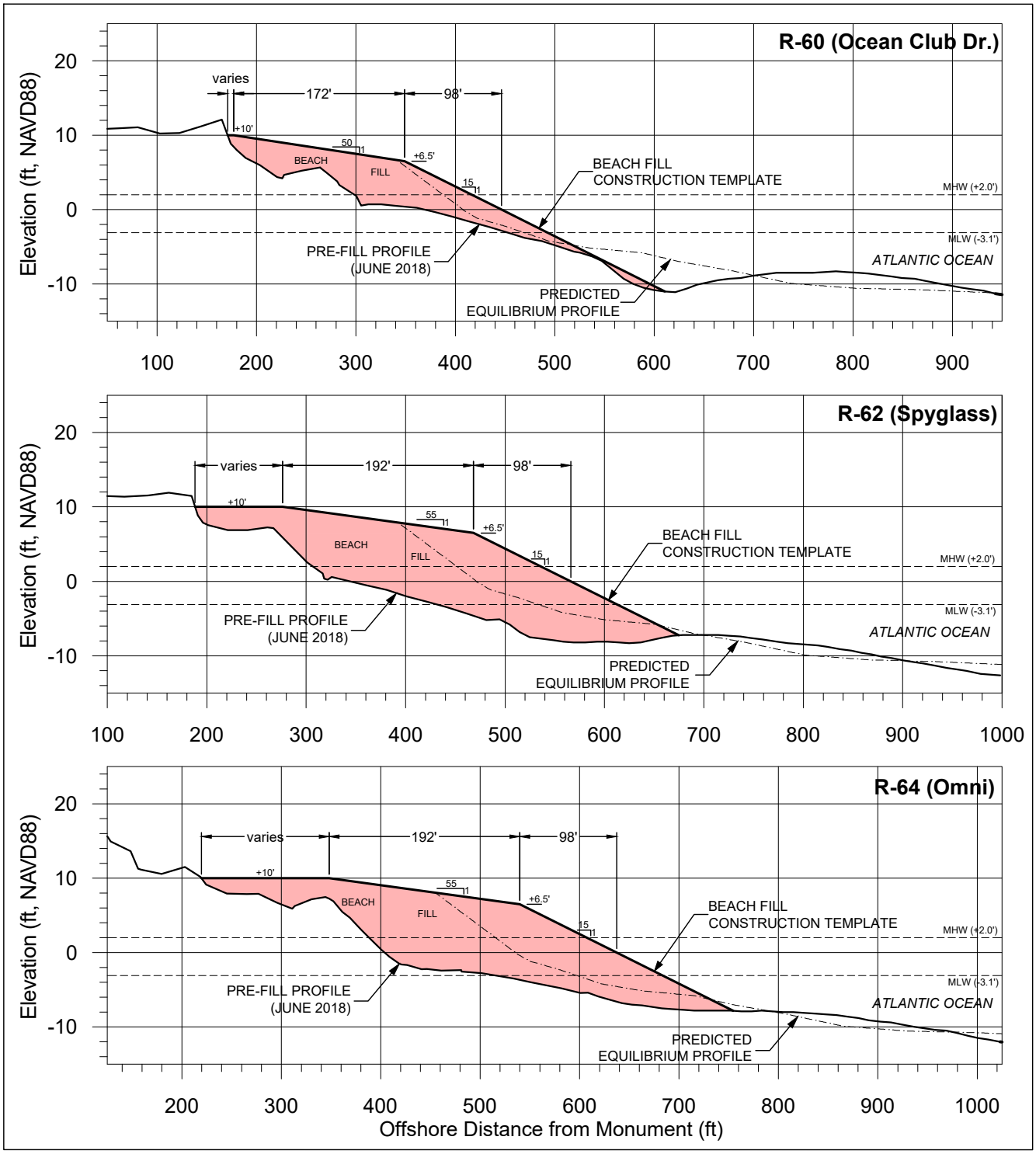

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
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Township: 2 N
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 5 OF 15

NASSAU COUNTY, FL

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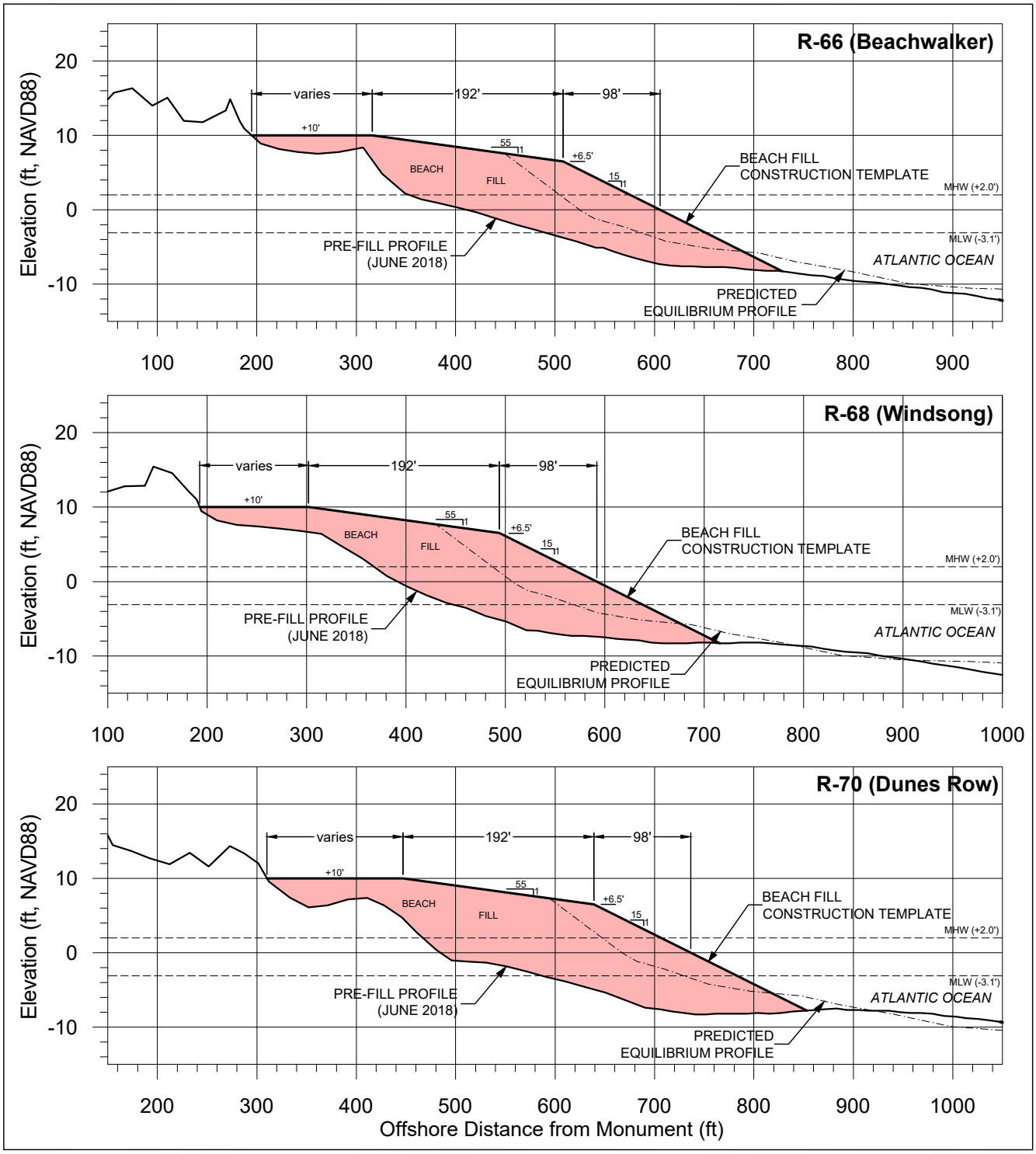

NOTES:
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 6 OF 15

NASSAU COUNTY, FL

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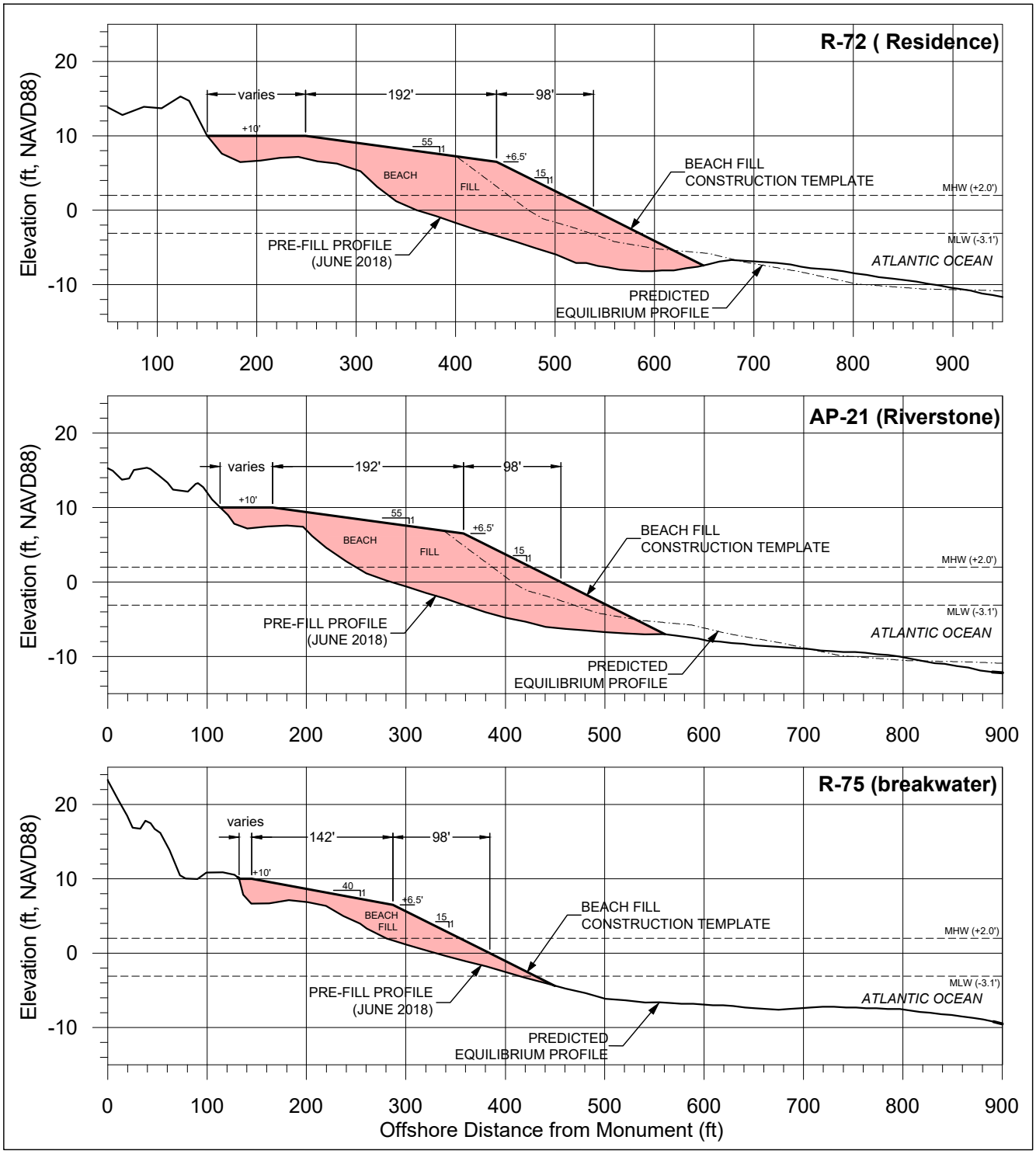

NOTES:

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 7 OF 15

NASSAU COUNTY, FL

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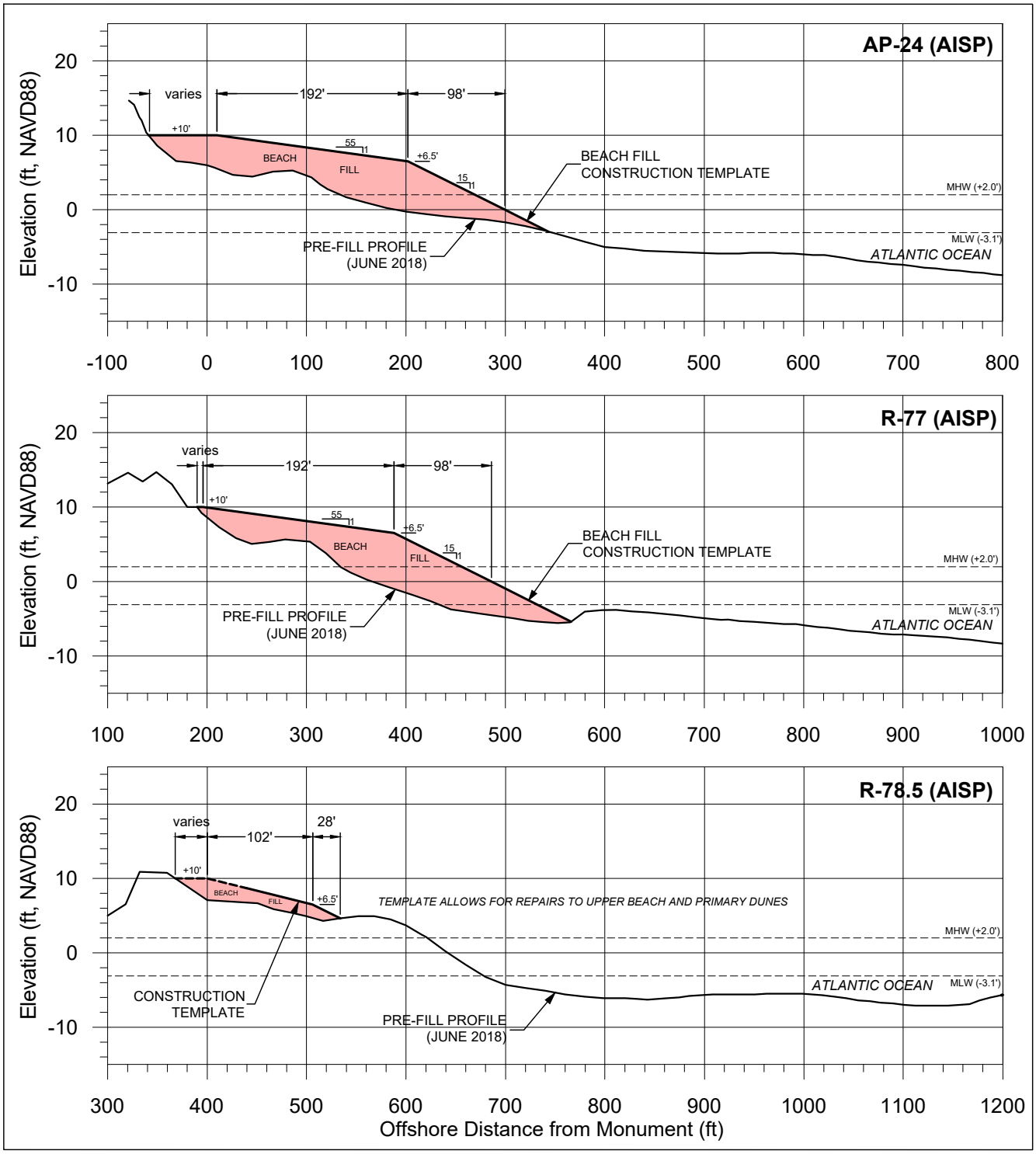

NOTES:

1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

Latitude: 30° 33.0' N
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 8 OF 15

NASSAU COUNTY, FL

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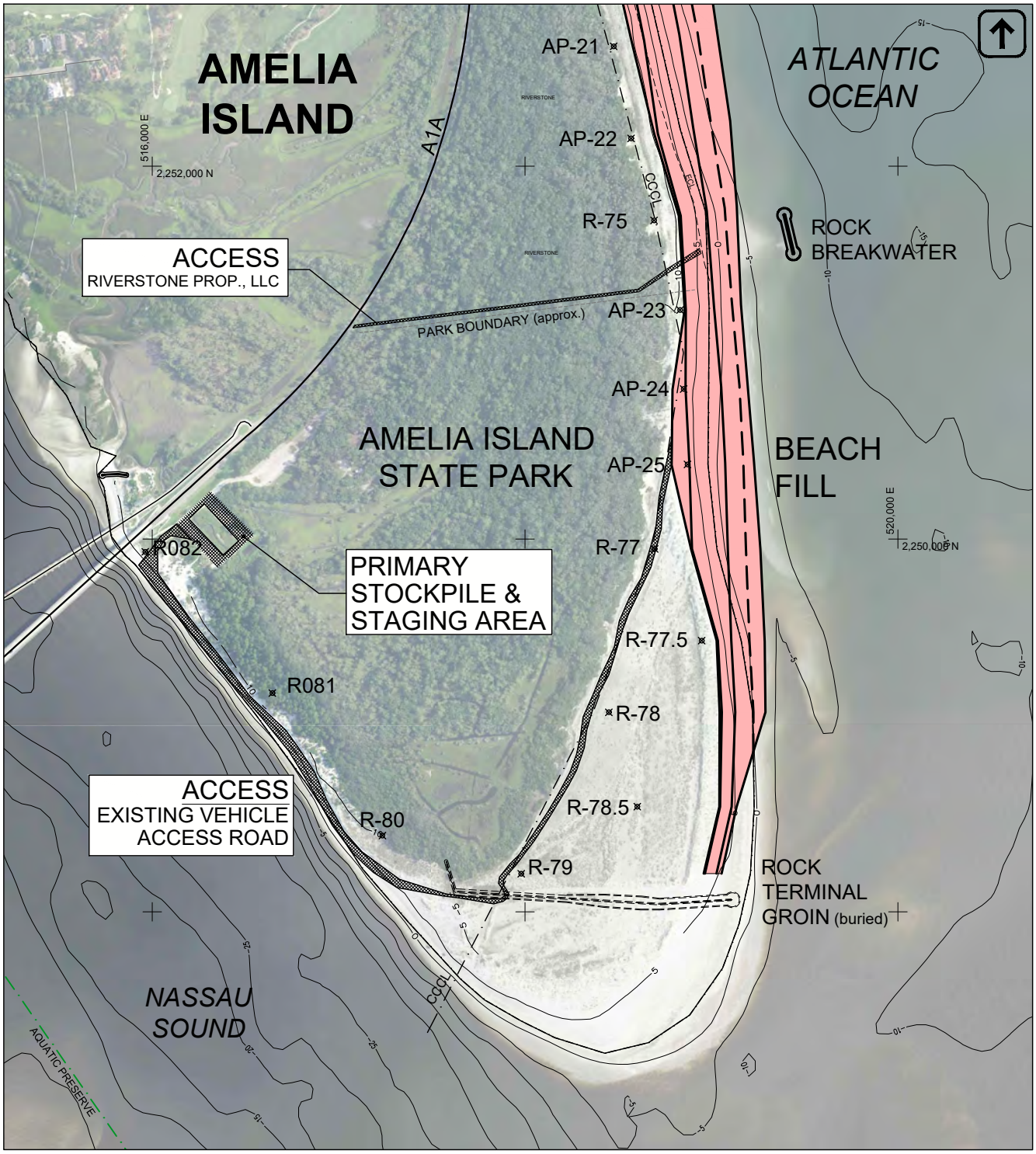

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 400 800 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE:	APPR	REVISION	DATE:	APPR	REVISION
08/20/19	AEB	RAI revs.			
07/01/20	AEB	RAI2 revs.			

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SOUTH ACCESS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 9 OF 15

NASSAU COUNTY, FL

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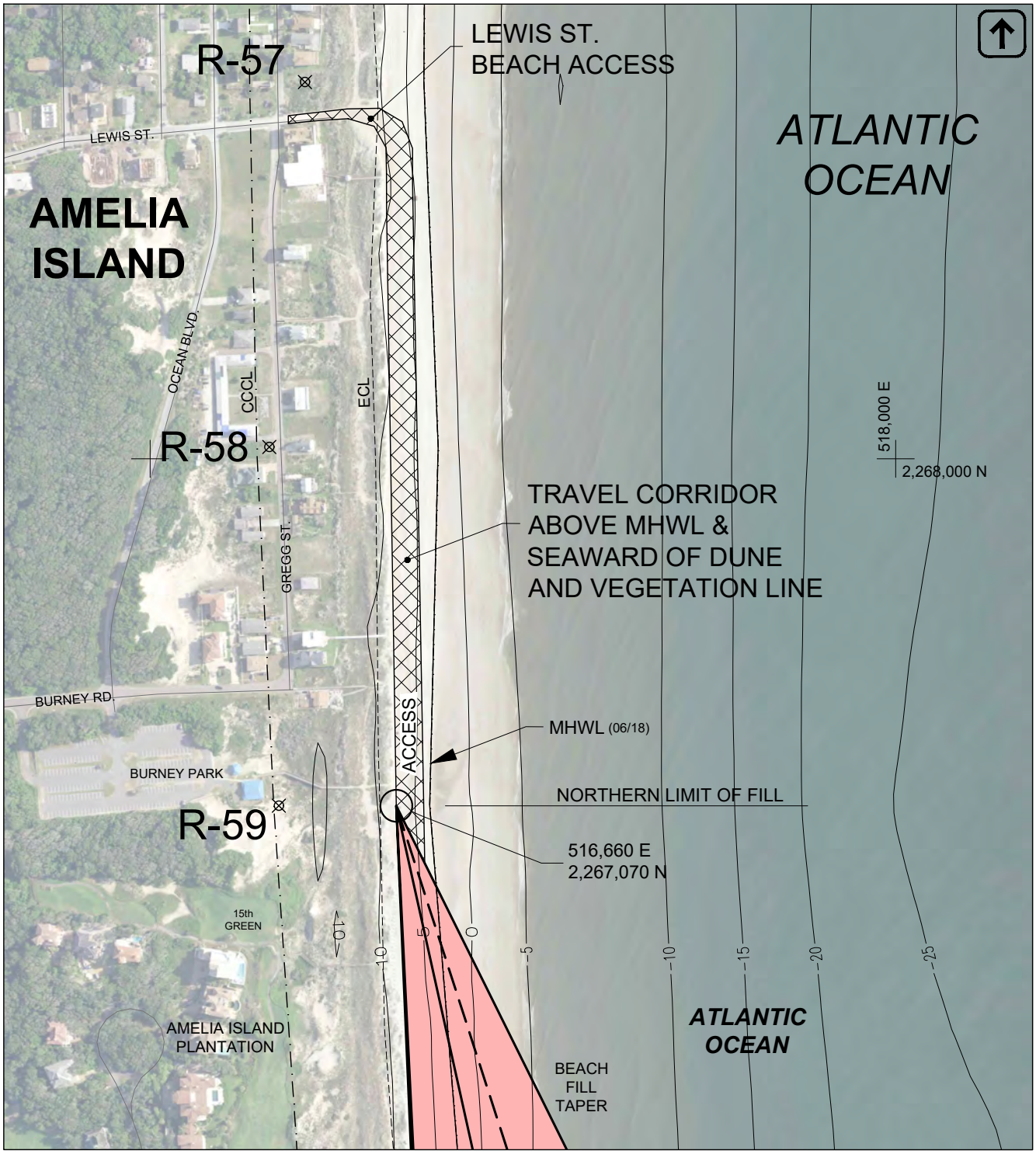

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 200 400 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
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DATE:	APPR	REVISION	DATE:	APPR	REVISION
08/20/19	AEB	RAI revs.			
07/01/20	AEB	RAI2 revs.			

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COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL
NORTH ACCESS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 10 OF 15

NASSAU COUNTY, FL

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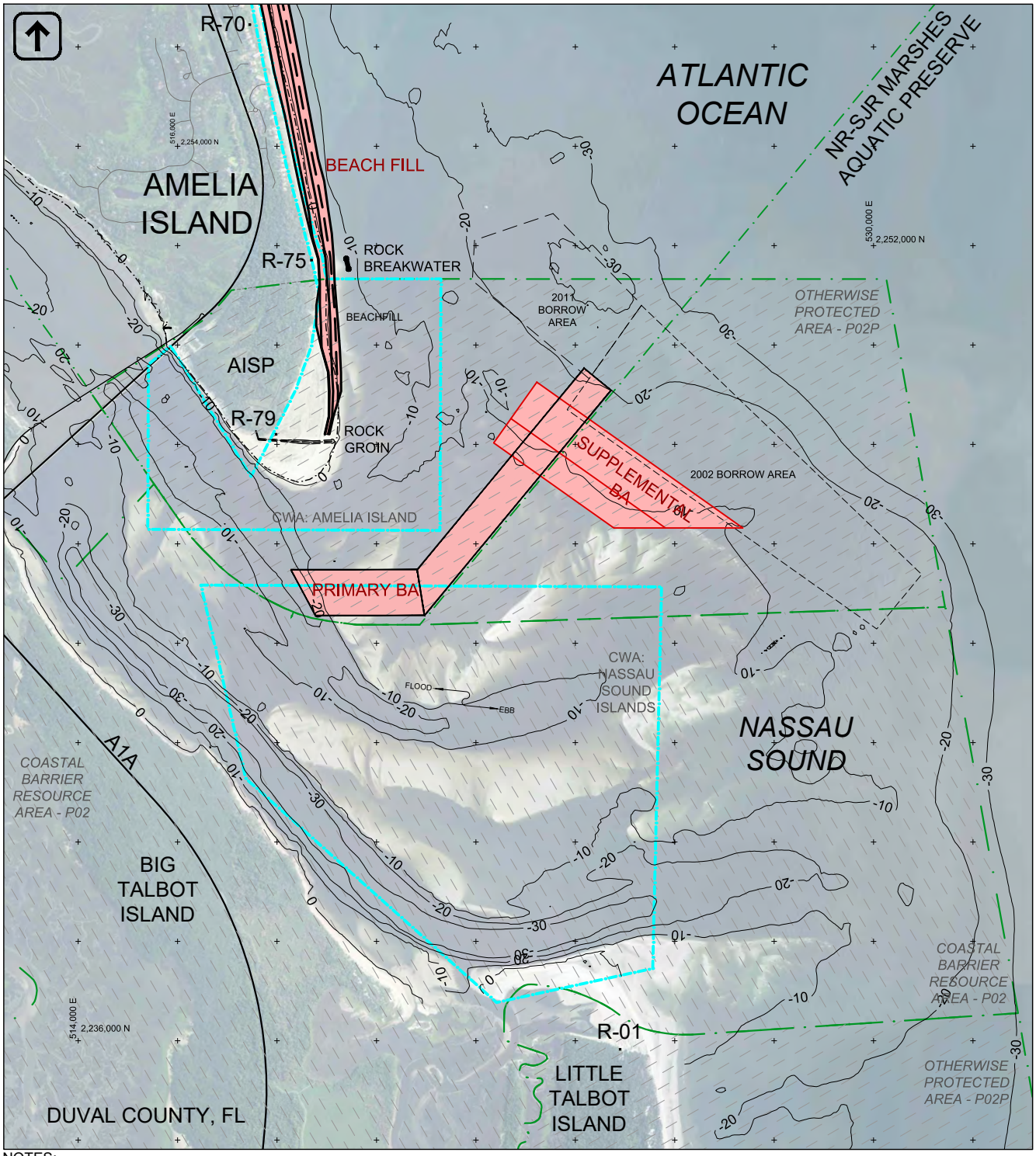

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 1,000 3,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
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DATE:	APPR	REVISION	DATE:	APPR	REVISION
08/20/19	AEB	RAI revs.			
07/01/20	AEB	RAI2 revs.			

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BORROW AREAS GENERAL LOCATION

DATE: 12/14/2018
DRAWN BY: ML
SHEET 11 OF 15

NASSAU COUNTY, FL

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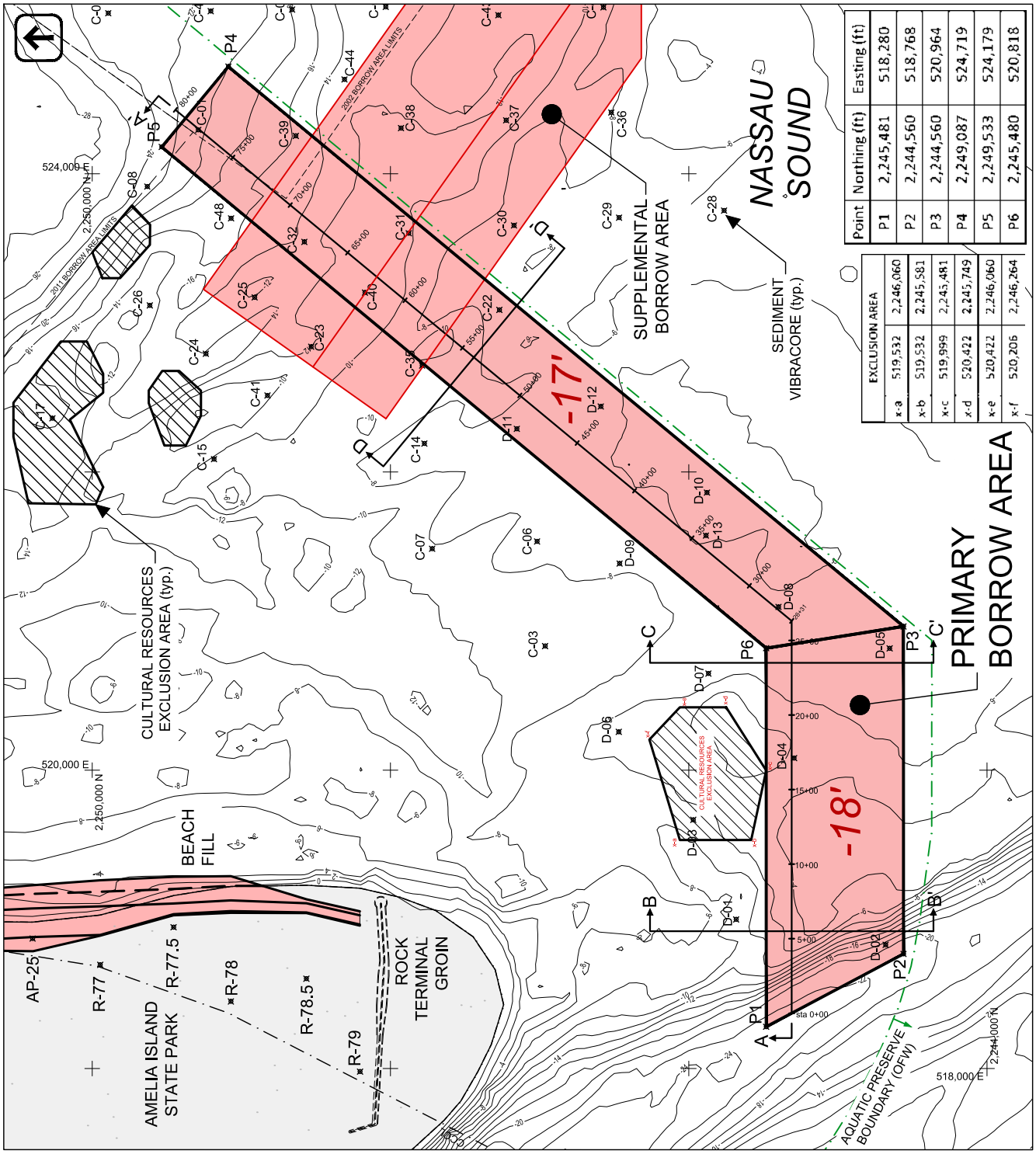

Point	Northing (ft)	Easting (ft)
P1	2,245,481	518,280
P2	2,244,560	518,768
P3	2,244,560	520,964
P4	2,249,087	524,719
P5	2,249,533	524,179
P6	2,245,480	520,818

EXCLUSION AREA		
x-a	519,532	2,246,060
x-b	519,532	2,245,581
x-c	519,999	2,245,481
x-d	520,422	2,245,749
x-e	520,422	2,246,060
x-f	520,206	2,246,264

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) VIBRACORE DATES VARY (2007, 2017, 2018)

GRAPHIC SCALE
0 500 1,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
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DATE:	APPR	REVISION	DATE:	APPR	REVISION
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PRIMARY BORROW AREA PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 12 OF 15

NASSAU COUNTY, FL

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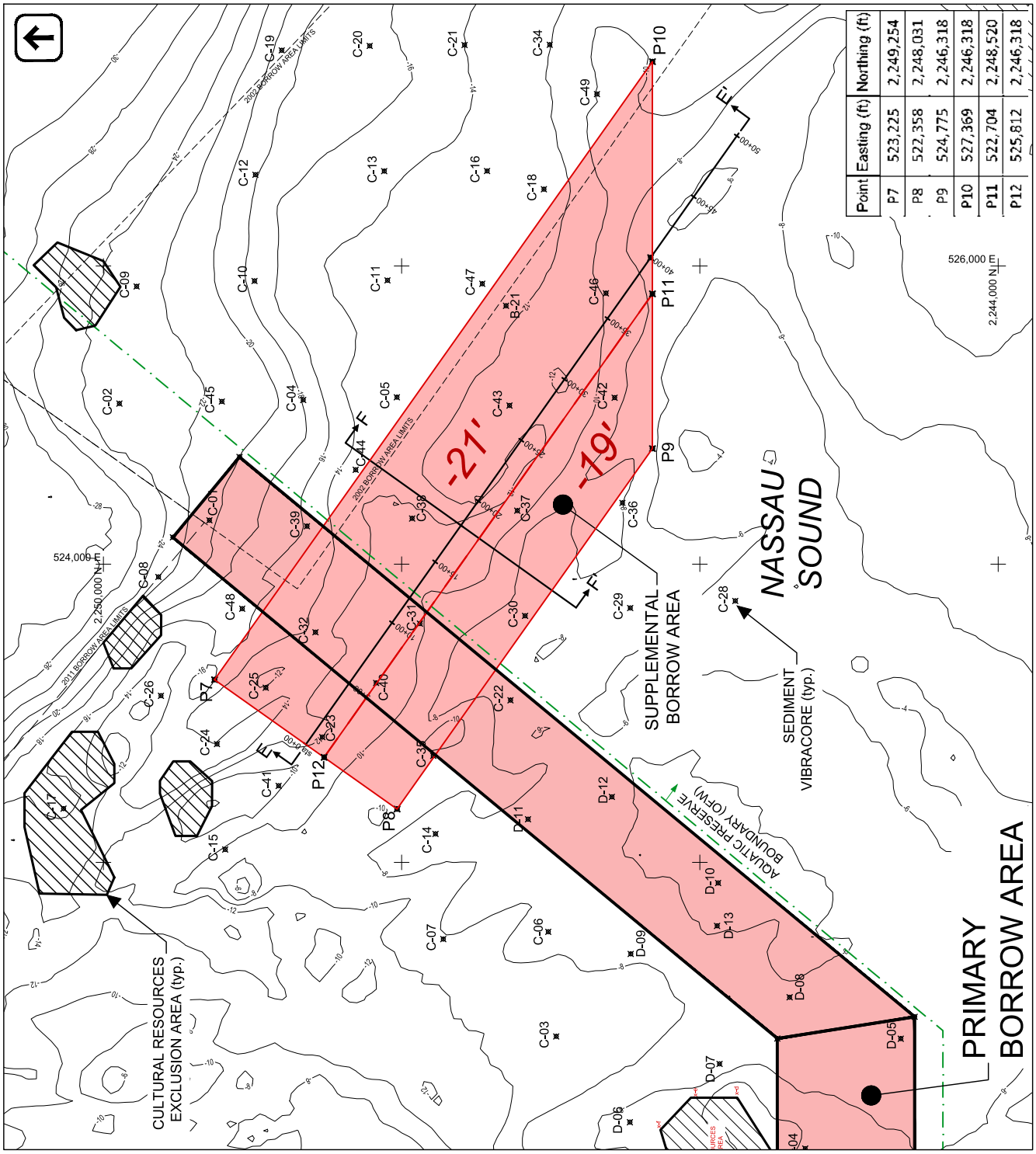

Point	Easting (ft)	Northing (ft)
P7	523,225	2,249,254
P8	522,358	2,248,031
P9	524,775	2,246,318
P10	527,369	2,246,318
P11	522,704	2,248,520
P12	525,812	2,246,318

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) VIBRACORE DATES VARY (2007, 2017, 2018)

GRAPHIC SCALE
0 500 1,000 FT

Latitude: 30° 33.0' N
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Sect: 18, 22
Township: 2 N
Range: 28 E

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

SUPPLEMENTAL BORROW AREA PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 13 OF 15

NASSAU COUNTY, FL

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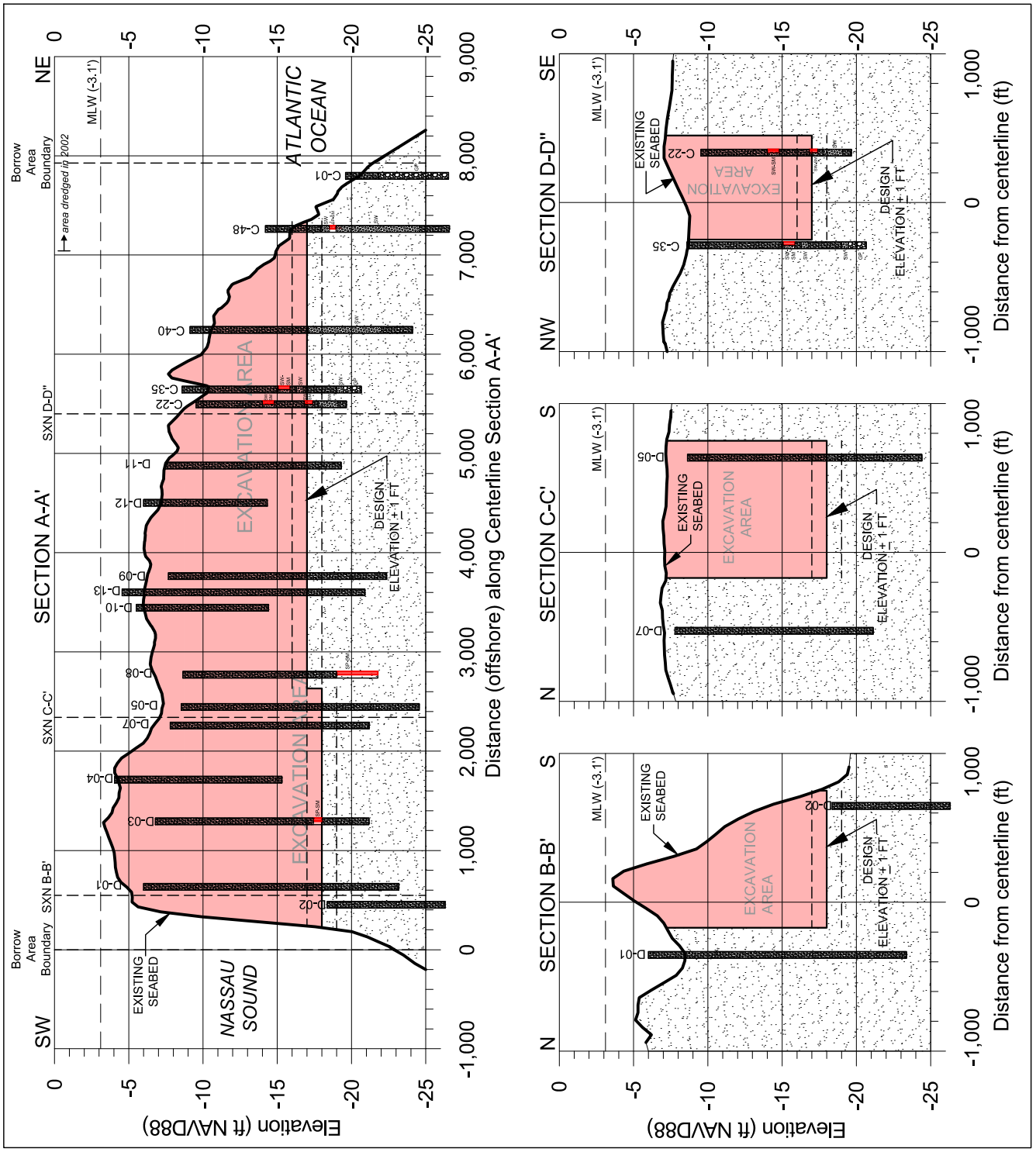

NOTES:

1) EXAGGERATED SCALES
2) Vert. - NAVD88, feet, SURVEY: JUNE 2018
3) See planview sheets for offsets from section lines
4) SP sediments unless otherwise noted

Latitude: 30° 33.0' N
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PRIMARY BORROW AREA SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 14 OF 15

NASSAU COUNTY, FL

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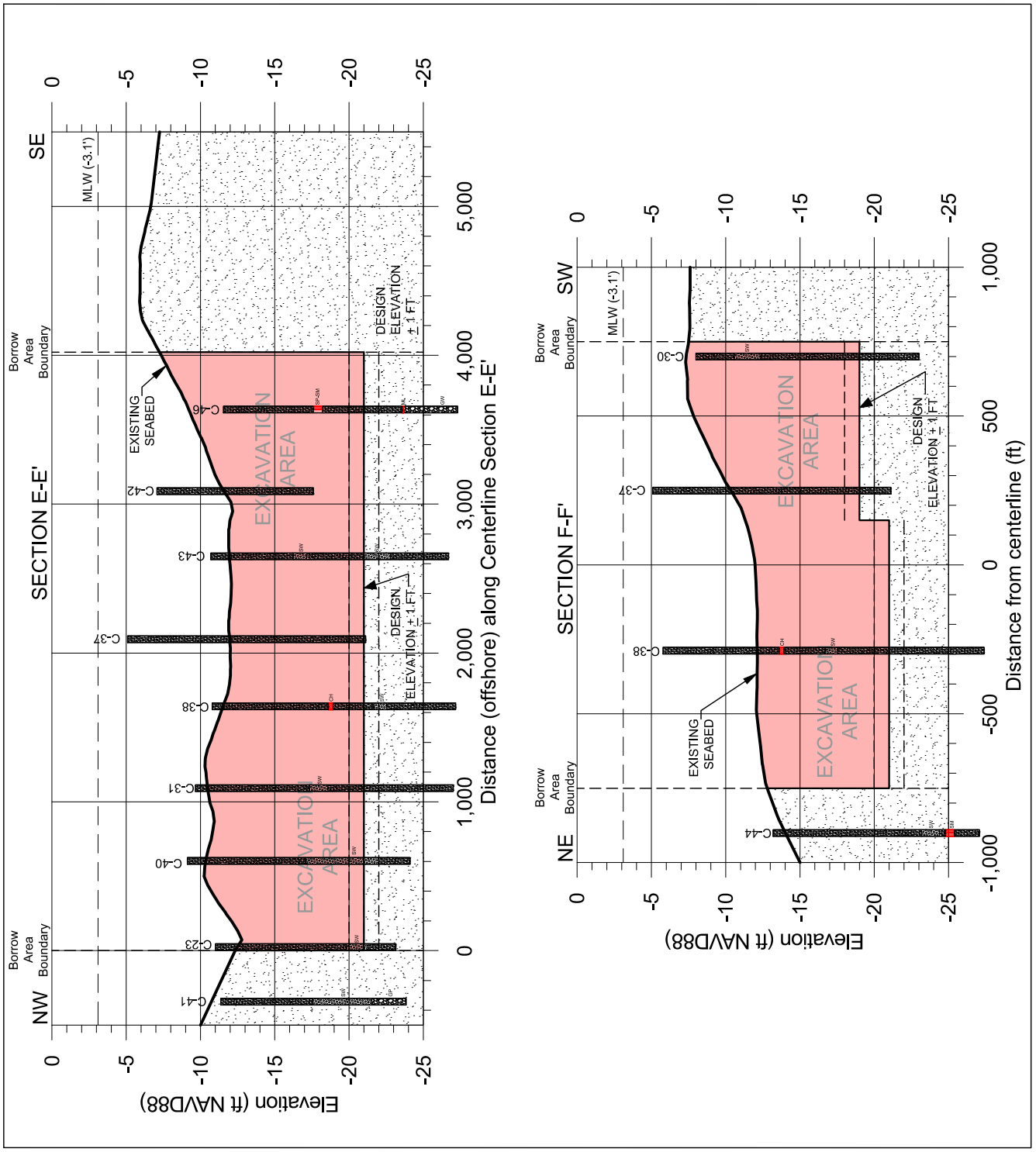

NOTES:
1) EXAGGERATED SCALES
2) Vert. - NAVD88, feet, SURVEY: JUNE 2018
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

SUPPLEMENTAL BORROW AREA SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 15 OF 15

South Amelia Island Shore Stabilization Project
Periodic Beach Renourishment

Physical Monitoring Plan

Prepared for:

Nassau County Board of County Commissioners
&
South Amelia Shore Stabilization Association (SAISSA)
&
Florida DEP Division of Recreation and Parks (FL Park Service)

Prepared By:

Olsen Associates, Inc.
2618 Herschel St.
Jacksonville, FL 32210
904-387-6114

1.0 INTRODUCTION

This plan describes the permit-mandated post-construction physical monitoring program for the periodic maintenance renourishment of the engineered South Amelia Island Shore Stabilization Project, located along the southern 3.6 miles (5.8 km) of the Atlantic Ocean shoreline of Amelia Island, Nassau County, FL. The project fill limits extend from FDEP R-monument R-59 at Burney Park southward to R-79 at the (buried) rock terminal groin on the Amelia Island State Park (AISP) property near the southern tip of the island at Nassau Sound. The project beach fill template typically requires up to 2.0 million cubic yards of sand (1.53 million cubic meters) every 9-10 years, based upon historical data. The first nourishment under this plan is proposed to occur in 2021 (at earliest). The project was last nourished in 2011. Portions of the AISP property were nourished in 2013 and 2019 with channel maintenance sand from the Atlantic Intracoastal Waterway (AIWW). The project beach fill template includes a dune feature along the landward limits of the template, to be maintained by sand placement, sand fence installation and maintenance where needed, and dune vegetation installation and maintenance, where needed. The project likewise includes an existing 275-ft (84m) detached rock breakwater near R-75, and a 1,600-ft (488m) permeable rock terminal groin at R-79 (currently buried) on AISP property. A third small rock groin lies just west of R-82 and west of the A1A and Crady bridges. These structures were constructed in 2004-2005. See **Figure 1**.

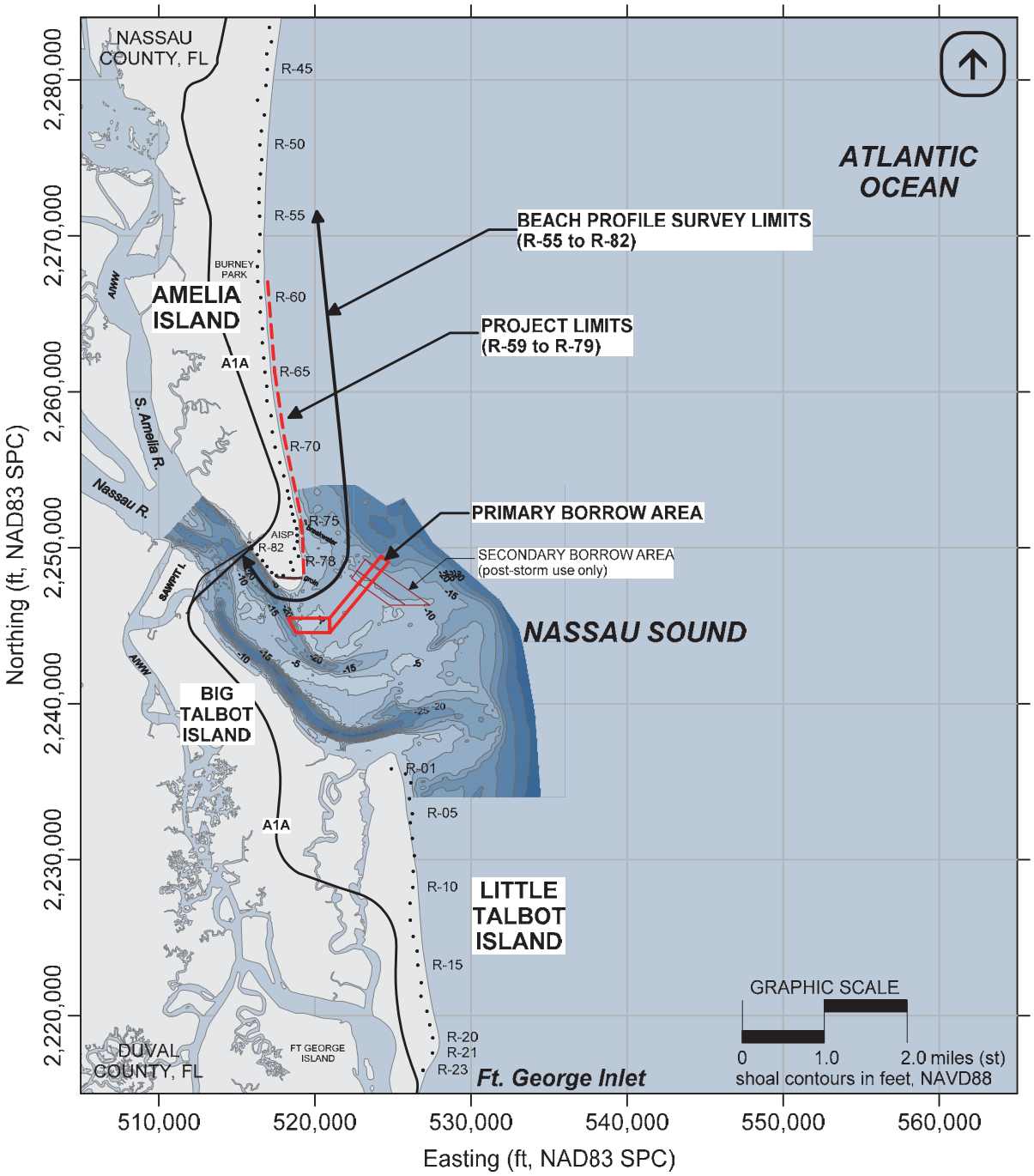

Figure 1 Location Map – South Amelia Island Shore Stabilization Project and Nassau Sound, FL.

As depicted in **Figure 1**, the primary borrow area lies within the adjacent Nassau Sound ebb shoal complex, south-southeast of the south tip of Amelia Island, and is intended to mimic the natural tidal channel alignments through the inlet. This borrow area occupies roughly 128 acres (52 hectares). The primary borrow area is expected to shoal in over the renourishment interval as the shoals and natural channels in the Sound migrate southward, such that the area is expected to be available for re-dredging in 9-10 years. A supplemental borrow area, occupying 139 acres of the seabed (56 hectares), is likewise identified and is intended only for post-storm response. The project shall be constructed via hydraulic cutterhead/pipeline dredge.

The physical monitoring plan is implemented by the Nassau County Board of County Commissioners, the South Amelia Island Shore Stabilization Association (SAISSA), and the FL Park Service as part of the well-established ongoing Long Range Beach Management Plan for South Amelia Island. The project shoreline has been formally monitored since the early 1990's, prior to the initial beach restoration along the SAISSA properties north of Amelia Island State Park. The purpose of the monitoring plan is to:

- meet the regulatory requirements of the permits issued for the proposed beach restoration projects (permit numbers noted above),

- evaluate the post-construction performance of the proposed beach fill project and borrow area.

- function as an important database for purposes of future beachfront development, planning or management activities,

- fulfill the requirements of FEMA with respect to disaster relief eligibility by maintaining the beach and documenting beach conditions prior to a major storm event, and

- provide design guidance for future beach maintenance activities along the South Amelia Island shoreline.

2.0 MONITORING PLAN ELEMENTS

The Monitoring Plan includes four basic elements:

- Comprehensive surveys of the renourished shoreline, the borrow area, and the Nassau Sound shoal system by a qualified hydrographic surveyor,
- Digital orthoimagery and oblique photography,
- Analysis of annual or biennial beach changes and maintenance of the project cumulative comparative database, and
- Formulation of a detailed *Annual or Biennial Report of Findings* for consideration by the County, SAISSA, the FL Park Service, the FDEP BIPP, USACE other State and Federal agencies, and the general public.

2.1 Survey - Scope of Work

2.1.1 Beach Profiles - Throughout the continuous 28,400 ft of monitored shoreline, beach profiles will be surveyed on 1,000-ft intervals utilizing the existing FDEP R-monuments (R-55 to R-82). Additional intermediate profiles will be surveyed at 500-ft intervals along the southern portion of the project, beginning at R-73/AP-19 and extending to R-82. At R-79, additional profiles are surveyed at different azimuths to document the shoreline conditions of the sand spit south of the rock terminal groin. In total, 40 beach profiles are to be surveyed. R-55 lies approximately 4,700 ft north of the northern limit of the project and 2,300 ft north of the Lewis St. beach access in American Beach. R-82 lies just east of the A1A bridge at the Amelia Island State Park main parking area. The FDEP BIPP standards for survey data collection for beach restoration projects shall be applied (FDEP 2014).

https://floridadep.gov/sites/default/files/PhysicalMonitoringStandards.pdf

2.1.2 Beach profiles along the Atlantic Ocean shoreline shall extend a minimum of 3,000 ft offshore (from the MHWL at the time of survey) or to the -30 ft NAVD88 contour (whichever is reached first). Profiles extending into Nassau Sound shall extend for at least 1,000 ft unless truncated by an impassable shoal. In addition, a shoreline survey along the approximate MHWL shall be conducted from the south side of the rock terminal groin southward and westward beyond the A1A bridge to the small tidal creek west of the AISP restroom facility.

2.1.3 Beach profile surveys shall be conducted immediately before and after construction, and on an annual post-construction basis throughout the life of the project, typically in the months of May or June (**Figure 2**). This will assure eligibility for post-storm disaster relief funds from FEMA for this non-federally funded project. Consistent with recent FDEP permit requirements, detailed reporting of the survey results shall be conducted on the following schedule (Year 1, Year 2, Year 3, Year 5, etc., see **Figure 2**).

2.1.4 Post-Storm Survey Contingency – The County, SAISSA, and the FPS are advised that in the event of a major storm impact, it will be necessary to perform a post-storm survey of the beaches for purposes of evaluating storm losses. The post-storm survey will be compared to the regularly-scheduled annual survey to complete the evaluation and apply to FEMA for reimbursement for project repairs. Historically, the post-storm survey is considered eligible for reimbursement cost-sharing by FEMA for post-disaster recovery.

2.1.5 Borrow Area and Nassau Sound – The 128-acre project borrow area (as permitted and designed) shall be surveyed on the basis of transects spaced at 200 ft intervals. The remainder of the Nassau Sound shoal system shall be surveyed concurrently at appropriate line spacings of 200 to 500 ft, achieving bank-to-bank hydrographic survey coverage consistent with prior surveys of the Sound shoals (see **Figure 1**, example). As part of each survey, the transects shall extend beyond the borrow area limits into a survey buffer zone by a minimum of 500 ft. The borrow area shall be survey be surveyed on the following schedule (Year 1, Year 2, Year 3, Year 5, etc., see **Figure 2**). If excavated, the supplemental borrow area shall be surveyed in a like manner.

2.2 Digital Aerial Orthoimagery

2.2.1 Shoreline - Controlled digital aerial orthoimagery at approximately low tide shall be flown immediately subsequent to project construction -- as well as at the same approximate time of the annual/biennial beach surveys. The limits of photography shall begin at Ft. George Inlet at the south end of Little Talbot Island in Duval County and shall extend northward beyond R-55, Nassau County, on Amelia Island. The photography shall also include the Nassau Sound shoreline of Amelia Island from R-79 westward a distance of 6,500 ft west of the A1A bridge (just west of the AIWW). The photography shall likewise cover the Little Talbot, Big Talbot, and Sawpit Island shorelines of the Sound to west of the AIWW channel. Per FDEP BIPP specifications, digital orthophotos will be produced, corrected to the State Plane Coordinate System (NAD83, Florida East Zone).

2.2.2 Oblique Aerial Photography – To continue to monitor the project shoreline response, the effects associated with the previously constructed rock structures within the project limits, and potential changes associated with the excavation of the channel-like borrow area at Nassau

Sound, low-altitude drone-based oblique aerial photography will be collected semi-annually (approx.) along the fill limits. Digital copies of the images will be provided to the Owner.

2.3 Geotechnical

Per the project Quality Assurance/Quality Control Plan, sand samples shall be collected along the nourished beach berm following construction. Sample Munsell color, percentage fines and shell content will be estimated and a grain-size distribution curve formulated for each sample in accordance with applicable ASTM standards. Results of the analyses shall be included in the project post-construction report.

Within the borrow area, surface sand samples shall be obtained during the period of each borrow site survey at four selected sampling stations utilizing a Ponar Grab. Each sand sample shall be analyzed in a manner consistent with the sediment QA/QC plan and the results included in the corresponding report-of-findings.

2.4 Analyses

Engineering reports shall be formulated based upon the collected data and submitted within 90 days of the surveys. These annual or biennial reports shall summarize and discuss the data, the performance of the beach fill project, and identify erosion and accretion patterns within the monitored area. Results shall be analyzed for patterns, trends, or changes between annual surveys and cumulatively since project construction. In addition, the report shall include a comparative review of project performance to performance expectations and identification of adverse effects attributable to the project.

The report shall specifically include:

i. The volume and percentage of advance nourishment lost since the last beach nourishment event, as measured relative to the Mean High Water Line (MHWL)and other relevant datums of the most recent survey;
ii. The most recent Mean High Water Line position (in feet) in comparison with the design profile at each individual monument location;
iii. The mean high water shoreline position changes (feet) relative to the pre-construction survey at each individual monument location for all the monitoring periods;
iv. The total measured remaining volume (in cy) in comparison with the total predicted remaining volume (cy) above the MHWL and above the Depth of Closure for the entire project area over the successive monitoring periods;
v. Morphological changes and shoaling (infilling) of the project borrow area, and volumetric and morphological changes in the Nassau Sound shoal system;

vi. Shoreline and morphological changes and conditions along the Little Talbot, Big Talbot, and Sawpit Islands as evidenced through inspection of the time series of controlled digital orthoimagery datasets;

vii. Other shoreline position and volumetric analyses, with quantitative measurements, the Permittee or Engineer deem useful in assessing the performance of the project;

The report shall include computations, tables and graphic illustrations of volumetric and shoreline position changes for the monitoring area. An appendix shall include superimposed plots of the two most recent beach profile surveys, the pre- and post-construction beach profiles, and other relevant dates, at each individual monument location.

Major report(s) of findings will be submitted annually approximately 90 days subsequent to the receipt of each completed major monitoring survey. The purpose of each report shall be to summarize the annual as well as cumulative data base, assess project performance, evaluate potential impacts, etc. The first report shall be the immediate post-construction report.

2.5 Deliverables

After each annual or biennial monitoring effort, the consultant shall provide the Owner group with a complete electronic copy of the report and appendices (*.PDF format). Electronic copies of all beach profile and hydrographic survey data, surveyor reports, metadata, digital aerial orthoimagery, and flight/camera calibration reports, shall be submitted to FDEP and to the Owner group in the appropriate formats (PDF, EXCEL, metadata, etc.). If desired, the consultant shall make an annual presentation of the monitoring results at a mutually convenient scheduled date. A copy of any digital presentation media can be transferred to the Owner group.

2.6 Plan Schedule

The overall Monitoring Plan Schedule for the first five years subsequent to construction is summarized by **Figure 2**. It is anticipated that monitoring will continue beyond the five years depicted on the same annual/biennial basis indicated by Years 4 and 5. The continued annual monitoring of the beach profiles will primarily serve to provide the necessary pre-storm data to satisfy FEMA post-storm damage eligibility criteria. The monitoring program is anticipated to continue to be a permanent component of the Long Range Beach Management Plan for the Owner group. It is noted that the longevity of the beach fill may be significantly affected by impacts from severe storms. The collection of beach monitoring data shall assist in the determination by the Owner group and FDEP for the need to initiate renourishment activities in the future.

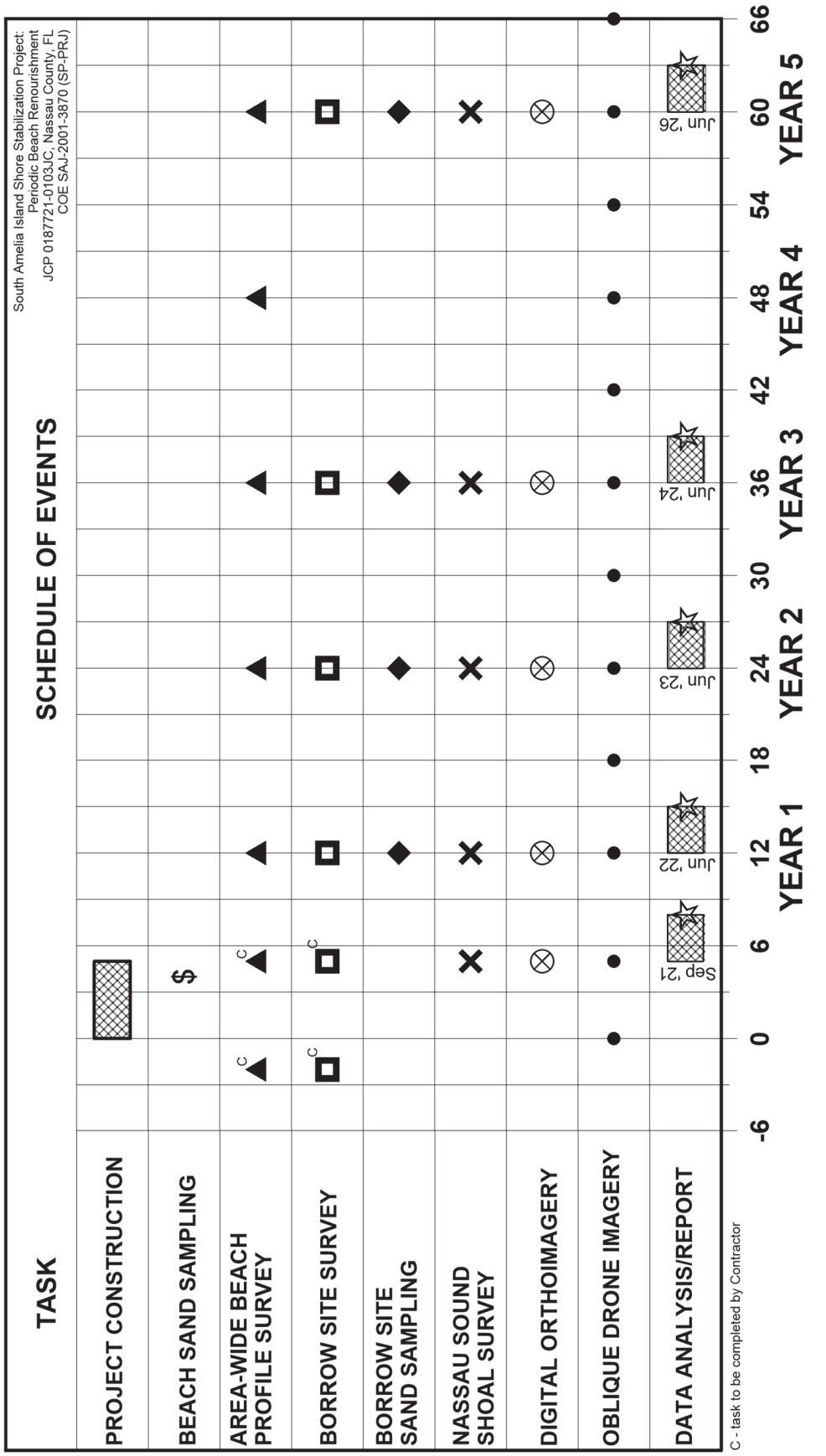

Figure 2 Schedule of monitoring events for the first five years following construction of the first periodic renourishment of the South Amelia Island Shore Stabilization Project. Monitoring elements beyond the 5-yr mark follow the same annual/biennial pattern of years 4 and 5. Aerial photography shall extend southward across Nassau Sound to Little Talbot Island and Ft. George Inlet.
*Schedule reflects construction in the Summer 2021 timeframe, such that the post-construction survey can be conducted in September 2021. Subsequent monitoring surveys will be held in the June pre-tropical storm season time frame (FEMA documentation).

APPROVED
Sediment QA/QC Plan
Permit #: 0187721-013-JC
Beaches Inlets and Ports Program

South Amelia Island Shore Stabilization Project (SAISSP)
Periodic Beach Renourishment
R-59 to R-79
Nassau County, FL

Joint Coastal Permit Application #0187721-013

SEDIMENT QUALITY ASSURANCE/QUALITY CONTROL PLAN

A. INTRODUCTION

In accordance with Rule 62B-41.008(1)(k)4.b., Florida Administrative Code (F.A.C.), this sediment Quality Control/Quality Assurance Plan (QA/QC Plan) has been prepared for the proposed periodic renourishment of the South Amelia Island Shore Stabilization Project. This QA/QC plan is intended to ensure that the material from the borrow site placed during construction meets the standards in paragraph 62B-41.007(2)(j), F.A.C.

The Permittee has conducted geotechnical investigations that provide adequate data concerning the character of the sediment and the quantities available within the spatial limits of the permitted borrow site. The Permittee has provided an analysis of the existing or native sediment and the sediment within the permitted borrow site that demonstrates its compatibility with the naturally occurring beach sediment in accordance with Rule 62B-41.007(2)(j), F.A.C. The sediment analysis and volume calculations were performed using established industry standards, and are certified by a Professional Engineer or a Professional Geologist registered in the State of Florida.

Based upon this information and the design of the borrow area, the Department of Environmental Protection (Department) has determined that use of the sediment from the borrow area(s) will maintain the general character and functionality of the sediment occurring on the beach and in the adjacent dune and coastal system. Furthermore, this information and the borrow area design provides sufficient quality control/quality assurance (QA/QC) that the mean grain size and carbonate content of the sediment from the borrow area will meet the requirements of Rule 62B-41.007(2)(j), F.A.C.; hence, additional QA/QC procedures are not required for these sediment parameters during construction.

This plan outlines the responsibilities of each stakeholder in the project as they relate to the placement of beach compatible material on the beach. These responsibilities are in response to the possibility that non-beach compatible sediments may exist within the borrow area(s) and could be unintentionally placed on the beach. The QC Plan specifies the minimum construction management, inspection and reporting requirements placed on the Marine Dredging Contractor and enforced by the Permittee, to ensure that the sediment from the borrow area(s) to be used in the project meet the compliance specifications. The QA/QC Plan specifies the minimum construction oversight, inspection and reporting requirements to be undertaken by the Permittee or the Permittee's On-Site Representative to observe, sample, and test the placed sediments to verify the sediments are in compliance.

B. SEDIMENT QUALITY SPECIFICATIONS

The sediment from the borrow area is similar in Munsell color and grain size distribution to the material in the existing coastal system at the beach placement sites. The Department and the Permittee acknowledge that it is possible that discrete occurrences of non-beach compatible sediments may exist within the permitted borrow area that do not comply with the limiting parameters of Rule 62B-41.007(2)(j) 1. – 5., F.A.C. or vary in Munsell color from the composite value. Furthermore, the Department may consider more restrictive values for the sediment parameters to ensure that the sediment from the borrow area is similar in color and grain size distribution to the sediment in the existing coastal system at the beach placement site. Therefore, fill material compliance specifications for the sediment from the borrow area proposed for this project are provided in **Table 1**.

The compliance specifications take into account the variability of sediment on the native or existing beach, and are values which may reasonably be attained given what is known about the borrow area sediment. These parameters were established and adopted from the 2011 renourishment project sediment QA/QC plan and post-construction sampling. Beach fill material which falls outside of these limits will be considered unacceptable and subject to remediation.

Table 1- Sediment Compliance Specifications
South Amelia Island Shore Stabilization Project – Beach Renourishment

Sediment Parameter	**Parameter Definition**	**Compliance Value**
Max. Silt Content	passing #230 sieve	**3%**
Max. Shell Content*	retained on #4 sieve	**9%****
Munsell Color Value	moist Value (chroma = 1)	**6.5 or lighter**
The beach fill material shall not contain construction debris, toxic material, other foreign matter, coarse gravel or rocks.		

*Shell Content is used as the indicator of fine gravel content for the implementation of quality control/quality assurance procedures.

**Referring to Rule 62B-41.007(2)(j), "If the natural beach exceeds any of the limiting parameters listed above, then the fill material shall not exceed the naturally occurring level for that parameter

C. QUALITY CONTROL PLAN

The contract documents shall incorporate the following technical requirements, or equivalent language, that addresses the location of dredging, sediment quality monitoring on the beach, and, if necessary, remedial actions. The Permittee will seek to enforce these contract requirements during the execution of work.

1. Electronic Positioning and Dredge Depth Monitoring Equipment. The Contractor will continuously operate electronic positioning equipment, approved by the Engineer, to monitor the precise positioning of the excavation device location(s) and depth(s). A Differential Global Positioning System (DGPS) or equivalent system providing equal or better accuracy will be used to determine the horizontal position and will be interfaced with an appropriate depth measuring device to determine the vertical position of the bottom of the excavation device. The horizontal positioning equipment will maintain an accuracy of +/-3.0 feet. The vertical positioning equipment will maintain a vertical accuracy of +/-0.5 feet with continuously applicable tidal corrections measured at the project site (via RTK GPS or other acceptable means).

2. Dredge Location Control. The Contractor is required to have, in continuous operation on the dredge, electronic positioning equipment that will accurately compute and plot the position of the dredge. Such fixes, and the accompanying plots, will be furnished to the Permittee's Engineer and/or on-site representative daily as part of the QC Reports. The electronic positioning equipment will be installed on the dredge so as to monitor, as closely as possible, the actual location of the excavation device(s). The location of the master antenna on the dredge and the distance and direction from the master antenna to the bottom of the excavation device will be reported on the Daily Reports. An electronic file depicting the excavation device positions in State Plane Coordinates, the excavation device depths corrected for tide elevation and referenced to the North American Vertical Datum of 1988 (NAVD 88) and the time, will be maintained using an interval of one (1) minute for each printed fix. An electronic file (in ASCII format) copy of the position data will be provided to the Engineer as part of the daily report. The Contractor will prepare a plot of the data that includes the State Plane Coordinate grid system and the borrow area limits. The format of the plot may be subject to approval by the Permittee's Engineer. No dredging will take place outside of the borrow area limits (horizontal and vertical limits) as shown on the drawings.

3. Dredging Observation. The Contractor will be responsible for establishing such control as may be necessary to ensure that the allowable excavation depths and spatial limits are not exceeded. If the Contractor encounters noncompliant sediment during dredging, the Contractor will immediately cease dredging, relocate the dredge into compliant sediment, and will verbally notify the Permittee's Engineer and/or on-site Representative, providing the time, location, and description of the noncompliant sediment. The Contractor will also report any encounters with noncompliant sediment in the Contractor's Daily Report, providing depth and location in State Plane Coordinates of said materials within the borrow area. The Contractor, in cooperation with the Permittee's Engineer, will use the dredge positioning records, plans, and Vibracore descriptions to determine where the Contractor may dredge to avoid additional placement of noncompliant sediment. The Contractor will adjust his or her construction operation to avoid the noncompliant sediment to the greatest extent practicable.

4. **Beach Observation**. The Contractor will continuously visually monitor the sediment being placed on the beach. If noncompliant sediment is placed on the beach, the Contractor will immediately cease dredging, relocate the dredge into compliant sediment, and verbally notify the Permittee's Engineer or on-site Representative, providing the time, location, and description of the noncompliant sediment. The Contractor will also report any encounters with noncompliant sediment in the Contractor's Daily Report, providing depth and location in State Plane Coordinates of said materials within the borrow area. The Contractor will take the appropriate remediation actions as directed by the Permittee or Permittee's Engineer.

5. **Excavation Requirements**. The Contractor will excavate within the approved boundaries and maximum depths of the borrow area in a uniform and continuous manner. If directed by the Permittee's Engineer, the Contractor will change the location and/or depth of excavation within the borrow area limits.

6. **Vibracore Logs and Grain Size Data.** The Contractor will be provided with all descriptions of sediment Vibracore borings collected within the borrow area, and will acknowledge that he is aware of the quality of the sediment as described in the sediment Vibracore logs. These logs and grain size data will be presented in the construction specifications.

D. QUALITY ASSURANCE PLAN

The Permittee will seek to enforce the construction contract and Department permits related to sediment quality. In order to do so, the following steps shall be followed:

1. Construction Observation. Construction observation by the Permittee's On-Site Representative will be performed 7 days a week, at least 8 hours a day during periods of active construction. Most observations will be conducted during daylight hours; however, random nighttime observations shall be conducted.

2. On-Site Representative. The Permittee will provide on-site observation by individuals with training or experience in beach nourishment and construction inspection and testing, and who are knowledgeable of the project design and permit conditions. The project Engineer, a qualified coastal engineer, will actively coordinate with the Permittee's On-Site Representative, who may be an employee or sub-contractor of the Permittee or the Engineer. Communications will take place between the Engineer and the Permittee's On-Site Representative on a daily basis.

3. Pre-Construction Meeting. The project QA/QC Plan will be discussed as a matter of importance at the pre-construction meeting. The Contractor will be required to acknowledge the goals and intent of the above described QA/QC Plan, in writing, prior to commencement of construction.

4. Contractor's Daily Reports. The Engineer will review the Contractor's Daily Reports which characterize the nature of the sediments encountered at the borrow area and placed along the project shoreline with specific reference to moist sand color and the occurrence of rock, rubble, shell, silt or debris that exceeds acceptable limits. The Engineer will review the dredge positions in the Contractor's Daily Report.

5. On Call. The Engineer will be continuously on call during the period of construction for the purpose of making decisions regarding issues that involve QA/QC Plan compliance.

6. Addendums. Any addendum or change order to the Contract between the Permittee and the Contractor will be evaluated to determine whether or not the change in scope will potentially affect the QA/QC Plan.

7. During Construction Sampling for Visual Inspection. To assure that the fill material placed on the beach is in compliance with the permit, the Permittee's Engineer or On-Site Representative will conduct assessments of the beach fill material as follows:

a. During excavation and fill placement activities, the Permittee's On-Site Representative will collect a sediment sample at approximately 500-ft intervals of the newly constructed berm to visually assess grain size, Munsell color, shell content, and silt content. The sample shall be a minimum of 1 U.S. pint (approximately 200 grams). This assessment will consist of handling the fill material to ensure that it is predominantly sand to note the physical characteristics and assure the material meets the sediment

compliance parameter specified in this Plan. If deemed necessary, quantitative assessments of the sand will be conducted for grain size, silt content, shell content and Munsell color using the methods outlined in **Section D.8.b**. Each sample will be archived with the date, time, and location of the sample. The results of these daily inspections, regardless of the quality of the sediment, will be appended to or notated on the Contractor's Daily Report. All samples will be stored by the Permittee for at least 60 days after project completion.

b. If the Permittee or Engineer determines that the beach fill material does not comply with the sediment compliance specifications in this QA/QC Plan, the Permittee or Engineer will immediately instruct the Contractor to cease material excavation operations and take whatever actions necessary to avoid further discharge of noncompliant sediment. The Contractor, in cooperation with the Permittee's Engineer, will use the dredge positioning records, plans, and Vibracore descriptions to determine where the Contractor may dredge to avoid additional placement of noncompliant sediment. The Contractor will adjust his or her construction operation to avoid the noncompliant sediment to the greatest extent practicable. The sediment inspection results will be reported to the Department.

8. Post-Construction Sampling for Laboratory Testing. To assure that the fill material placed on the beach was adequately assessed by the borrow area investigation and design, the Project Engineer will conduct assessments of the sediment as follows:

a. Post-construction sampling of each acceptance section and testing of the fill material will be conducted to verify that the sediment placed on the beach meets the expected criteria/characteristics provided during from the geotechnical investigation and borrow area design process. Upon completion of an acceptance section of constructed beach, the Engineer will collect two (2) duplicate sand samples at every FDEP reference monument profile line to quantitatively assess the grain size distribution, moist Munsell color, shell content, and silt content for compliance. The Engineer will collect the sediment samples of a minimum of 1 U.S. pint (at least 200 grams) each from the bottom of a test hole a minimum of 18 inches deep within the limits of the constructed berm. The Engineer will visually assess grain size, Munsell color, shell content, and silt content of the material by handling the fill material to ensure that it is predominantly sand, and further to note the physical characteristics. The Engineer will note the existence of any layering or rocks within the test hole. One sample will be sent for laboratory analysis while the other sample will be archived by the Permittee. All samples and laboratory test results will be labeled with the Project name, FDEP Reference Monument Profile Line designation, State Plane (X,Y) Coordinate location, date sample was obtained, and "Construction Berm Sample."

b. All samples will be evaluated for visual attributes (Munsell color and shell content), sieved in accordance with the applicable sections of ASTM D422-63 (Standard Test Method for Particle-Size Analysis of Soils), ASTM D1140 (Standard Test Method for Amount of Material in Soils Finer than No. 200 Sieve), and ASTM D2487 (Classification of Soils for Engineering Purposes), and analyzed for carbonate content. The samples will be sieved using the following U.S. Standard Sieve Numbers: 3/4", 5/8", 3.5, 4, 5, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, 200, and 230.

c. A summary table of the sediment samples and test results for the sediment compliance parameters shall accompany the complete set of laboratory testing results. The column headings will include:

Sample Number; Mean Grain Size (mm); Sorting Value: Silt Content (%); Shell Content (%); Munsell Color Value; and a column stating whether each sample MET or FAILED the compliance values found in **Table 1**. The sediment testing results will be certified by a P.E or P.G. registered in the State of Florida. A statement of how the placed fill material compares to the sediment analysis and volume calculations from the sand search investigation and borrow area design shall be included in the sediment testing results report. The Permittee will submit sediment testing results and analysis report to the Department within 90 days following beach construction.

d. In the event that a section of beach contains fill material that is not in compliance with the sediment compliance specifications, then the Department will be notified. Notification will indicate the volume, aerial extent and location of any unacceptable beach areas and remediation planned.

E. REMEDIATION

1. Compliance Area. If a sample does not meet the compliance value for construction debris, toxic material, other foreign material, coarse gravel, or rock the Permittee shall determine the aerial extent and remediate regardless of the extent of the noncompliant material. If a sample is noncompliant for the silt content, shell content, or Munsell color and the aerial extent exceeds 10,000 square feet, the Permittee shall remediate.

2. Notification. If an area of newly constructed beach does not meet the sediment compliance specifications, then the Department (JCPCompliance@dep.state.fl.us) will be notified. Notification will indicate the aerial extent and location of any areas of noncompliant beach fill material and remediation planned. As outlined in section E.4 below, the Permittee will immediately undertake remediation actions without additional approvals from the Department. The results of any remediation will be reported to the Department following completion of the remediation activities and shall indicate the volume of noncompliant fill material removed and replaced.

3. Sampling to determine extent. In order to determine if an area greater than 10,000 square feet of beach fill is noncompliant, the following procedure will be performed by the Engineer:

a. Upon determination that the first sediment sample is noncompliant, at minimum, five (5) additional sediment samples will be collected at a 25-foot spacing in all directions and assessed. If the additional samples are also noncompliant, then additional samples will be collected at a 25-foot spacing in all directions until the aerial extent is identified.
b. The samples will be visually compared to the acceptable sand criteria. If deemed necessary by the Engineer, quantitative assessments of the sand will be conducted for grain size, silt content, shell content, and Munsell color using the methods outlined in section D.8.b. Samples will be archived by the Permittee.
c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of noncompliant fill.
d. The total square footage will be determined.
e. The site map and analysis will be included in the Contractor's Daily Report.

4. Actions. The Permittee or Permittee's Engineer shall have the authority to determine whether the material placed on the beach is compliant or noncompliant. If placement of noncompliant material occurs, the Contractor will be directed by the Permittee or Permittee's Engineer on the necessary corrective actions. Should a situation arise during construction that cannot be corrected by the remediation methods described within this QA/QC Plan, the Department will be notified. The remediation actions for each sediment parameter are as follows:

a. Silt: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value, or removing the noncompliant fill material and replacing it with compliant fill material.

b. Shell: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value or removing the noncompliant fill material and replacing it with compliant fill material.
c. Munsell color: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value or removing the noncompliant fill material and replacing it with compliant fill material.
d. Coarse gravel: screening and removing the noncompliant fill material and replacing it with compliant fill material.
e. Construction debris, toxic material, or other foreign matter: removing the noncompliant fill material and replacing it with compliant fill material.

All noncompliant fill material removed from the beach will be transported to an appropriate upland disposal facility located landward of the Coastal Construction Control Line.

5. Post-Remediation Testing. Re-sampling shall be conducted following any remediation actions in accordance with the following protocols:

a. Within the boundaries of the remediation actions, samples will be taken at maximum of 25-foot spacing.
b. The samples will be visually compared to the acceptable sand criteria. If deemed necessary by the Engineer, quantitative assessments of the sand will be conducted for grain size, silt content, and Munsell color using the methods outlined in section D.8.b. Samples will be archived by the Permittee.
c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of remediation actions.

6. Reporting. A post-remediation report containing the site map, sediment analysis, and volume of noncompliant fill material removed and replaced will be submitted to the Department within 7 days following completion of remediation activities. All reports or notices relating to this permit shall be emailed and sent to the Department at:

DEP Beaches Inlets, and Ports Program
JCP Compliance Officer
Mail Station 3566
2600 Blair Stone Road
Tallahassee, Florida 32399-3000

phone: (850) 245-7591
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STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE
U.S. Fish and Wildlife Service
August 12, 2013

The eastern indigo snake protection/education plan (Plan) below has been developed by the U.S. Fish and Wildlife Service (USFWS) in Florida for use by applicants and their construction personnel. At least **30 days prior** to any clearing/land alteration activities, the applicant shall notify the appropriate USFWS Field Office via e-mail that the Plan will be implemented as described below (North Florida Field Office: jaxregs@fws.gov; South Florida Field Office: verobeach@fws.gov; Panama City Field Office: panamacity@fws.gov). As long as the signatory of the e-mail certifies compliance with the below Plan (including use of the attached poster and brochure), no further written confirmation or "approval" from the USFWS is needed and the applicant may move forward with the project.

If the applicant decides to use an eastern indigo snake protection/education plan other than the approved Plan below, written confirmation or "approval" from the USFWS that the plan is adequate must be obtained. At least 30 days prior to any clearing/land alteration activities, the applicant shall submit their unique plan for review and approval. The USFWS will respond via e-mail, typically within 30 days of receiving the plan, either concurring that the plan is adequate or requesting additional information. A concurrence e-mail from the appropriate USFWS Field Office will fulfill approval requirements.

The Plan materials should consist of: 1) a combination of posters and pamphlets (see **Poster Information** section below); and 2) verbal educational instructions to construction personnel by supervisory or management personnel before any clearing/land alteration activities are initiated (see **Pre-Construction Activities** and **During Construction Activities** sections below).

POSTER INFORMATION

Posters with the following information shall be placed at strategic locations on the construction site and along any proposed access roads (a final poster for Plan compliance, to be printed on 11" x 17" or larger paper and laminated, is attached):

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

SIMILAR SNAKES: The black racer is the only other solid black snake resembling the eastern indigo snake. However, black racers have a white or cream chin, thinner bodies, and WILL BITE if handled.

LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands

and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION UNDER FEDERAL AND STATE LAW: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

IF YOU SEE A <u>LIVE</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the live eastern indigo snake sufficient time to move away from the site without interference;
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A <u>DEAD</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

Telephone numbers of USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

PRE-CONSTRUCTION ACTIVITIES

1. The applicant or designated agent will post educational posters in the construction office and throughout the construction site, including any access roads. The posters must be clearly visible to all construction staff. A sample poster is attached.

2. Prior to the onset of construction activities, the applicant/designated agent will conduct a meeting with all construction staff (annually for multi-year projects) to discuss identification of the snake, its protected status, what to do if a snake is observed within the project area, and applicable penalties that may be imposed if state and/or federal regulations are violated. An educational brochure including color photographs of the snake will be given to each staff member in attendance and additional copies will be provided to the construction superintendent to make available in the onsite construction office (a final brochure for Plan compliance, to be printed double-sided on 8.5" x 11" paper and then properly folded, is attached). Photos of eastern indigo snakes may be accessed on USFWS and/or FWC websites.

3. Construction staff will be informed that in the event that an eastern indigo snake (live or dead) is observed on the project site during construction activities, all such activities are to cease until the established procedures are implemented according to the Plan, which includes notification of the appropriate USFWS Field Office. The contact information for the USFWS is provided on the referenced posters and brochures.

DURING CONSTRUCTION ACTIVITIES

1. During initial site clearing activities, an onsite observer may be utilized to determine whether habitat conditions suggest a reasonable probability of an eastern indigo snake sighting (example: discovery of snake sheds, tracks, lots of refugia and cavities present in the area of clearing activities, and presence of gopher tortoises and burrows).

2. If an eastern indigo snake is discovered during gopher tortoise relocation activities (i.e. burrow excavation), the USFWS shall be contacted within one business day to obtain further guidance which may result in further project consultation.

3. Periodically during construction activities, the applicant's designated agent should visit the project area to observe the condition of the posters and Plan materials, and replace them as needed. Construction personnel should be reminded of the instructions (above) as to what is expected if any eastern indigo snakes are seen.

POST CONSTRUCTION ACTIVITIES

Whether or not eastern indigo snakes are observed during construction activities, a monitoring report should be submitted to the appropriate USFWS Field Office within 60 days of project completion. The report can be sent electronically to the appropriate USFWS e-mail address listed on page one of this Plan.

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

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- Cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site without interference.
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate U.S. Fish and Wildlife Service (USFWS) office, with the location information and condition of the snake.
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South Florida Field Office – (772) 562-3909

Killing, harming, or harassing indigo snakes is strictly prohibited and punishable under State and Federal Law.

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

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LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

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LEGAL STATUS: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

August 12, 2013

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

Please read the following information provided by the U.S. Fish and Wildlife Service to become familiar with standard protection measures for the eastern indigo snake.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960
May 22, 2013

Eric P. Summa
Chief, Environmental Branch (PD-E)
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Summa:

This document transmits the U.S. Fish and Wildlife Service's (Service) Programmatic Piping Plover Biological Opinion (P^3BO) for the effects of U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities on the non-breeding piping plover (*Charadrius melodus*) and its designated Critical Habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). The current status of the federally listed piping plover is threatened, and the Service designated Critical Habitat for wintering piping plovers on July 10, 2001. This P^3BO is for the North Florida Ecological Services Office (NFESO) and the South Florida Ecological Services Office (SFESO) areas of responsibility (AORs). You requested formal consultation by letter of May 7, 2013.

This P^3BO is based on the information provided in the Corps May 7, 2013, letter, the Statewide Programmatic Biological Assessment of February 17, 2011, subsequent meetings between Corps and Service personnel, and other sources of information. We have assigned Consultation Code 04EF1000-2013-F-0124 to this consultation. A complete administrative record of this consultation is on file at the NFESO. Each project proposing to utilize this P^3BO will undergo an evaluation process by the Corps to determine if it properly fits within this programmatic approach. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the P^3BO are applicable to the project, the Service will concur within 30 days and it will be covered by this programmatic consultation. The Corps will consult separately on individual projects that do not fit within this programmatic approach unless the Service grants an exception in accordance with the Incidental Take Statement in the P^3BO.

This consultation includes the following proposed activities conducted in the AORs of the NFESO and the SFESO:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management (BOEM);
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

For Civil Works activities, the Corps specified during the consultation process that "fish and wildlife enhancement" activities beyond mitigation of project impacts must be authorized as a project purpose, be authorized as a project feature, or be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 June 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority [ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)], the Corps does not expect to receive authorization and funding for it. However, the Corps proposes to implement the following Conservation Measures to reduce impacts on piping plovers for all projects (those in both non-optimal and optimal piping plover habitat) included in this consultation with the potential to affect piping plovers or their critical habitat:

1. Adhere to appropriate seasonal windows to the maximum extent practicable;

2. Implement survey guidelines for non-breeding shorebirds when appropriate. For Corps Civil Works projects, the "surveys" must be limited to the term of the construction unless they are otherwise authorized and funded by Congress;

   [Note: The term of the construction is considered to be the time in which the construction contractor is working on the beach. This usually starts soon after the "notice to proceed" and ends when the contractor finishes placing sand or finishes conducting other shore protection activities on/near the beach.]

3. Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting;

4. Avoid impacts to the primary constituent elements (PCEs) of piping plover Critical Habitat to the maximum extent practicable;

5. The Corps or Applicant will evaluate the project area prior to consultation for the presence of piping plover PCEs as a basis for making their initial determination of effect;

6. The Corps will work with the Service to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (*i.e.*, washover fans). For Corps Civil Works projects, "enhancement" must be limited to the extent authorized and funded as a project feature or project purpose;

7. The Corps will attempt to time the construction of Civil Works sand placement and dredging projects to prevent two adjacent beaches or inlets from being constructed in the same year;

8. The Corps Civil Works program will work with the Florida Department of Environmental Protection (FDEP) to consider the value and context of inlet habitat features (*i.e.*, emergent spits, sand bars, etc.) within each inlet's management plan and adjust future dredging frequencies, to the maximum extent practicable and consistent with applicable law, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex; and

9. The Corps Civil Works program will consider placing dredged materials in the nearshore region as an alternative to beach placement to minimize effects to piping plovers and their habitat.

With the implementation of these Conservation Measures, the Corps has determined the proposed activities may affect, but are not likely to adversely affect the piping plover in areas not identified as Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and they include coastal habitat features that function mostly unimpeded. Optimal Piping Plover Areas include:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or
    f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely state-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

    a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
    b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
    c. Palmer Point Park, Sarasota County (R-77 to R-83);

d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
e. Crandon Park, Miami-Dade County (R-89 to R-101); and
f. Sanibel Island, Lee County (R-109 to R-174).

The Service concurs with this determination as it applies to projects in non-optimal habitat, and the Corps will reinitiate consultation if they are unable to implement the Conservation Measures as described above. No additional consultation is required for projects located in habitat determined to be non-optimal for piping plovers. The attached P^3BO addresses projects located in optimal piping plover habitat, as defined above.

As with the Service's Statewide Programmatic Biological Opinion (SPBO), the Corps and the Service will meet annually during the fourth week of August to review the proposed activities, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this P^3BO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions. This programmatic consultation will be reviewed every 5 years. If new information concerning the projects or the piping plover arises, this consultation will be reviewed sooner than 5 years. Reinitiation of formal consultation is required 10 years after the issuance of this P^3BO.

We are available to meet with agency representatives to discuss this consultation. If you have any questions, please contact Dawn Jennings at the NFESO (904-731-3103) or Craig Aubrey in the SFESO (772-469-4309).

Sincerely yours,

Larry Williams
State Supervisor

SHORE PROTECTION ACTIVITIES IN THE GEOGRAPHICAL REGION OF THE NORTH AND SOUTH FLORIDA ECOLOGICAL SERVICES FIELD OFFICES

Programmatic Piping Plover Biological Opinion

May 22, 2013

Prepared by:

U.S. Fish and Wildlife Service

TABLE OF CONTENTS

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

Act	Endangered Species Act
AOR	Area of Responsibility
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FR	Federal Register
MBTA	Migratory Bird Treaty Act
NFESO	U.S. Fish and Wildlife Service's North Florida Ecological Services Office
P^3BO	Programmatic Piping Plover Biological Opinion
PCE	Primary Constituent Elements
Service	U.S. Fish and Wildlife Service
SFESO	U.S. Fish and Wildlife Service's South Florida Ecological Services Office
SPBO	Statewide Programmatic Biological Opinion
USGS	U.S. Geological Survey

CONSULTATION HISTORY

1980s and 1990s	Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s.
April 19, 2011	The Service issued the original SPBO concerning planning and regulatory sand placement projects in Florida and their effects on nesting sea turtles.
August 22, 2011	The Service issued their revised SPBO. The SPBO did not include take for the non-breeding piping plover or its designated Critical Habitat. Consultation for plovers was conducted on a case-by-case basis.
October 30, 2012	The Service and the Corps held the first annual meeting on the progress of the SPBO. The agencies discussed outstanding piping plover issues, including the proposed terms and conditions. The agencies agreed to conduct a separate re-initiation of consultation for piping plovers limited to peninsular Florida to programmatically address take of piping plovers.
May 7, 2013	The Corps sent a letter to the Service formally requesting a Programmatic Piping Plover Biological Opinion.
Other Collaboration	Numerous telephone conversations and e-mails were conducted between the Corps and the Service concerning the content of the P^3BO and initiation of consultation.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes activities associated with the placement of compatible sediment on beaches or in the nearshore region of Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and include coastal habitat features that function mostly unimpeded. Below is a list of currently known Optimal Piping Plover Areas:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or

f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely State-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

    a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
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    e. Crandon Park, Miami-Dade County (R-89 to R-101); and
    f. Sanibel Island, Lee County (R-109 to R-174).

ACTION AREA

The Action Area includes sandy beaches; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; bayside shorelines of bays and lagoons; and emergent nearshore sand bars of the Atlantic Coast (Nassau County to Miami-Dade County) and the Gulf Coast (Monroe County to Taylor County) of Florida (Figures 1 and 2). The proposed action includes the replacement and rehabilitation of groins utilized as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This P^3BO includes both Corps Regulatory and Civil Works activities. Both Corps Regulatory and Civil Works activities may include the involvement of other Federal agencies, such as the Department of Defense, BOEM, and the Federal Emergency Management Agency. The activities covered in the P^3BO encompass the following:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the BOEM;
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future sand placement actions addressed in this P^3BO may include maintenance of these existing projects or beaches that have not experienced a history of sand placement activities. Maintenance

dredging activities include dredging of both deep draft harbors and shallow draft inlets when these activities affect optimal piping plover habitat.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat description

The piping plover is a small, pale sand-colored shorebird, about 7 inches long with a wingspan of about 15 inches (Palmer 1967). Cryptic coloration is a primary defense mechanism for piping plovers where nests, adults, and chicks all blend in with their typical beach surroundings. Piping plovers on wintering and migration grounds respond to intruders (*e.g.,* pedestrian, avian and mammalian) usually by squatting, running, and flushing (flying).

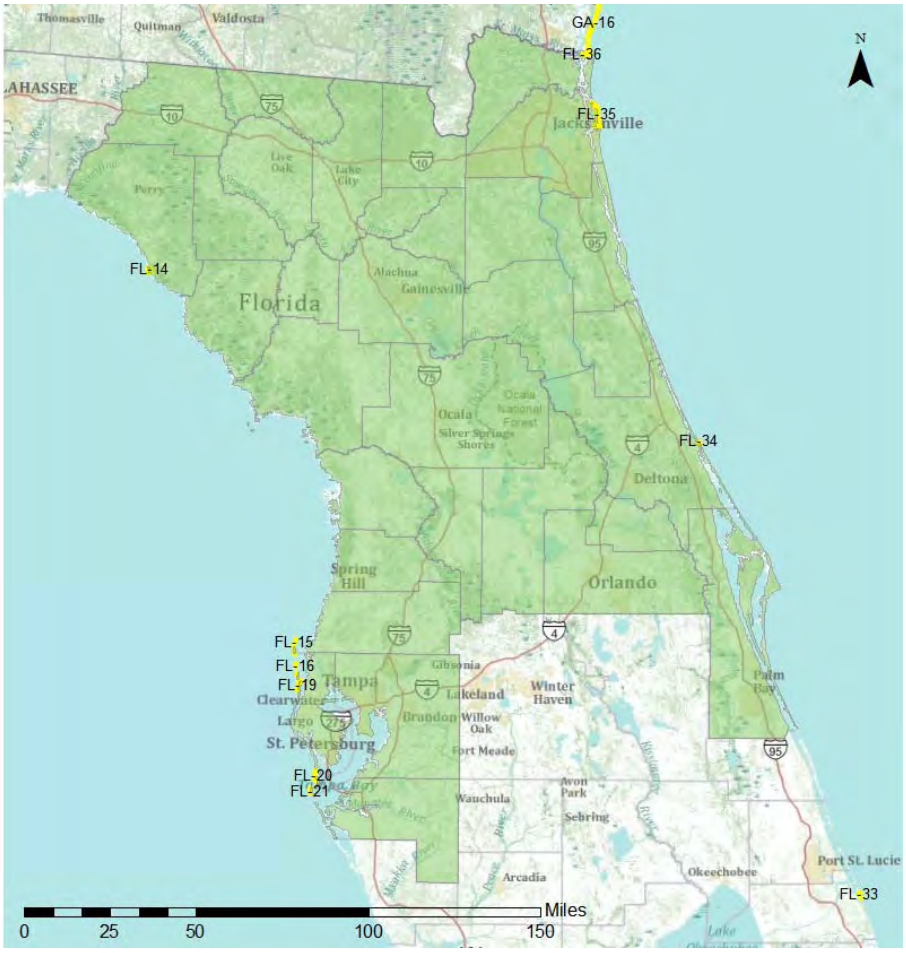

Figure 1 Piping plover designated Critical Habitat in the North Florida Ecological Services Field Office's area of responsibility**.**

On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (Service 1985). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Protection of the species under the Act reflects the species' precarious status range-wide.

Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plovers in the Action Area include individuals from all three breeding populations. Piping plover subspecies are phenotypically indistinguishable, and most studies in the nonbreeding range report results without regard to breeding origin. Although a recent analysis shows strong patterns in the wintering distribution of piping plovers from different breeding populations, partitioning is not complete and major information gaps persist.

Figure 2 Piping plover designated Critical Habitat in the South Florida Ecological Services Field Office's area of responsibility.

The Service has designated Critical Habitat for the piping plover on three occasions. Two of these designations protected different piping plover breeding populations. Critical Habitat for the Great Lakes breeding population was designated May 7, 2001 (66 Federal Register [FR] 22938, Service 2001a), and Critical Habitat for the northern Great Plains breeding population was designated September 11, 2002 (67 FR 57637, Service 2002). The Service designated Critical Habitat for wintering piping plovers on July 10, 2001 (66 FR 36038, Service 2001b). Wintering piping plovers may include individuals from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic Coast. The three separate designations of piping plover Critical Habitat demonstrate diversity of PCEs between the two breeding populations as well as diversity of PCEs between breeding and wintering populations.

Designated wintering piping plover Critical Habitat originally included 142 areas (the rule states 137 units; this is an error) encompassing approximately 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas.

The PCEs for piping plover wintering habitat essential for the conservation of the species are those habitat components that support foraging, roosting, and sheltering, and the physical features necessary for maintaining the natural processes that support these habitat components. The PCEs are found in geographically dynamic coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide (Service 2001a). PCEs of wintering piping plover Critical Habitat include sand or mud flats, or both, with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (Service 2001a). Important components of the beach/dune ecosystem include surf-cast algae, sparsely vegetated back beach and salterns, spits, and washover areas. Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. The units designated as Critical Habitat are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient to support future recovered populations, and the existence of this habitat is essential to the conservation of the species. Additional information on each specific unit included in the designation can be found at 66 FR 36038 (Service 2001a).

Life history

Piping plovers live an average of 5 years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years. Plovers are known to begin breeding as early as 1 year of age (MacIvor 1990; Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu et al. 1990; Cross 1990; Goldin et al. 1990; MacIvor 1990; Hake 1993). Piping plovers generally fledge only a single brood per season, but may re-nest several times if previous nests are lost. The reduction in suitable nesting habitat due to a number of

factors is a major threat to the species, likely limiting reproductive success and future recruitment into the population (Service 2009).

Plovers depart their breeding grounds for their wintering grounds between July and late August, but southward migration extends through November. More information about the three breeding populations of piping plovers can be found in the following documents:

a. Piping Plover, Atlantic Coast Population: 1996 Revised Recovery Plan (Service 1996);
b. 2009 Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation (Service 2009);
c. 2003 Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*) (Service 2003);
d. Questions and Answers about the Northern Great Plains Population of Piping Plover (Service 2002).

Piping plovers use habitats in Florida primarily from July 15 through May 15. Below (2010) surveyed plovers north of Marco Island, Florida, and found plovers color-banded during the surveys to have very high wintering site fidelity. Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (Service 1996). The pattern of both fall and spring counts at many Atlantic Coast sites demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to 1 month during their migrations (Noel and Chandler 2005; Stucker and Cuthbert 2006). Some midcontinent breeders travel up or down the Atlantic Coast before or after their overland movements (Stucker and Cuthbert 2006). Use of inland stopovers during migration is also documented (Pompei and Cuthbert 2004). The source breeding population of a given wintering individual cannot be determined in the field unless it has been banded or otherwise marked. Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a significant degree. While piping plover migration patterns and needs remain poorly understood, and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle.

Review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) found more than 3,400 fall and spring stopover records at 1,196 sites. Published reports indicated piping plovers do not concentrate in large numbers at inland sites and they seem to stop opportunistically. In most cases, reports of birds at inland sites were single individuals.

Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Data based on four rangewide mid-winter (late January to early February) population surveys, conducted at 5-year intervals starting in 1991, show that total numbers have fluctuated over time, with some areas experiencing increases and others decreases. Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (*e.g.,* inlet relocation, dredging of

shoals and spits). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Elliott-Smith et al. 2009). Similarly, the increase in the 2006 numbers in the Bahamas is attributed to greatly increased census efforts; the extent of additional habitat not surveyed remains undetermined (Elliott-Smith et al. 2009). Changes in wintering numbers may also be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area. Opportunities to locate previously unidentified wintering sites are concentrated in the Caribbean and Mexico (Elliott-Smith et al. 2009). Further surveys and assessment of seasonally emergent habitats (*e.g.,* seagrass beds, mudflats, oyster reefs) within bays lying between the mainland and barrier islands in Texas are also needed.

Midwinter surveys may underestimate the abundance of nonbreeding piping plovers using a site or region during other months. In late September 2007, 104 piping plovers were counted at the south end of Ocracoke Island, North Carolina (National Park Service 2007), where none were seen during the 2006 International Piping Plover Winter Census (Elliott-Smith et al. 2009). Noel et al. (2007) observed up to 100 piping plovers during peak migration at Little St. Simons Island, Georgia, where approximately 40 piping plovers wintered in 2003 to 2005. Differences among fall, winter, and spring counts in South Carolina were less pronounced, but inter-year fluctuations (*e.g.,* 108 piping plovers in spring 2007 versus 174 piping plovers in spring 2008) at 28 sites were striking (Maddock et al. 2009). Even as far south as the Florida Panhandle, monthly counts at Phipps Preserve in Franklin County ranged from a midwinter low of 4 piping plovers in December 2006, to peak counts of 47 in October 2006 and March 2007 (Smith 2007). Pinkston (2004) observed much heavier use of Texas Gulf Coast (ocean-facing) beaches between early September and mid-October (approximately 16 birds per mile) than during December to March (approximately 2 birds per mile).

Local movements of non-breeding piping plovers may also affect abundance estimates. At Deveaux Bank, one of South Carolina's most important piping plover sites, 5 counts at approximately 10-day intervals between August 27 and October 7, 2006, oscillated from 28 to 14 to 29 to 18 to 26 (Maddock et al. 2009). Noel and Chandler (2008) detected banded Great Lakes piping plovers known to be wintering on their Georgia study site in 73.8 $\pm$ 8.1 percent of surveys over 3 years.

Abundance estimates for non-breeding piping plovers may also be affected by the number of surveyor visits to the site. Preliminary analysis of detection rates by Maddock et al. (2009) found 87 percent detection during the midwinter period on core sites surveyed three times a month during fall and spring and one time per month during winter, compared with 42 percent detection on sites surveyed three times per year (Cohen 2009).

Gratto-Trevor et al. (2009) found strong patterns (but no exclusive partitioning) in winter distribution of uniquely banded piping plovers from four breeding populations (Figure 3).

All eastern Canada and 94 percent of Great Lakes birds wintered from North Carolina to southwest Florida. However, eastern Canada birds were more heavily concentrated in North Carolina, and a larger proportion of Great Lakes piping plovers were found in South Carolina and Georgia. Northern Great Plains populations were primarily seen farther west and south, especially on the Texas Gulf Coast. Although the great majority of Prairie Canada individuals were observed in Texas, particularly southern Texas, individuals from the U.S. Great Plains were more widely distributed on the Gulf Coast from Florida to Texas.

Figure 3 Distribution and range of *C. m. melodus:* Great Lakes DPS of *C. m. circumcinctus*, Northern Great Plains DPS of *C. m. circumcinctus* (base map from Elliott-Smith and Haig 2004 by permission of Birds of North America Online, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology). Note that this map is a conceptual presentation of subspecies and DPS ranges, and is not intended to convey precise boundaries.

The findings of Gratto-Trevor et al. (2009) provide evidence of differences in the wintering distribution of piping plovers from these four breeding areas. However, the distribution of birds by breeding origin during migration remains largely unknown. Other major information gaps include the wintering locations of the U.S. Atlantic Coast breeding population (banding of U.S. Atlantic Coast piping plovers has been extremely limited) and the breeding origin of piping plovers wintering on Caribbean islands and in much of Mexico.

Banded piping plovers from the Great Lakes, Northern Great Plains, and eastern Canada breeding populations showed similar patterns of seasonal abundance at Little St. Simons Island, Georgia (Noel et al. 2007). However, the number of banded plovers originating from the latter two populations was relatively small at this study area.

This species exhibits a high degree of intra- and interannual wintering site fidelity (Nicholls and Baldassarre 1990a; Drake et al. 2001; Noel and Chandler 2005; Stucker and Cuthbert 2006). Gratto-Trevor et al. (2009) reported that 6 of 259 banded piping plovers observed more than once per winter moved across boundaries of the 7 U.S. regions. Of 216 birds observed in different years, only 8 changed regions between years, and several of these shifts were associated with late summer or early spring migration periods (Gratto-Trevor et al. 2009). Total number of individuals observed on the wintering grounds was 46 for Eastern Canada, 150 for the U.S. Great Lakes, 169 for the U.S. Great Plains, and 356 for Prairie Canada.

Local movements are more common. In South Carolina, Maddock et al. (2009) documented many cross-inlet movements by wintering banded piping plovers as well as occasional movements of up to 11.2 miles by approximately 10 percent of the banded population. Larger movements within South Carolina were seen during fall and spring migration. Similarly, eight banded piping plovers that were observed in two locations during 2006 and 2007 surveys in Louisiana and Texas were all in close proximity to their original location (Maddock 2008).

In 2001, 2,389 piping plovers were located during a winter census, accounting for only 40 percent of the known breeding birds recorded during a breeding census (Ferland and Haig 2002). About 89 percent of birds that are known to winter in the U.S. do so along the Gulf Coast (Texas to Florida), while 8 percent winter along the Atlantic Coast (North Carolina to Florida).

The status of piping plovers on winter and migration grounds is difficult to assess, but threats to piping plover habitat used during winter and migration identified by the Service during its designation of Critical Habitat continue to affect the species. Unregulated motorized and pedestrian recreational use, inlet and shoreline stabilization projects, beach maintenance and nourishment, and pollution affect most winter and migration areas. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat.

The 2004 and 2005 hurricane seasons affected a substantial amount of habitat along the Gulf Coast. Habitats such as those along Gulf Islands National Seashore have benefited from increased washover events which created optimal habitat conditions for piping plovers. Conversely, hard shoreline structures are put into place following storms throughout the species range to prevent such shoreline migration (see *Factors Affecting the Species Habitat within the Action Area*). Four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Census tallied more than 350 piping plovers. Comparison of imagery taken 3 years before and several days after Hurricane Katrina found that the Chandeleur Islands lost 82 percent of their surface area (Sallenger et al. in review), and a review of aerial photography prior to the 2006 Census suggested little piping plover habitat remained (Elliott-Smith et al. 2009). However, Sallenger et al. (in review) noted that habitat changes in the Chandeleurs stem not only from the effects of these storms, but rather from the combined effects of the storms, long-term (greater than 1,000 years) diminishing sand supply, and sea-level rise relative to the land.

The Service is aware of the following site specific conditions that affect the status of several habitats piping plover use while wintering and migrating, including Critical Habitat Units. In Texas, one Critical Habitat Unit was afforded greater protection due to the acquisition of adjacent upland properties by the local Audubon chapter. In another unit in Texas, vehicles were removed from a portion of the beach decreasing the likelihood of automobile disturbance to plovers. Exotic plant removal is occurring in another Critical Habitat Unit in South Florida. The Service and other government agencies remain in a contractual agreement with the U.S. Department of Agriculture for predator control within limited coastal areas in the Florida panhandle, including portions of some Critical Habitat Units. Continued removal of potential terrestrial predators is likely to enhance survivorship of wintering and migrating piping plovers. In North Carolina, one Critical Habitat Unit was afforded greater protection when the local Audubon chapter agreed to manage the area specifically for piping plovers and other shorebirds following the relocation of a nearby inlet channel.

Biogeography and Habitat Preferences

Wintering piping plovers prefer coastal habitats that include sand spits, islets (small islands), tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Harrington 2008). Sandy mud flats, ephemeral pools, and overwash areas are also considered primary foraging habitats. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds (Cohen et al. 2008). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990a).

Recent study results in North Carolina, South Carolina, and Florida, complement information from earlier investigations in Texas and Alabama (summarized in the 1996 Atlantic Coast and 2003 Great Lakes Recovery Plans) regarding habitat use patterns of piping plovers in their coastal migration and wintering range. As documented in Gulf Coast studies, nonbreeding piping plovers in North Carolina primarily used sound (bay or bayshore) beaches and sound islands for foraging and ocean beaches for roosting, preening, and being alert (Cohen et al. 2008). The probability of piping plovers being present on the sound islands increased with increasing exposure of the intertidal area (Cohen et al. 2008). Maddock et al. (2009) observed shifts to roosting habitats and behaviors during high-tide periods in South Carolina.

LeDee et al. (2008) conducted a remote analysis of piping plover wintering sites, measuring 11 ecological parameters to determine their correlation to piping plover presence. Piping plover abundance was negatively correlated with urban area and total road length, and positively correlated with inter-tidal area, presence on the mainland (as opposed to the peninsula/island feature), and total inter-tidal and beach area (LeDee et al. 2008).

Recent geographic analysis of piping plover distribution on the upper Texas coast noted major concentration areas at the mouths of rivers, washover passes (low, sparsely vegetated barrier island habitats created and maintained by temporary, storm-driven water channels), and major bay systems (Arvin 2008). Earlier studies in Texas have drawn attention to washover passes,

which are commonly used by piping plovers during periods of high bayshore tides and during the spring migration period (Zonick 1997; Zonick 2000). Elliott-Smith et al. (2009) reported piping plover concentrations on exposed seagrass beds and oyster reefs during seasonal low water periods in 2006.

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea-level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or the Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). West-central Florida beaches are considered to be low energy beaches with a gradual offshore slope and fine-grained, quartz sand beaches. The dynamics of the Florida shoreline are shaped by the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. The East coast may also experience erosion from late September through March due to nor'easters. Gulf beaches are largely protected from severe nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of 7 feet at the Florida-Georgia line to less than 2 feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than 3 feet (microtidal) except in the extreme south where it ranges from 3 to 4 feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Foraging/Food Habits

Behavioral observations of piping plovers on the wintering grounds suggest that they spend the majority of their time foraging (Nicholls and Baldassarre 1990a; Drake 1999a, 1999b). Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, and ephemeral pools, and adjacent salt marshes (Gibbs 1986; Zivojnovich and Baldassarre 1987; Nicholls 1989; Coutu et al. 1990; Nicholls and Baldassarre 1990a; Nicholls and Baldassarre 1990b; Hoopes 1993; Loegering 1992; Goldin 1993; Elias-Gerken 1994; Wilkinson and Spinks 1994; Zonick 1997; Service 2001a). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993; Hoopes 1993). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994; Zonick 1997), and at all stages in the tidal cycle (Goldin 1993; Hoopes 1993). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and

occasionally bivalve mollusks found on top of the soil or just beneath the surface (Bent 1929; Cairns 1977; Nicholls 1989; Zonick and Ryan 1996).

As observed in Texas studies, Lott et al. (2009) identified bay beaches (bay shorelines as opposed to ocean-facing beaches) as the most common landform used by foraging piping plovers in southwest Florida. However in northwest Florida, Smith (2007) reported landform use by foraging piping plovers about equally divided between Gulf of Mexico (ocean-facing) and bay beaches. Exposed intertidal areas were the dominant foraging substrate in South Carolina (accounting for 94 percent of observed foraging piping plovers; Maddock et al. 2009) and in northwest Florida (96 percent of foraging observations; Smith 2007). In southwest Florida, Lott et al. (2009) found approximately 75 percent of foraging piping plovers on intertidal substrates.

Home Range

Plovers seem to exhibit strong site fidelity to nonbreeding areas. Plovers vary their habitat use, and it is suggested heterogeneous habitats may be more important than specific habitat features for plovers (Drake et al. 2001; Nicholls and Baldassarre 1990b). Mean home range size (95 percent of locations) for 49 radio-tagged piping plovers in southern Texas in 1997 through 1998 was 3,113 acres, mean core area (50 percent of locations) was 717 acres, and the mean linear distance moved between successive locations (1.97 $\pm$ 0.04 days apart) averaged across seasons, was 2.1 miles (Drake 1999a; Drake et al. 2001). Seven radio-tagged piping plovers used a 4,967-acre area (100 percent minimum convex polygon) at Oregon Inlet in 2005 and 2006, and piping plover activity was concentrated in 12 areas totaling 544 acres (Cohen et al. 2008). Noel and Chandler (2008) observed high fidelity of banded piping plovers along a 0.62 and 2.8 mile section of beach on Little St. Simons Island, Georgia.

Life Cycle

Piping plovers spend up to 10 months of their life cycle on their migration and at wintering grounds, generally July 15 through as late as May 15. Piping plover migration routes and habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from breeding or wintering piping plovers. Migration stopovers by banded piping plovers from the Great Lakes have been documented in New Jersey, Maryland, Virginia, and North Carolina (Stucker and Cuthbert 2006). Migrating breeders from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault et al. 2005). As many as 85 staging piping plovers have been tallied at various sites in the Atlantic breeding range (Perkins 2008), but the composition (*e.g.,* adults that nested nearby and their fledged young of the year versus migrants moving to or from sites farther north), stopover duration, and local movements are unknown. In general, distance between stopover locations and duration of stopovers throughout the coastal migration range remains poorly understood.

Predators and Competitors

Plovers face predation by avian and mammalian predators that are present year-round on the wintering grounds. There are minimal studies on the impacts of predation on migrating or wintering piping plovers, and investigations into effects of predation on nonbreeding piping plovers falls under the Great Lakes recovery plan. Predator control on their wintering and migration grounds is considered to be a low priority at this time, except for the threat of disturbance to roosting and feeding piping plovers posed by dogs off leash (Service 2009). Plovers must compete with other shorebirds for suitable foraging and roosting habitat.

Disease Factors

Neither the final listing rule nor the recovery plans state that disease is an issue for the species, and no plan assigns recovery actions to this threat factor. The Piping Plover 5-Year Review: Summary and Evaluation provides additional information on the limited concern of avian influenza and West Nile virus on the species (Service 2009).

Roosting

Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers. Lott et al. (2009) found greater than 90 percent of roosting piping plovers in southwest Florida in old wrack with the remainder roosting on dry sand. In South Carolina, 18 and 45 percent of roosting piping plovers were in fresh and old wrack, respectively. The remainder of roosting birds used intertidal habitat (22 percent), backshore (defined as the zone of dry sand, shell, cobble and beach debris from the mean high water line up to the toe of the dune; 8 percent), washover (2 percent), and ephemeral pools (1 percent) (Maddock et al. 2009). Thirty percent of roosting piping plovers in northwest Florida were observed in wrack substrates with 49 percent on dry sand and 20 percent using intertidal habitat (Smith 2007). In Texas, seagrass debris (bayshore wrack) was an important feature of piping plover roosting sites (Drake 1999a). Mean abundance of two other plover species in California, including the listed western snowy plover, was positively correlated with an abundance of wrack during the nonbreeding season (Dugan et al. 2003).

Seven years of surveys, two to three times per month, along 8 miles of Gulf of Mexico (ocean-facing) beach in Gulf County, Florida, cumulatively documented nearly the entire area used at various times by roosting or foraging piping plovers. Birds were reported using the midbeach to the intertidal zone. Numbers ranged from 0 to 39 birds on any given survey day (Eells unpublished data).

Atlantic Coast and Florida studies highlighted the importance of inlets for nonbreeding piping plovers. Almost 90 percent of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott et al. 2009). Piping plovers were among seven shorebird species found more often than expected ($p = 0.0004$; Wilcoxon Test Scores) at inlet locations versus

noninlet locations in an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008).

Population dynamics

Population Size

The International Piping Plover Breeding Census is conducted throughout the breeding grounds every 5 years by the Great Lakes/Northern Great Plains Recovery Team of the U.S. Geological Survey (USGS). The census is the largest known, complete avian species census, and is coordinated by Elise Elliott Smith and various state and provincial coordinators. It is designed to determine species abundance and distribution throughout its annual cycle. The last survey in 2006 documented 3,497 breeding pairs, with a total of 8,065 birds throughout Canada and the U.S. A more recent 2010 Atlantic Coast breeding piping plover population estimate was 1,782 pairs, which was more than double the 1986 estimate of 790 pairs. This was determined to be a net increase of 86 percent between 1989 and 2010 (Service 2011). An associated winter census documented a total of 454 piping plovers in Florida (Elliott-Smith et al. 2009). For the Gulf Coast of Florida, the surveys documented 321 piping plovers at 117 sites covering approximately 522 miles of suitable habitat (Elliott-Smith et al 2009). A total of 133 plovers were observed along the Atlantic Coast during the 2009 survey, and Northwest Florida numbers for the 2006 International Piping Plover Census were 111, with an increased survey effort from previous years. This represents an increase from the 53 piping plovers sighted in the 2001 effort. More information on the results of past International Piping Plover Censuses and an analysis of the data is found in the 2009 Service's Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) and in the report published by the USGS (Elliott-Smith et al. 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. Although multiple observations of the same bird may have been documented, these reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR.

Population Variability

The pattern of population growth among the recovery units along the Atlantic Coast was uneven, and was accompanied by periodic declines in both overall and regional populations (Service 2011). Although there is some indication of recovery in the Atlantic Coast population, any optimism should be tempered by observed geographic and temporal variability in population growth.

Population Stability

The most consistent finding in the various population viability analyses conducted for piping plovers (Ryan et al. 1993; Melvin and Gibbs 1996; Plissner and Haig 2000; Wemmer et al. 2001; Larson et al. 2002; Amirault et al. 2005; Calvert et al. 2006; Brault 2007) indicates even small declines in adult and juvenile survival rates will cause increases in extinction risk. A banding study conducted between 1998 and 2004 in Atlantic Canada concluded lower return rates of juvenile (first year) birds to the breeding grounds than was documented for Massachusetts (Melvin and Gibbs 1996), Maryland (Loegering 1992), and Virginia (Cross 1996) breeding populations in the mid-1980s and very early 1990s. This is consistent with failure of the Atlantic Canada population to increase in abundance despite high productivity (relative to other breeding populations) and extremely low rates of dispersal to the U.S. over the last 15 plus years (Amirault et al. 2005). This suggests maximizing productivity does not ensure population increases. However, other studies suggest that survivability is good at wintering sites (Drake et al. 2001). Please see the Piping Plover 5-Year Review: Summary and Evaluation for additional information on survival rates at wintering habitats (Service 2009).

Status and distribution

Reasons for Listing

The 1985 final rule stated the number of piping plovers on the Gulf of Mexico coastal wintering grounds might be declining as indicated by preliminary analysis of the Christmas Bird Count data. Independent counts of piping plovers on the Alabama coast indicated a decline in numbers between the 1950s and early 1980s. At the time of listing, the Texas Parks and Wildlife Department stated 30 percent of wintering habitat in Texas had been lost over the previous 20 years. The final rule also stated, in addition to extensive breeding area problems, the loss and modification of wintering habitat was a significant threat to the piping plover.

Threats to Piping Plovers

The Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) provides an analysis of threats to piping plovers in their migration and wintering range. The threats identified in this document that were of primary concern included the loss and modification of wintering habitat (including shoreline development, beach maintenance and nourishment, inlet dredging, and the construction of jetties and groins).

The Piping Plover 5-Year Review: Summary and Evaluation noted that overutilization for commercial, recreational, scientific, or educational purposes was not a current threat to piping plovers on their wintering and migration grounds. Disease was identified as being only a minor threat. The impacts of predation on nonbreeding populations are largely undocumented, but they remain a potential threat. However, the Service considers predator control on piping plover wintering and migration grounds to be a low priority at this time (Service 2009).

Neither the final listing rule nor the recovery plans state disease is an issue for piping plover, and no plan assigns recovery actions to this threat factor. Based on information available to date, West Nile virus and avian influenza are a minor threat to piping plovers (Service 2009).

Habitat loss and degradation on winter and migration grounds from shoreline and inlet stabilization efforts, both within and outside of designated Critical Habitat, remains a serious threat to all piping plover populations. In some areas, beaches that abut private property are needed by wintering and migrating piping plovers. However, residential and commercial developments that typically occur along private beaches may pose significant challenges for efforts to maintain natural coastal processes. The threat of habitat loss and degradation, combined with the threat of sea-level rise associated with climate change, raise serious concerns regarding the ability of private beaches to support piping plovers over the long term.

Future actions taken on private beaches will determine whether piping plovers continue to use these beaches or whether the recovery of piping plovers will principally depend on public property. As Lott et al. (2009) concludes, "The combination of development and shoreline protection seems to limit distribution of non-breeding piping plovers in Florida. If mitigation or habitat restoration efforts on barrier islands fronting private property are not sufficient to allow plover use of some of these areas, the burden for plover conservation will fall almost entirely on public land managers."

While public lands may not be at risk of habitat loss from private development, significant threats to piping plover habitat remain on many municipal, State, and federally owned properties. These public lands may be managed with competing missions that include conservation of imperiled species, but this goal frequently ranks below providing recreational enjoyment to the public, readiness training for the military, or energy development projects.

Public lands remain the primary places where natural coastal dynamics are allowed. Of recent concern are requests to undertake beach nourishment actions to protect coastal roads or military infrastructure on public lands. If project design does not minimize impediments to shoreline overwash which are necessary to help replenish bayside tidal flat sediments and elevations, significant bayside habitat may become vegetated or inundated, thereby exacerbating the loss of preferred piping plover habitat. Conversely, if beach fill on public lands is applied in a way that allows for "normal" system overwash processes, and sediment is added back to the system, projects may be less injurious to barrier island species that depend on natural coastal dynamics.

Maintaining wrack for food and cover in areas used by piping plovers may help offset effects that result from habitat degradation due to sand placement associated with berm and beach nourishment projects and ensuing human disturbance. Leaving wrack on private beaches may improve use by piping plovers, especially during migration when habitat fragmentation may have a greater effect on the species. In addition, using recreation management techniques, Great Lakes recovery action 2.14 may minimize the effects of habitat loss. Addressing off-road vehicles and pet disturbance may increase the suitability of existing piping plover habitat.

The dredging and mining of sediment from inlet complexes threatens the piping plover on its wintering grounds through habitat loss and degradation. The maintenance of deep draft navigation channels by dredging can alter the natural coastal processes on inlet shorelines of nearby barrier islands (Service 2012). Forty-four percent of the tidal inlets within the U.S. wintering range of the piping plover have been or continue to be dredged, primarily for navigational purposes. The dredging of navigation channels or relocation of inlet channels for erosion-control purposes contributes to the cumulative effects of inlet habitat modification by removing or redistributing the local and regional sediment supply. Dredging can occur on an annual basis or every 2 to 3 years, resulting in continual perturbations and modifications to inlets and their adjacent shoreline habitats (Service 2012).

As sand sources for beach nourishment projects have become more limited, ebb tidal shoals are being utilized as borrow areas more frequently. Exposed ebb and flood tidal shoals and sandbars are prime roosting and foraging habitats for piping plovers. In general, these shoals are only accessible by boat and tend to receive less human recreational use than nearby mainland beaches. This mining of material from inlet shoals for use as beach fill is not equivalent to the natural sediment bypassing due to the virtually instantaneous movement of sand. In a natural system, the sand would gradually and continuously move through the inlet system, providing a greater opportunity for emergent shoals to form (Service 2012).

The Deepwater Horizon oil spill, which started April 20, 2010, discharged into the Gulf of Mexico through July 15, 2010. According to government estimates, the leak released between 100 and 200 million gallons of oil into the Gulf. The U.S. Coast Guard estimates that more than 50 million gallons of oil have been removed from the Gulf, or roughly a quarter of the spill amount. Additional effects to natural resources may be attributed to the 1.84 million gallons of dispersant applied to the spill. As of July 2010, approximately 625 miles of Gulf Coast shoreline was oiled (approximately 360 miles in Louisiana, 105 miles in Mississippi, 66 miles in Alabama and 94 miles in Florida) (Joint Information Center 2010). These numbers reflect a daily snapshot of shoreline that experienced effects from oil; however, they do not include cumulative effects to date, or shoreline that has already been cleaned.

Piping plovers have continued to winter within the Gulf of Mexico shorelines. Researchers have and continue to document oiled piping plovers stemming from this spill. Oiling of designated piping plover Critical Habitat has been documented. Affects to the species and its habitat are expected, but their extent remains difficult to predict. The U.S. Coast Guard, the states, and responsible parties from the Unified Command, with advice from Federal and State natural resource agencies, initiated protective and cleanup efforts per prepared contingency plans to deal with petroleum and other hazardous chemical spills for each state's coastline. The contingency plans identify sensitive habitats, including all federally listed species' habitats, which receive a higher priority for response actions. Those plans allow for immediate habitat protective measures for cleanup activities in response to large contaminant spills. While such plans usually ameliorate the threat to piping plovers, it is yet unknown how much improvement will result in this case given the breadth of the effects associated with the Deepwater Horizon incident.

Based on all available data prior to the Deepwater Horizon oil spill, the risk of effects from contamination to piping plovers and their habitat was recognized, but the safety contingency plans were considered adequate to alleviate most of these concerns. The Deepwater Horizon incident has brought heightened awareness of the intensity and extent of impacts to fish and wildlife habitat from large-scale releases. In addition to potential direct habitat degradation from oiling of intertidal habitats and retraction of stranded boom, effects to piping plovers may occur from the increased human presence associated with boom deployment and retraction, cleanup activities, wildlife response, and damage assessment crews working along shorelines. Research studies are documenting the potential expanse of effects to the piping plover.

Analysis of the species/Critical Habitat likely to be affected

The proposed action has the potential to adversely affect wintering and migrating piping plovers and their habitat from all three breeding populations that may use the Action Area. The Atlantic Coast and Great Plains breeding populations of piping plover are listed as threatened, while the Great Lakes breeding population is listed as endangered. Therefore, this P^3BO considers the potential effects of this project on this species and its designated Critical Habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres (corresponding to approximately 47 miles of beach) as Critical Habitat for wintering piping plovers in peninsular Florida. There are no Corps civil works shore protection projects located in designated Critical Habitat. There are five Corps civil works navigation projects that typically place dredged material in Critical Habitat Units: King's Bay (Unit FL-36), Ponce Inlet (Unit FL-34), St. Lucie Inlet (Unit FL-33), Matanzas Pass (Unit FL-25), and Tampa Harbor (Unit FL-21). Maintenance dredging at these navigational channels typically occurs on 1 to 5 year intervals. These five units account for 1,749 acres (10 miles) of the 23,709 acres of total designated Critical Habitat in the Action Area (or 7.4 percent). These and other Critical Habitat Units may also be affected by non-Civil Works projects under Corps regulatory authority.

This P^3BO does not rely on the regulatory definition of "destruction or adverse modification" of Critical Habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to Critical Habitat.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area

As mentioned in Section II(C)1, the 2006 International Piping Plover Census surveys documented 321 wintering piping plovers at 117 sites covering approximately 522 miles of suitable habitat along the Gulf Coast of Florida, and an additional 133 plovers along the Atlantic Coast (Elliott-Smith et al 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several

Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. These reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR. It is important to note many of these observations may be multiple observations of the same specimen; therefore, these numbers do not represent a population estimate.

The Action Area encompasses 11 Critical Habitat Units in the NFESO's AOR (Figure 1), and an additional 11 Critical Habitat Units in the SFESO's AOR (Figure 2). The descriptions of the Critical Habitat Units associated with the proposed action vary, but generally include land from mean lower low water to where densely vegetated habitat or developed structures, not used by piping plovers, begin and where the PCEs no longer occur. The PCEs consist of intertidal flats including sand or mud flats with no or very sparse emergent vegetation. In addition, adjacent unvegetated or sparely vegetated sand, mud, or algal flats above high tide are important.

Factors affecting the species environment within the Action Area

Coastal development

Shoreline development throughout the wintering range poses a threat to all populations of piping plovers. Beach maintenance and nourishment, inlet dredging, and artificial structures, such as jetties and groins, can eliminate wintering areas and alter sedimentation patterns leading to the loss of nearby habitat. Structural development along the shoreline or manipulation of natural inlets upsets the dynamic processes and results in habitat loss or degradation (Melvin et al. 1991). Increased coastal development brings other recreational disturbances that are known to prevent bird usage of an area, including human disturbance, predation or disturbance by domestic animals, beach raking and cleaning, and habitat degradation by off-road vehicles (Service 2009).

Recreational management techniques, such as vehicle restrictions, pet restrictions, and symbolic fencing (usually sign posts and string) of roosting and feeding habitats, can help to address anthropogenic disturbances to wintering plovers. Educational materials, such as informational signs or brochures, can also provide valuable information to assist the public in understanding the need for conservation measures. Although these measures can be effective, they are not implemented consistently throughout the State.

Accelerated sea-level rise

Potential effects of sea-level rise on coastal beaches vary regionally due to subsidence or uplift as well as the geological character of the coast and nearshore (Service 2009). Low elevations and proximity to the coast make all nonbreeding coastal piping plover foraging and roosting habitats vulnerable to the effects of rising sea-level. Furthermore, areas with small astronomical tidal ranges (*e.g.*, portions of the Gulf Coast where intertidal range is less than 3.3 feet) are the most vulnerable to loss of intertidal wetlands and flats induced by sea-level rise (EPA 2009).

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat that lies immediately seaward of numerous structures or roads, especially if those shorelines are also armored with hardened structures. Without development or armoring, low undeveloped islands can migrate toward the mainland, pushed by the overwashing of sand eroding from the seaward side and being re-deposited in the bay (Scavia et al. 2002). Overwash and sand migration are impeded on developed portions of islands. Instead, as sea-level increases, the ocean-facing beach erodes and the resulting sand is deposited offshore. The buildings and the sand dunes then prevent sand from washing back toward the lagoons, and the lagoon side becomes increasingly submerged during extreme high tides (Scavia et al. 2002), diminishing both barrier beach shorebird habitat and protection for mainland developments.

A number of groups have met to discuss climate change and its potential impacts to Florida. In 2007, Governor Charlie Crist hosted "Serve to Preserve: A Florida Summit on Global Climate Change." To combat climate change, this summit focused on methods for reducing emissions to avoid contributing to climate change. It did not address efforts to limit coastal development or to encourage more natural coastal processes. Based on the present level of available information concerning the effects of global climate change on the status of the piping plover and its designated Critical Habitat, the Service acknowledges the potential for changes to occur in the Action Area.

Sand placement activities

Sand placement projects have the potential to alter piping plover habitat, including the PCEs of Critical Habitat. Beach nourishment can create a beach seaward of existing hard stabilization or heavy development, where the beach has been lost due to erosion and/or sea-level rise, restoring associated ecosystem functions. Although dredge and fill projects that place sand on beaches or dunes may restore lost or degraded habitat, these projects may degrade habitat by altering the natural sediment composition and depressing the invertebrate base in some areas. This hinders habitat migration with sea-level rise, and replaces the natural dune beach nearshore system with artificial geomorphology (Service 2012). Lott et al. (2009) found a strong negative correlation between sand placement projects and the presence of plovers on the Gulf Coast of Florida; however, he noted that additional research was needed to clarify whether the cause was the sand placement project or the tendency for these projects to be located on highly developed shorelines. Harrington (2008) noted the need for a better understanding of the potential effects of inlet-related projects, such as jetties, on bird habitats.

In areas where the shoreline is highly eroded, sand placement activities can improve piping plover foraging and roosting habitat (National Research Council 1995). Sand placement activities add sand to the sediment budget, increasing the beach width and providing a sand source for emergent nearshore features to form. Although there is some research related to the management of beach nourishment projects to better maintain the habitat for piping plovers, much of this research is focused on beaches in the northern U.S. where breeding occurs (Melvin et al. 1991; Houghton 2005; Maslo et al. 2010). In their wintering grounds, increasing beach

width is an important aspect of beach nourishment projects in highly developed, eroding areas. The timing of the project is also important in preventing impacts to piping plovers as a result of sand placement activities.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on wintering piping plovers within the Action Area. The analysis includes effects of interrelated and interdependent activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by wintering piping plovers. Since piping plovers can be present on these beaches for up to 10 months per year, construction is likely to occur while the species is utilizing these beaches and associated habitats. Short-term and temporary impacts to piping plover activities could result from project work occurring on the beach that flushes birds from roosting or foraging habitat. Long-term impacts could include a hindrance in the ability of wintering plovers to recuperate from their migratory flight from their breeding grounds, survive on their wintering areas, or to build fat reserves in preparation for migration back to their breeding grounds. Long-term impacts may also result from changes in the physical characteristics of the beach from the placement of the sand.

Proximity of the action

Maintenance dredging of navigational inlets occurs throughout the state in both Federal and non-Federal channels. Sand placement activities (resulting from both shore protection projects and placement of dredged materials as a result of maintenance dredging activities) would occur within and adjacent to wintering piping plover foraging and roosting habitats. Groin and jetty repair or replacement would occur adjacent to inlets, or along beach habitats where they may be used to stabilize the beach and limit erosion.

Distribution

Sand placement activities that may impact piping plover roosting and foraging would occur along both the Gulf of Mexico and the Atlantic Ocean coasts. The Service expects the proposed construction activities could directly and indirectly affect the availability of habitat for migrating and wintering piping plovers to roost and forage. The proposed construction activities are also expected to cause piping plovers usage of Critical Habitat Units located within the Action Area to temporarily decrease.

Timing

The timing of maintenance dredging, sand placement, and groin/jetty repairs or replacement activities may occur during or outside of the migration and wintering period for piping plovers (July 15 to May 15). For projects occurring outside of the migration and wintering period, the Service expects indirect effects to occur later in time.

Nature of the effect

Although the Service expects direct short-term effects from disturbance during project construction, it is anticipated the action will also result in direct, and indirect, long term effects to piping plovers and Critical Habitat. The Service expects there may be morphological changes to piping plover habitat, including roosting and foraging habitat, and to Critical Habitat within the Action Area. Activities that affect or alter the use of optimal habitat, Critical Habitat, or increase disturbance to the species may decrease the survival and recovery potential of the piping plover. Effects to piping plovers and their habitat as a result of groin and jetty repair or replacement will primarily be due to construction ingress and egress when construction is required to be conducted from land. In addition, construction materials and equipment may need to be stockpiled on the beach. These effects would be more likely to be experienced with repair or replacement of groin structures that are located in shallower water, as the majority of work done to jetties is conducted from the water or from the crest of the structure (Martin 2013).

Duration

Time to complete the project construction varies depending on the project size, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). According to Corps estimations, project work could take as little as 1 month and as long as 2 years. Piping plover habitats would remain disturbed until the project is completed and the habitats are restored. Beach restoration projects would typically be complete in 6 to 12 months. The direct effects would be expected to be short-term in duration, until the benthic community reestablishes within the new beach profile. Indirect effects from the activity, including those related to altered sand transport systems, may continue to occur as long as sand remains on the beach.

The effects of the proposed action are of a temporary quantitative and qualitative nature. The habitat will be temporarily unavailable to wintering plovers during the construction period, and the quality of the habitat will be reduced for several months following project activities. Dredging in inlets where emergent shoals have formed would result in a loss of optimal piping plover habitat, which may or may not reform in the same quality or quantity in the future. Dredging inlets, repairing and replacing groins or jetties, or sand placement during months when piping plovers are present causes disturbance that disrupts the birds' foraging efficiency and hinders their ability to build fat reserves over the winter and in preparation for migration, as well as their recuperation from migratory flights (Service 2009). The mean linear distance moved by wintering plovers from their core area is estimated to be approximately 2.1 miles (Drake et al.

2001), suggesting they could be negatively impacted by temporary disturbances anywhere in their core habitat area. The PCEs associated with designated Critical Habitat would be temporarily adversely affected during and following sand placement, but may also experience some positive benefits from the increase in available beach and its associated new wrack.

Disturbance frequency

The frequency of maintenance dredging activities varies greatly, and can be as often as annually or semiannually at some inlets that experience high rates of shoaling, or as infrequently as once every 7 years at inlets that do not experience high rates of shoaling. Sand placement activities as a result of shore protection activities typically occur once every 5 to 7 years. Dredging and sand placement can occur at any time during the year based on availability of funding, other applicable species' windows, and the availability of dredges to conduct the work.

The disturbance frequency related to groin and jetty repair and replacement varies greatly based on the original construction methodology, the construction materials, and the conditions under which the structure is placed. Most structures in Florida are constructed with Florida limerock or granite (preferred). Granite structures can last 50 years or more without requiring maintenance, while limerock structures may require maintenance on a slightly more frequent basis due to their lower densities. On average, hard structures are designed to require only minor repairs (such as replacing dislocated rock) that would only be expected approximately every 20 years (Martin 2013).

Disturbance severity

The Action Area encompasses a large percentage of the wintering range of the piping plover; however, the overall intensity of the disturbance is expected to be minimal. The intensity of the effect on piping plover habitat may vary depending on the frequency of the sand placement activities, the existence of staging areas, and the location of the beach access points. The severity is also likely to be slight, as plovers located within the Action Area are expected to move outside of the construction zone due to disturbance; therefore, no plovers are expected to be directly taken as a result of this action.

Analyses for effects of the action

The Action Area encompasses peninsular Florida within the AORs of the NFESO and the SFESO on both the Atlantic and Gulf coasts of Florida. It consists mostly of designated piping plover Critical Habitat Units and publicly owned land that exhibits the following features: located within 1 mile of an inlet; emergent nearshore sand bars; washover fans; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; or bayside shorelines of bays and lagoons.

Direct effects

Sand placement projects that utilize beach compatible material from either an appropriate borrow site or from the authorized Federal channel, have the potential to elevate the beach berm and widen the beach, providing storm protection and increasing recreational space. The construction window (*i.e.,* sand placement, dredging, groin and jetty repair/replacement) for each event is likely to extend through a portion of at least one piping plover migration and winter season. If material is placed on the beach, heavy machinery and equipment (*e.g.,* trucks and bulldozers operating on Action Area beaches, the placement of the dredge pipeline, and sand placement) may adversely affect migrating and wintering piping plovers in the Action Area by disturbing and disrupting normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat in adjacent areas along the shoreline. Sand placement may occur in and adjacent to habitat that appears suitable for roosting and foraging piping plovers, or that will become more optimal with time. Short-term and temporary construction effects to piping plovers will occur if the birds are roosting and feeding in the area during a migration stopover. The deposition of sand may temporarily deplete the intertidal food base along the shoreline and temporarily disturb roosting birds during project construction.

For some highly eroded beaches, sand placement will have a beneficial effect on the habitat's ability to support wintering piping plovers. Narrow beaches that do not support a productive wrack line may see an improvement in foraging habitat available to piping plovers following sand placement. The addition of sand to the sediment budget may also increase a sand-starved beach's likelihood of developing habitat features valued by piping plovers, including washover fans and emergent nearshore sand bars.

Maintenance dredging of shallow-draft inlets can occasionally require the removal of emergent shoals that may have formed at the location of the Federally-authorized channel from the migration of the channel over time. In these cases, the dredging activities would result in a complete take of that habitat. However, this take could be either temporary or more permanent in nature depending upon the location of future shoaling within the inlet.

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979; Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983; Pilkey et al. 1984). As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water, where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983). The proposed activities associated with this P^3BO only include the repair and replacement of existing groins and jetties. Since the primary effects associated with groins and jetties are associated with their alteration of sand movement, the effects would not change with the proposed action. Temporary

adverse effects to the piping plover from disruption in the immediate vicinity of the project would occur during construction.

Indirect effects

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. During sand placement, suffocation of invertebrate species will occur and degrade the suitability of the habitat for foraging. The effects to the benthic communities and the indirect effects to the piping plover will occur even if sand placement activities occur outside the piping plover migration and wintering seasons. Timeframes projected for benthic recruitment and re-establishment following sand placement are between 6 months and 2 years. Tilling to loosen compacted sand, sometimes required following beach nourishment to minimize effects to nesting sea turtles, may affect wrack that has accumulated on the beach. However, tilling is usually conducted above the wrack line. This may affect feeding and roosting habitat for piping plovers since they often use wrack for cover and foraging.

Natural, undeveloped barrier islands need storms and overwash to maintain the physical and biological environments they support (Young et al. 2006). Sand placement may limit washover fans from developing, which could accelerate the successional state of sand flats such that they will likely become vegetated within a few years (Leatherman 1988). This may reduce an area's value to foraging and roosting piping plovers. The piping plover's rapid response to habitats formed by washovers from the hurricanes in 2004 and 2005 in the Florida panhandle at Gulf Islands National Seashore and Eglin Air Force Base's Santa Rosa Island, and similar observations of their preferences for overwash habitats at Phipps Preserve and Lanark Reef in Franklin County, Florida, and elsewhere in their range, demonstrate the importance of these habitats for wintering and migrating piping plovers.

Restoration of beaches through sand placement may increase recreational pressures within the project area. Recreational activities, including increased pedestrian use, have the potential to adversely affect piping plovers through disturbance and through increased presence of predators, including both domestic animals and feral animals attracted by the presence of people and their trash. Long-term effects could include a decrease in piping plover use of habitat due to increased disturbance levels.

Pilkey and Dixon (1996) stated beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development, which leads to the need for more and larger protective measures. Greater

development may also support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas. Optimal habitat for the piping plover often occurs on publicly owned lands where human development may be limited; however, development of roads, bridges, and recreational facilities may be subject to scenarios similar to those described above.

Species' response to the proposed action

The Service bases this P^3BO on anticipated direct and indirect effects to piping plovers (wintering and migrating) and their Critical Habitat as a result of dredging, sand placement on beaches, and groin and jetty repair/replacement, which may prevent the maintenance or formation of habitat that piping plovers consider optimal for foraging and roosting. Heavy machinery and equipment (*e.g.,* trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect migrating and wintering piping plovers in the project area by disturbance and disruption of normal activities such as roosting and forging, and possibly forcing piping plovers to expend valuable energy reserves to seek available habitat elsewhere. In addition, foraging in suboptimal habitat by migrating and wintering piping plovers may reduce the fitness of individuals. Furthermore, increased and continual disturbance within optimal habitat, including Critical Habitat Units, could have effects on all three breeding populations of piping plovers.

Cumulative effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

It is reasonably certain coastal development, human occupancy, and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. However, areas identified as optimal piping plover habitat are not as likely to be affected by coastal development and human occupancy, since they are primarily protected areas that are relatively undeveloped compared to other beaches in Florida. Optimal Piping Plover Areas may still experience heavy recreational use. It is unknown how much influence beach nourishment will contribute to the development and recreational use of the shoreline. Most activities affecting designated piping plover Critical Habitat would require Federal permits or funding. The Service is unable to identify any specific activities that would be considered cumulative effects.

CONCLUSION

There are 2,340 miles of sandy shoreline available (although not necessarily suitable) throughout the piping plover wintering range within the conterminous U.S. The primary effects of the proposed activities are to piping plover foraging and roosting habitat, and these effects are typically limited to the first year following project construction. Beach wrack and the benthic community are often reestablished between 6 months and 1 year following project construction.

In the long-term, sand placement activities will add sediment to the system that could otherwise be removed as part of inlet maintenance, and increase the availability of suitable habitat for the species.

After reviewing the current status of the northern Great Plains, Great Lakes, and Atlantic Coast wintering piping plover populations, the environmental baseline for Action Area, the effects of the proposed activities, the Conservation Measures proposed by the Corps, and the cumulative effects, it is the Service's biological opinion that implementation of these actions, as proposed, is not likely to jeopardize the continued existence of the piping plover.

In addition, after reviewing the current status of the affected species, the environmental baseline for the Action Area, the effects of the proposed activities, and the cumulative effects, it is the Service's biological opinion the action, as proposed, will not adversely modify designated critical habitat for the reason given below.

Although some Critical Habitat Units may be impacted by project activities, these would most frequently be units or portions of units that are highly eroded and where habitat for piping plovers has become degraded. In these instances, the adverse effects of project activities would be offset over time by beneficial effects associated with the restoration of beaches. In all cases, neither the negative nor the positive effects of beach nourishment are likely to be permanent due to the dynamic nature of shoreline processes. Project activities would not affect a Critical Habitat Unit to the extent that, over time, the unit would be unable to serve its intended purposes. Therefore, any loss of habitat would not have a significant effect on the species' persistence or on the function of these Critical Habitat Units as a whole.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be implemented by the Corps so they become binding conditions of any permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the Terms and

Conditions or, (2) fails to adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the effects of incidental take, the Corps must report the progress of the action and its effects on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

It is difficult for the Service to estimate the exact number of piping plovers that could be migrating through or wintering within the Action Area at any one point in time and place during project construction. Disturbance to suitable habitat resulting from both dredging and sand placement activities within the Action Area would affect the ability of an undetermined number of piping plovers to find suitable foraging and roosting habitat during the migrating and wintering periods of any given year. Because the number of piping plovers that would be affected by projects cannot be determined, the Service will use the annual disturbance in shoreline miles as a surrogate for take.

The FDEP's Critically Eroded Beaches in Florida report identified 204.2 miles of critically eroded beaches on the Atlantic Coast of Florida, and an additional 102.3 miles of critically eroded beaches on the Gulf Coast of Florida in the Action Area (FDEP 2012). FDEP's definition of "critically eroded" requires upland development, recreation, wildlife habitat, or important cultural resources to be threatened. Due to the threat to upland interests, it is anticipated that beaches identified by FDEP to be critically eroding would be the most likely to be affected by the proposed action. Of the 204.2 miles of critically eroded beaches on the Atlantic Coast, approximately 49.4 miles are located on public lands primarily managed for conservation purposes; on the Gulf Coast, approximately 14.7 miles of the 102.3 miles of critically eroded beaches are located on public lands, for a total of 64.1 miles in the Action Area that are most likely to be affected. We acknowledge some additional public lands that are not defined as critically eroded and not included in the estimate above may also be affected. However, not all public lands have habitat elements that support migrating or wintering piping plover on a regular basis; therefore, some public lands included in the estimate above are not optimal piping plover habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres, corresponding to approximately 47 miles of beach, as Critical Habitat for wintering piping plovers in peninsular Florida. Most designated Critical Habitat is publicly owned (see Appendix A) and the Critical Habitat most likely to be disturbed would fall under the critically eroded, publicly owned category, part of the estimated 64.1 miles of beach cited above.

An additional 15.0 miles of beach in six units are defined as optimal piping plover habitat, but not located on publically-owned lands or Critical Habitat Units. Over time, most or all of these areas may be subject to project-related disturbance. Therefore, the total shoreline (optimal piping plover habitat) estimated to be effected by the proposed action is 79.1 miles, rounded for our purposes to 80 miles. It is estimated approximately 10 percent or less of the total 80 miles of

potentially affected optimal habitat would be impacted in any given year (or approximately 8 miles). In years following emergency events, the impacted area is expected to increase to approximately 25 percent or less of the total mileage, or 20 miles of shoreline. Over the past 10 years, two Congressional Orders occurred due to emergency events (2004-2005 hurricane season, and the 2012 hurricane season). The increased sand placement activities due to emergency events are anticipated to occur once in a 7-year period. This estimate is considered to be conservative, as many of the lands identified as optimal piping plover habitat are undeveloped. Since upland development is generally not threatened in these areas, the cost of placing sand on these shorelines is not justified.

Sand placement resulting from maintenance dredging projects is the most likely activity to affect these areas due to the preference to keep sand within the littoral system. It is expected the exact mileage of shoreline affected by the proposed action will vary from year to year. Maintenance dredging and sand placement activities may result in an unspecified number of piping plovers occupying these areas to be taken in the form of harm (*e.g.,* death, injury) and harassment as a result of this action.

EFFECT OF THE TAKE

In this P^3BO, the Service determined the proposed project is not likely to result in jeopardy to the piping plover.

REASONABLE AND PRUDENT MEASURES

The Service has determined the following Reasonable and Prudent Measures are necessary and appropriate to minimize take of the piping plover in the Action Area. If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the Term and Condition is not reasonable and prudent for the specific project or activity and request exception under the P^3BO; or

2. Initiate consultation with the Service for the specific project or activity.

The Service may respond by either of the following:

1. Allowing an exception to the Terms and Conditions under the P^3BO; or

2. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

The post construction survey requirements are described in Reasonable and Prudent Measure #5 and Term and Condition #8. These requirements are subject to congressional authorization and

the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps will notify the Service when initiating consultation for the project.

1. All sand placed on the beach or in the nearshore shall be compatible with the existing beach and will maintain the general character and functionality of the existing beach.

2. The Corps or the Applicant will notify the Service of the commencement of projects that utilize this P^3BO for the purposes of tracking incidental take of the species.

3. The Corps shall protect habitat features considered preferred by plovers outside of the project footprint in accordance with Terms and Conditions 3, 4, 5, and 6.

4. The Corps will facilitate awareness of piping plover habitat by educating the public on ways to minimize disruption to the species.

5. The Corps, the Applicant, or the local sponsor shall provide the mechanisms necessary to monitor impacts to piping plovers within the Action Area.

6. The Corps shall facilitate an annual meeting with the Service to assess the effectiveness of the protection and minimization measures outlined in this P^3BO.

TERMS AND CONDITIONS

1. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

2. The Corps or the Permittee must provide the following information to the Service Field Supervisor of the appropriate Field Office at least 10 business days prior to the commencement of work:

    a. Project location (include FDEP Range Monuments and latitude and longitude coordinates);
    b. Project description (include linear feet of beach, actual fill template, access points, and borrow areas);
    c. Date of commencement and anticipated duration of construction; and
    d. Names and qualifications of personnel involved in piping plover surveys.

3. Prior to construction, the Corps shall delineate preferred piping plover habitat (intertidal portions of ocean beaches, ephemeral pools, washover areas, wrack lines) adjacent to or outside of the project footprint that might be impacted by construction activities. Obvious identifiers shall be used (for example, pink flagging on metal poles) to clearly mark the beginning and end points to prevent accidental impacts to use areas.

4. Piping plover habitat delineated adjacent to or outside of the project footprint shall be avoided to the maximum extent practicable when staging equipment, establishing travel corridors, and aligning pipeline.

5. Driving on the beach for construction shall be limited to the minimum necessary within the designated travel corridor, which will be established just above or just below the primary "wrack" line.

6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of piping plovers. Workers shall be briefed on the importance of not littering and keeping the project area trash and debris free. See Appendix B for examples of suitable receptacles.

7. Educational signs shall be installed at public access points within the project area with emphasis on the importance of the beach habitat and wrack for piping plovers. When the project area has a pet or dog regulation, the provisions of the regulation shall be included on the educational signs.

8. For one full piping plover migration and winter season (beginning July 15 to May 15) prior to construction, and 2 years following each dredging and sand placement event, bi-monthly (twice-monthly) surveys for piping plovers shall be conducted in the beach fill and in any other intertidal or shoreline areas within or affected by the project. If a full season is not available, at least 5 consecutive months with three surveys per month spaced at least 9 days apart are required. During emergency projects, the surveys will begin as soon as possible prior to, and up to implementing the project. Piping plover identification, especially when in non-breeding plumage, can be difficult. If pre-construction monitoring is not practicable, it will be so indicated in the notification to the Service (see Term and Condition #2 above) and the Service will decide whether to require a separate individual consultation. See introductory paragraph to Reasonable and Prudent Measures earlier in this document.

9. The person(s) conducting the survey must demonstrate the qualifications and ability to identify shorebird species and be able to provide the information listed below. The following will be collected, mapped, and reported:

a. Date, location, time of day, weather, and tide cycle when survey was conducted;
b. Latitude and longitude of observed piping plover locations (decimal degrees preferred);
c. Any color bands observed on piping plovers;
d. Behavior of piping plovers (*e.g.*, foraging, roosting, preening, bathing, flying, aggression, walking);
e. Landscape features(s) where piping plovers are located (*e.g.*, inlet spit, tidal creeks, shoals, lagoon shoreline);
f. Habitat features(s) used by piping plovers when observed (*e.g.*, intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation);
g. Substrata used by piping plovers (*e.g.*, sand, mud/sand, mud, algal mat);
h. The amount and type of recreational use (*e.g.*, people, dogs on or off leash, vehicles, kite-boarders); and
i. All other shorebirds/waterbirds seen within the survey area.

All information shall be provided in an Excel spreadsheet. Monitoring results shall be submitted (datasheets, maps, database) on standard electronic media (*e.g.*, CD, DVD) to the appropriate Field Office by July 31 of each year in which monitoring is completed. If an appropriate web based reporting system becomes available, it would be used in lieu of hard copy/media.

[NOTE: As a condition to a permit from the FDEP, the bird monitor may also be required to report shorebird data to the Florida Fish and Wildlife Conservation Commission (FWC) https://public.myfwc.com/crossdoi/shorebirds/SigninExploreData.aspx.]

10. The Corps shall meet with the Service and the FWC (and BOEM as appropriate) annually to discuss the effectiveness of the avoidance measures and additional measures to include for future projects. The agencies will also review the projects utilizing this P^3BO the previous year to ensure that the reporting requirements for calculating the extent of take are adequate. This meeting will also explore:

    a. The possibility of using dredged materials to enhance potential or existing piping plover habitat within and adjacent to the project area;
    b. Methods for funding beneficial use opportunities for dredged materials that are not least-cost disposal to benefit piping plovers and their habitat;
    c. The development of shore protection design guidelines that can be utilized during future project planning to protect and/or enhance piping plover habitat; and
    d. Incorporating artificial lagoons or ephemeral pools into project designs adjacent to inlets where sand placement is proposed.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and

threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or Critical Habitat, to help implement recovery plans, or to develop information.

1. The Corps will facilitate a meeting between the Applicant or the local sponsor, the FWC, and the Service to discuss steps for the long-term protection of wrack within the project area; and

2. The Service encourages continued investigation into opportunities for increasing monitoring for Civil Works operations and maintenance projects.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

The amount or extent of incidental take for piping plovers will be considered exceeded if sand is placed on more than 8 miles of optimal piping plover shoreline during a nonemergency year, and a maximum of 20 miles of optimal piping plover shoreline during or following an emergency event (declared disaster or Congressional Order) as a result of this programmatic action. If the anticipated level of incidental take is exceeded during the course of this action, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or Critical Habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or Critical Habitat not considered in this opinion; or (4) a new species is listed or Critical Habitat designated that may be affected by the action. Reinitiation of formal consultation is also required 10 years after the issuance of this P^3BO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

MIGRATORY BIRD TREATY ACT

Migratory Bird Treaty Act (MBTA) for all Projects:

Comply with the FWC's standard shorebird protection guidelines to protect against impacts to nesting shorebirds during implementation of these projects on the Gulf Coast during the periods from February 15-August 31 or on the Atlantic Coast from April 1- August 31. All sand placement events could impact nesting shorebirds protected under the MBTA.

***The MBTA implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA it is unlawful by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

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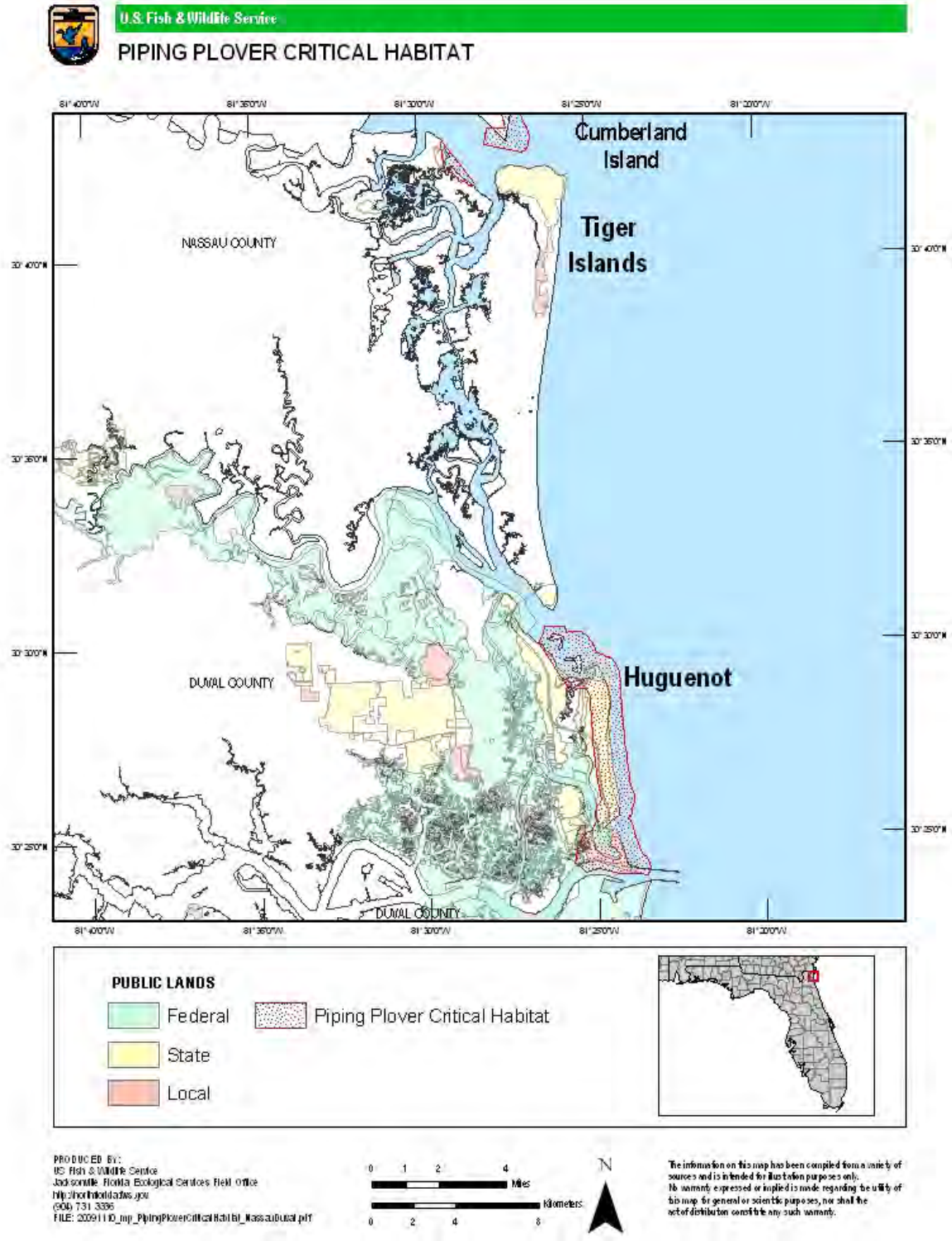
APPENDIX A: PIPING PLOVER CRITICAL HABITAT UNITS IN THE ACTION AREA


U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
Cumberland Island
Tiger Islands
Huguenot
NASSAU COUNTY
DUVAL COUNTY
DUVAL COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
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Miles
Kilometers
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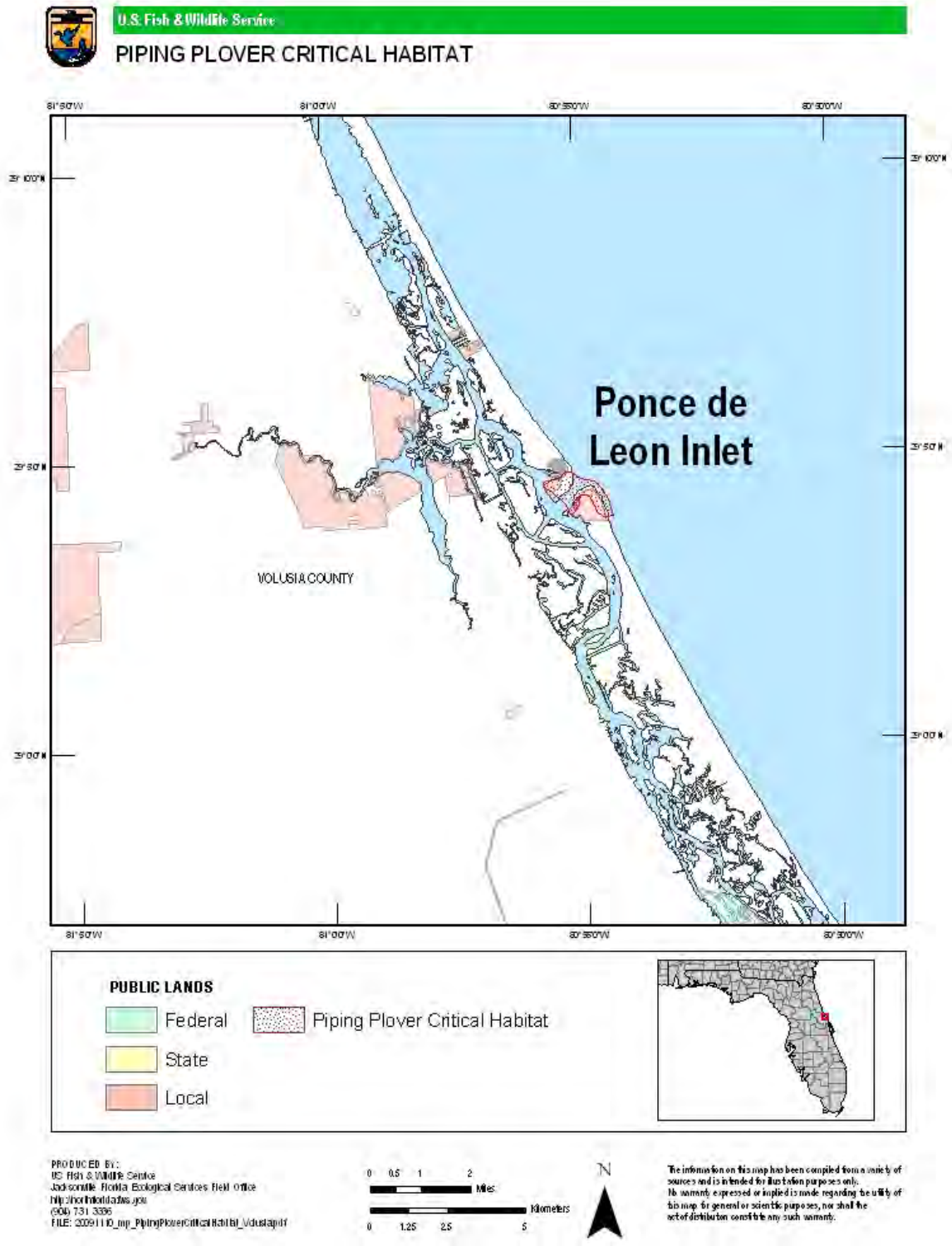
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
81°05'W
81°00'W
80°55'W
80°50'W
29°10'N
29°05'N
29°00'N
Ponce de Leon Inlet
VOLUSIA COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Volusia.pdf
0 0.5 1 2
Miles
0 1.25 2.5 5
Kilometers
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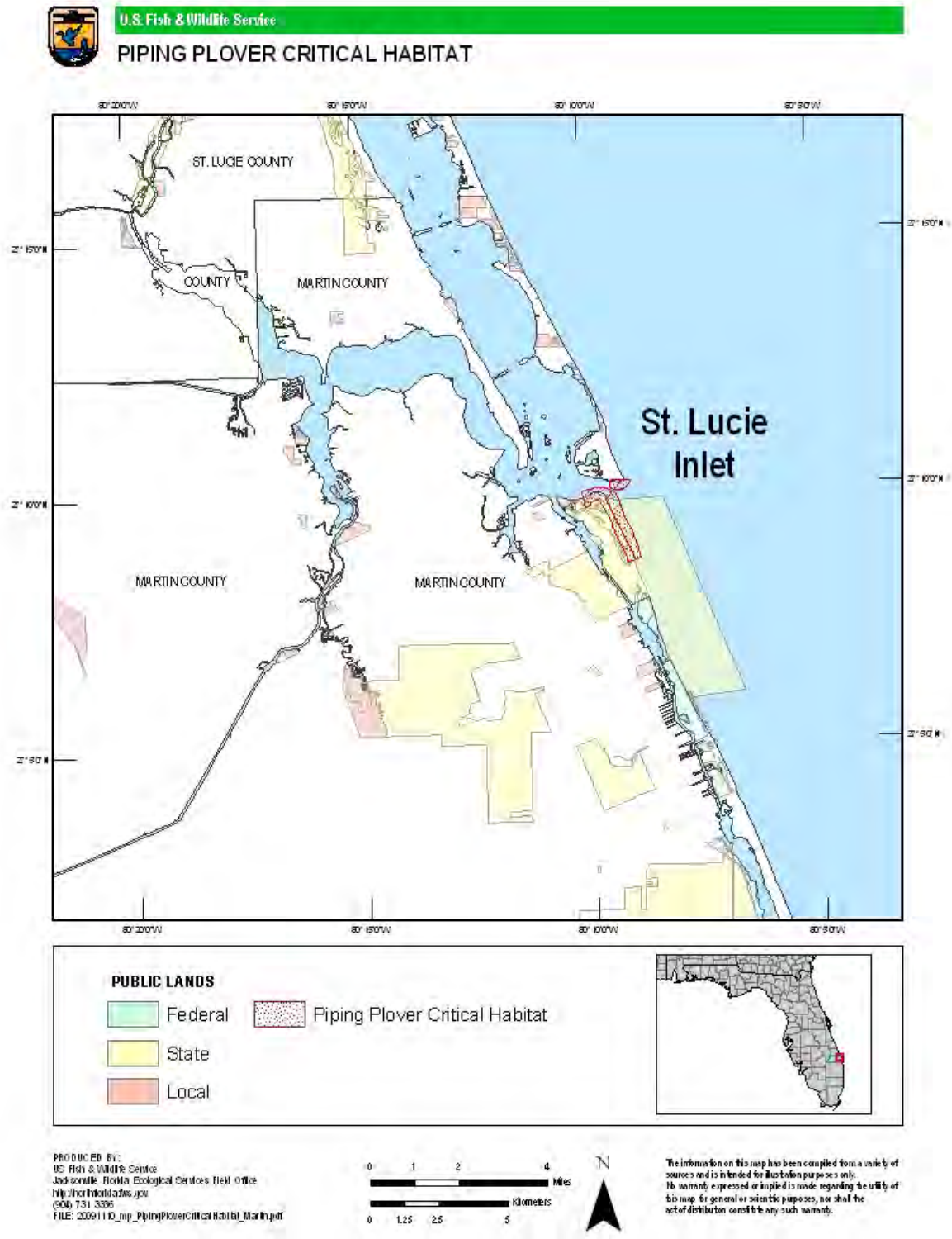
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
ST. LUCIE COUNTY
MARTIN COUNTY
MARTIN COUNTY
MARTIN COUNTY
St. Lucie Inlet
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Martin.pdf
0 1 2 4 Miles
0 1.25 2.5 5 Kilometers
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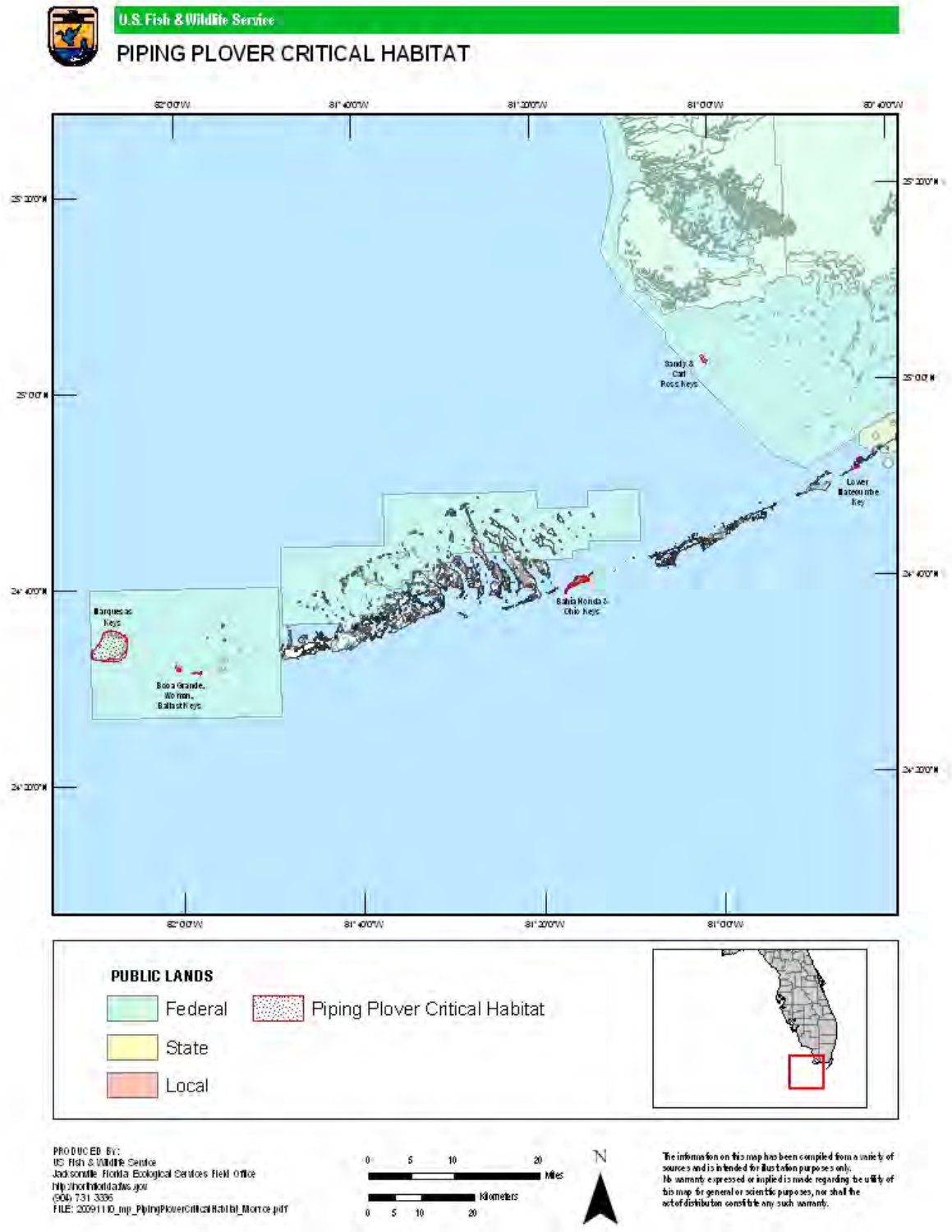
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
82°00'W
81°40'0"W
81°20'0"W
81°00'W
80°40'0"W
25°20'0"N
25°00'N
24°40'0"N
24°20'0"N
Sandy & Carl Ross keys
Lower Matecumbe Key
Bahia Honda & Ohio keys
Marquesas Keys
Boca Grande, Woman, Ballast Keys
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Monroe.pdf
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Miles
Kilometers
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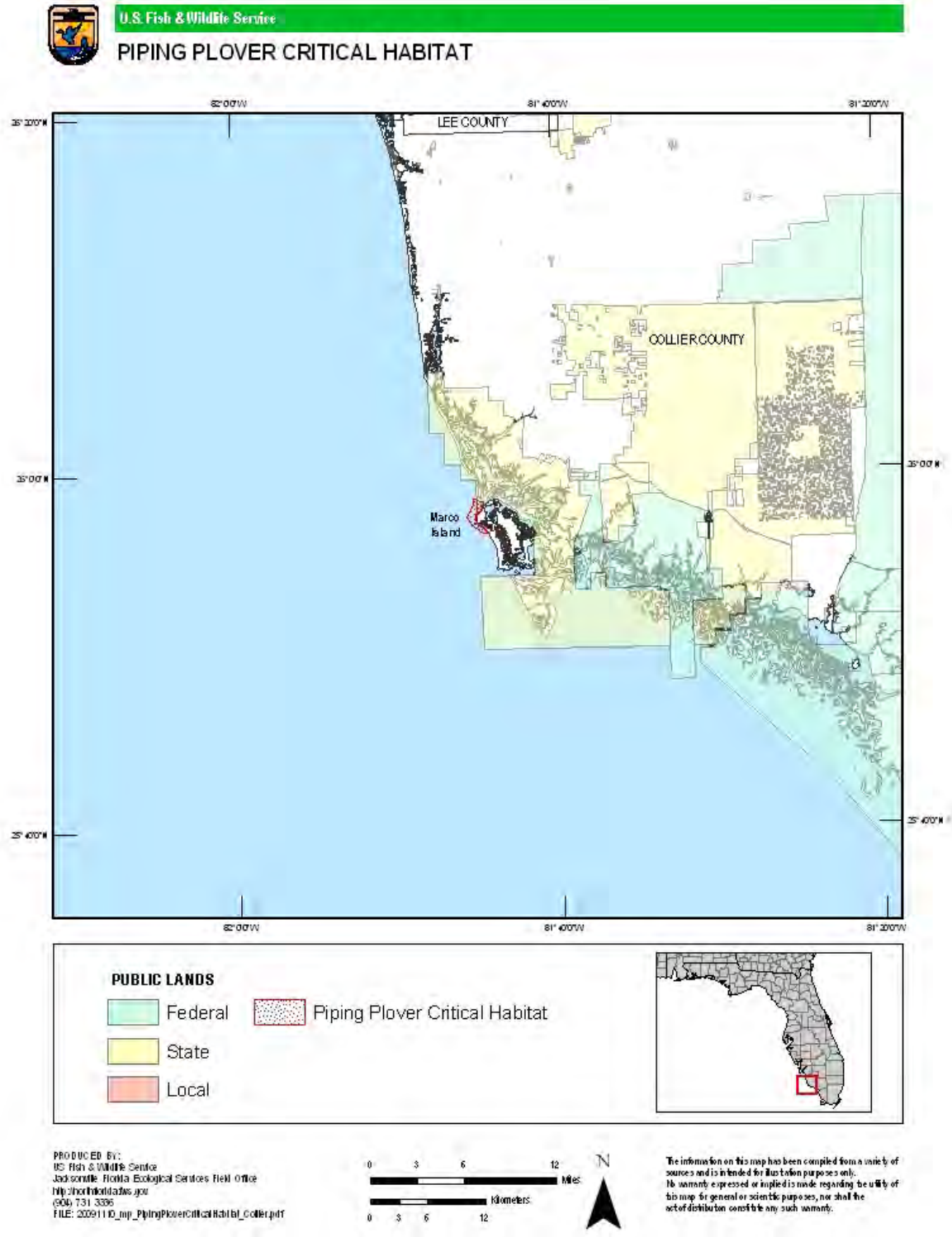
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
LEE COUNTY
COLLIER COUNTY
Marco Island
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Collier.pdf
0 3 6 12
Miles
Kilometers
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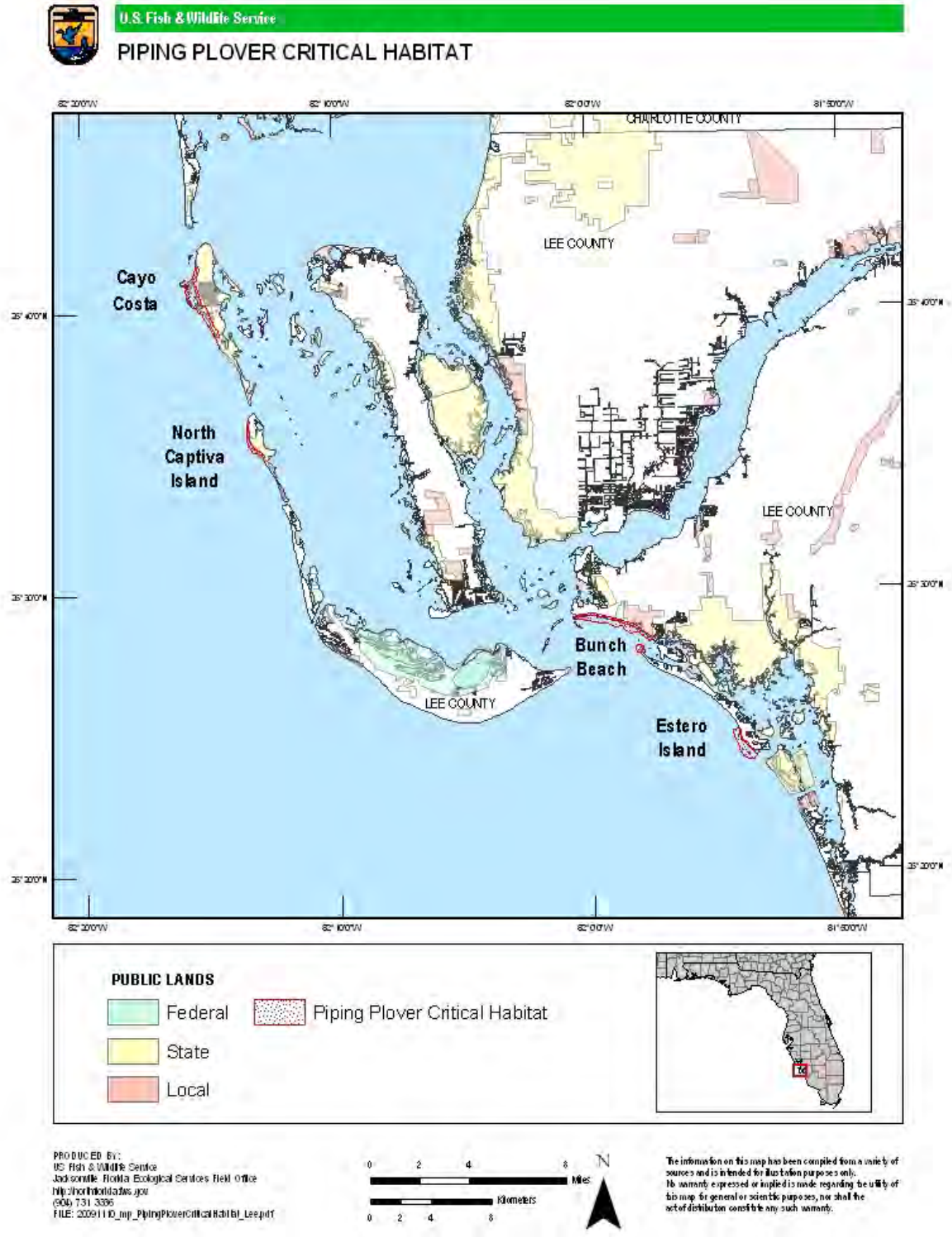
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
CHARLOTTE COUNTY
LEE COUNTY
Cayo Costa
North Captiva Island
LEE COUNTY
Bunch Beach
LEE COUNTY
Estero Island
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Lee.pdf
Miles
Kilometers
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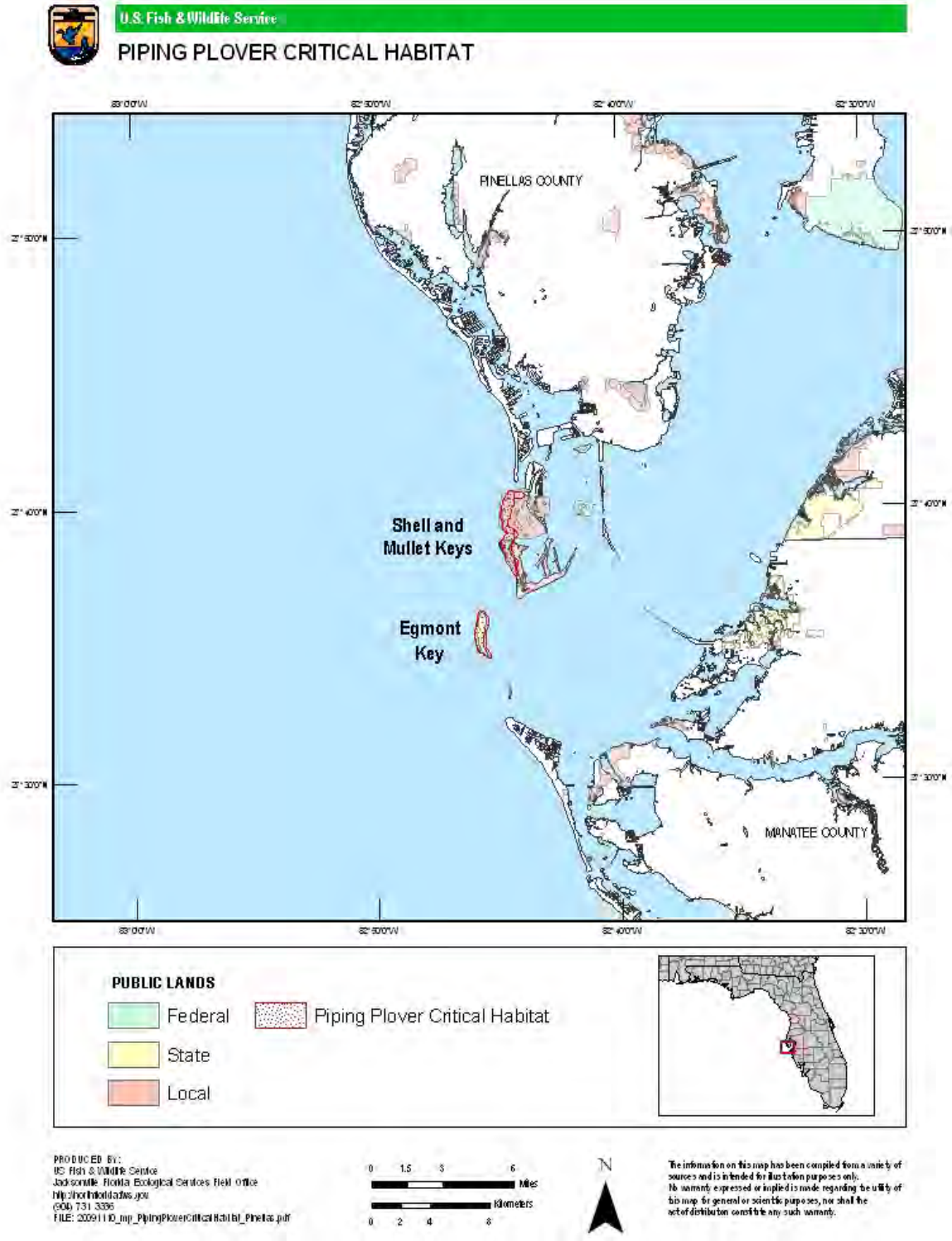
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
PINELLAS COUNTY
Shell and Mullet Keys
Egmont Key
MANATEE COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Pinellas.pdf
0 1.5 3 6
Miles
Kilometers
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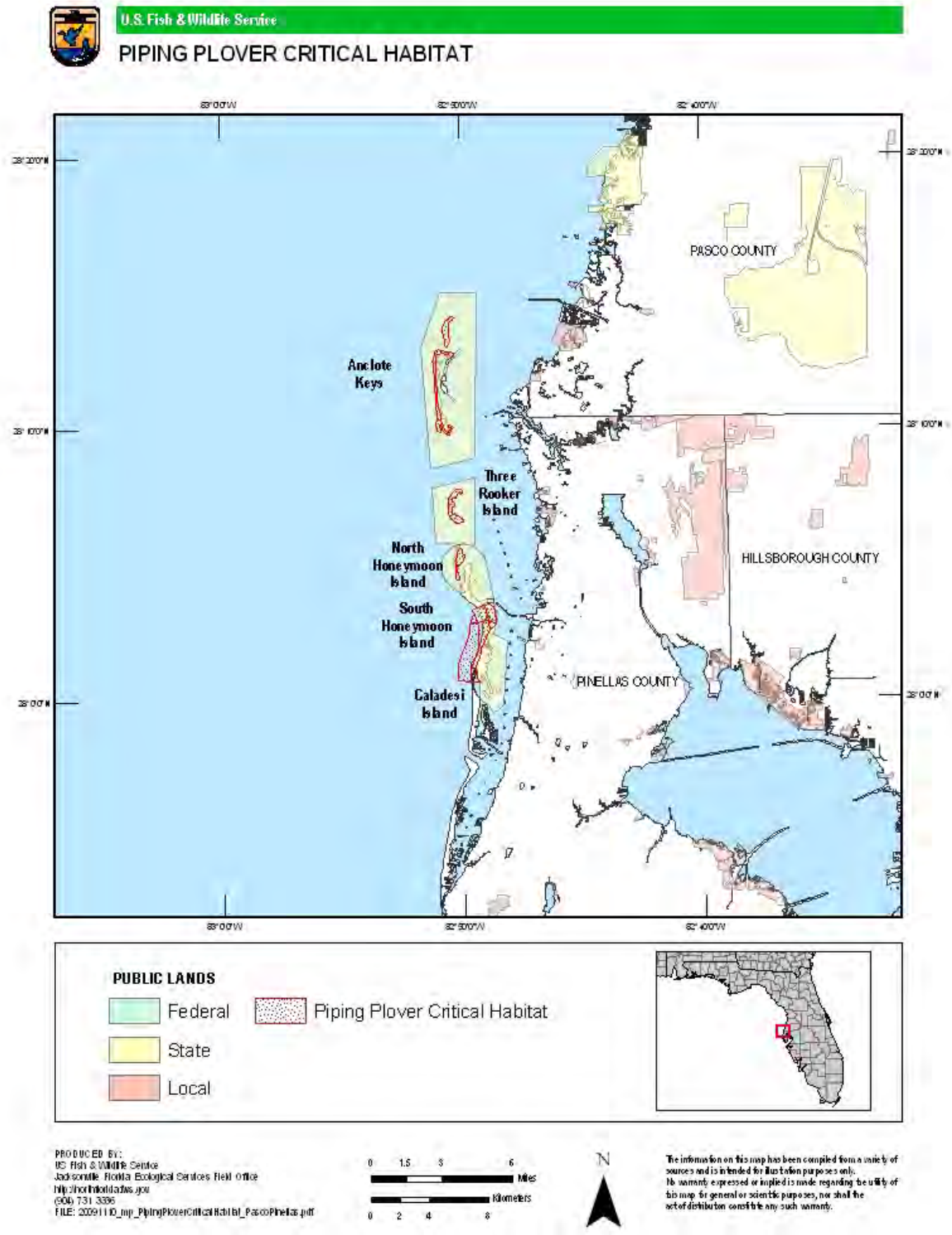
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
PASCO COUNTY
Anclote Keys
Three Rooker Island
North Honeymoon Island
South Honeymoon Island
Caladesi Island
HILLSBOROUGH COUNTY
PINELLAS COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_PascoPinellas.pdf
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0 2 4 8 Kilometers
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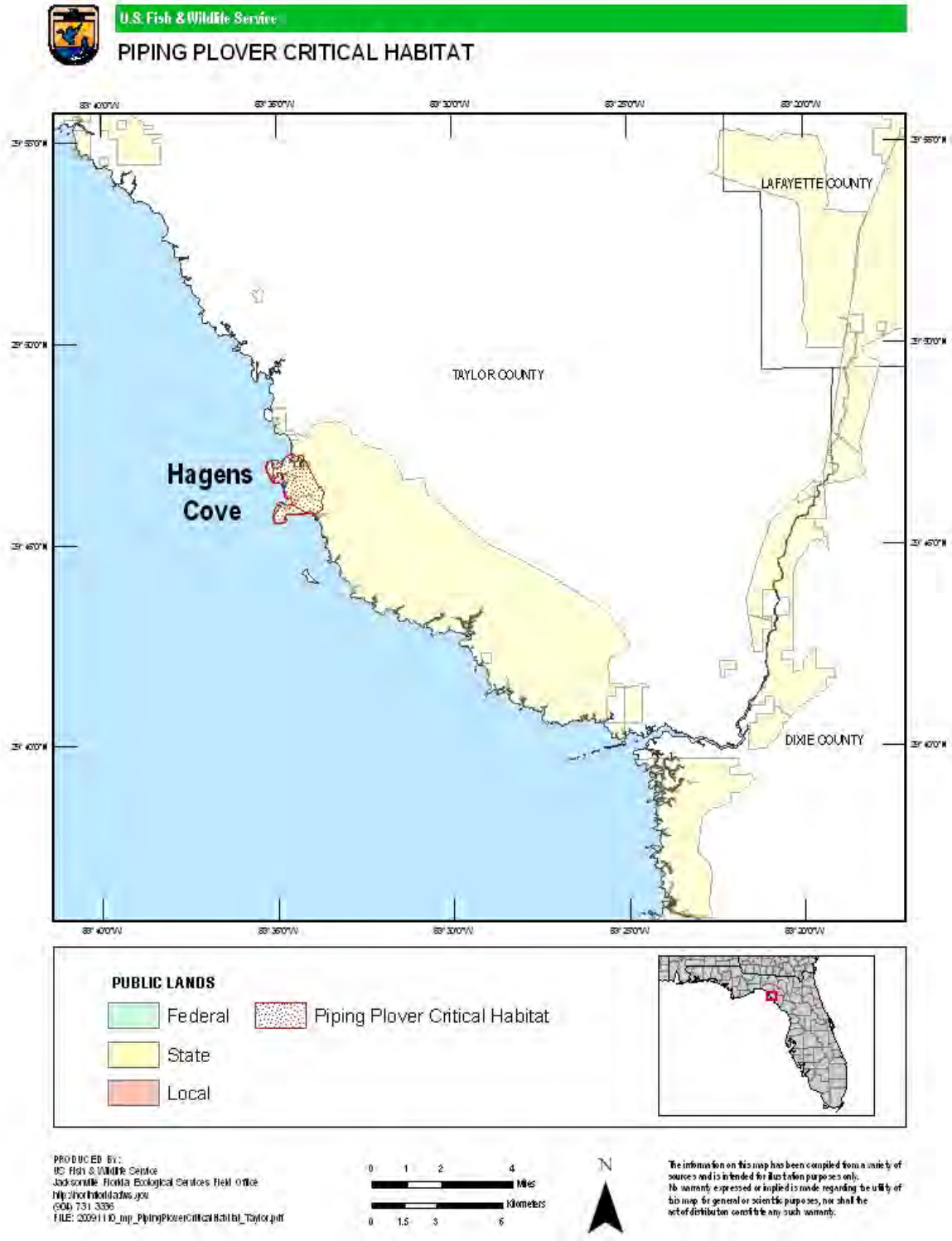
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
LAFAYETTE COUNTY
TAYLOR COUNTY
DIXIE COUNTY
Hagens Cove
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
US Fish & Wildlife Service
Jacksonville Florida Ecological Services Field Office
http://northfloridafws.gov
(904) 731-3336
FILE: 20091110_mp_PipingPloverCriticalHabitat_Taylor.pdf
0 1 2 4 Miles
0 1.5 3 6 Kilometers
N
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APPENDIX B: EXAMPLE PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle that is secured and heavy enough not to easily be turned over.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Service Log Number: 41910-2011-F-0170

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Dear Colonel Dodd:

This letter transmits the U.S. Fish and Wildlife Service's revised Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) Civil Works and Regulatory sand placement activities in Florida and their effects on the following sea turtles: Northwest Atlantic Ocean distinct population segment (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat; green (*Chelonia mydas);* leatherback (*Dermochelys coriacea*); hawksbill (*Eretmochelys imbricata*); and Kemp's ridley (*Lepidochelys kempii*) ; and the following beach mice: southeastern (*Peromyscus polionotus niveiventris*); Anastasia Island (*Peromyscus polionotus phasma*); Choctawhatchee (*Peromyscus polionotus allophrys*); St. Andrews (*Peromyscus polionotus peninsularis*); and Perdido Key (*Peromyscus polionotus trissyllepsis*) and their designated critical habitat. It does not address effects of these activities on the non-breeding piping plover (*Charadrius melodus*) and its designated critical habitat or for the red knot (*Calidris canutus rufa*). Effects of Corps planning and regulatory shore protection activities on the non-breeding piping plover and its designated critical habitat within the North Florida Ecological Services office area of responsibility and the South Florida Ecological Services office area of responsibility are addressed in the Service's May 22, 2013, Programmatic Piping Plover Biological Opinion. Effects of shore protection activities for the piping plover in the Panama City Ecological Services office area of responsibility will be addressed on a project by project basis.

Each proposed project will undergo an evaluation process by the Corps to determine if it properly fits within a programmatic approach. The project description will determine if the project is appropriate to apply to this programmatic consultation. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the SPBO are applicable to the project, it will be covered by this programmatic consultation. If not, the Corps will consult separately on individual projects that do not fit within this programmatic approach.

We will meet annually during the fourth week of August to review the sand placement projects, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this SPBO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions.

The entire programmatic consultation will be reviewed every five years or sooner if new information concerning the projects or protected species occurs. Reinitiation of formal consultation is also required 10 years after the issuance of this SPBO.

We are available to meet with agency representatives to discuss the remaining issues with this consultation. If you have any questions, please contact Peter Plage at the North Florida Ecological Services Office at (904) 731-3085, Jeffrey Howe at the South Florida Ecological Services Office at (772) 469-4283, or Lisa Lehnhoff at the Panama City Ecological Services Office at (850) 769-0552, extension 241.

Sincerely,

for Larry Williams
State Supervisor

Shore Protection Activities along the Coast of Florida

Statewide Programmatic Biological Opinion

(Revised)

February 27, 2015

Prepared by:
U.S. Fish and Wildlife Service

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Acronyms

ABM	Alabama Beach Mouse
Act	Endangered Species Act
AFB	Air Force Base
AIBM	Anastasia Island Beach Mouse
ASP	Anastasia State Park
BO	Biological Opinion
CBM	Choctawhatchee Beach Mouse
CBRA	Coastal Barrier Resources Act
CCAFS	Cape Canaveral Air Force Station
CFR	Code of Federal Regulations
CH	Critical Habitat
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Corps	U.S. Army Corps of Engineers
DOI	U.S. Department of the Interior
DTRU	Dry Tortugas Recovery Unit
F	Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FMNM	Fort Matanzas National Monument
FR	*Federal Register*
FWC	Florida Fish and Wildlife Conservation Commission

FWC/FWRI	Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute
GCRU	Greater Caribbean Recovery Unit
GINS	Gulf Islands National Seashore
GTMNERR	Guana Tolomato Matanzas National Estuarine Research Reserve
HCP	Habitat Conservation Plan
IMA	Important Manatee Areas
INBS	Index Nesting Beach Survey
IPCC	Intergovernmental Panel on Climate Change
ITP	Incidental Take Permit
K	Carrying Capacity
MANLAA	May Affect, but is Not Likely to Adversely Affect
MHW	Mean High Water
MHWL	Mean High Water Line
MMPA	Marine Mammal Protection Act
mtDNA	Mitochondrial Deoxyribonucleic Acid
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
NWAO DPS	Northwest Atlantic Ocean Distinct Population Segment
NWR	National Wildlife Refuge
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Elements

PFRU	Peninsular Florida Recovery Unit
PHVA	Population and Habitat Viability Analysis
PKBM	Perdido Key Beach Mouse
PKSP	Perdido Key State Park
PSI	Per Square Inch
PVA	Population Viability Analysis
SABM	St. Andrews Beach Mouse
SAJ	South Atlantic Jacksonville
SAM	South Atlantic Mobile
SAV	submerged aquatic vegetation
SEBM	Southeastern Beach Mouse
Service	U.S. Fish and Wildlife Service
SNBS	Statewide Nesting Beach Survey
SPBO	Statewide Programmatic Biological Opinion
SR	State Road
TED	Turtle Excluder Device
TEWG	Turtle Expert Working Group
U.S.C.	United States Code
U.S.	United States

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Federal Activity No:	41910-2010-F-0284
Applicant:	U.S. Army Corps of Engineers
Date Started:	May 30, 2007
Project Title:	Shore Protection Activities
Ecosystem:	Florida Coastline
Counties:	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia.

Dear Colonel Dodd:

This document is the U.S. Fish and Wildlife Service's (Service) Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities in Florida and their effects on the Northwest Atlantic Ocean distinct population (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat, green (*Chelonia mydas),* leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles, and southeastern (*Peromyscus polionotus niveiventris*), Anastasia Island (*Peromyscus polionotus phasma*), Choctawhatchee (*Peromyscus polionotus allophrys*), St. Andrews (*Peromyscus polionotus peninsularis*), and Perdido Key (*Peromyscus polionotus trissyllepsis*) beach mice and designated critical habitat (CH) for the Perdido Key beach mouse (PKBM), Choctawhatchee beach mouse (CBM), and St. Andrews beach mouse (SABM) **(Table 1)**. This SPBO is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We have assigned Service Federal Activity number 41910-2010-F-0284 for this consultation.

The Corps determined that the proposed project "may affect and is likely to adversely affect the above listed species (**Table 1)**. The Corps also has determined that the proposed project "may affect, but is not likely to adversely affect" (MANLAA) the West Indian (Florida) manatee (*Trichechus manatus latirostris*), the roseate tern (*Sterna dougallii dougallii*), the beach jacquemontia (*Jacquemontia reclinata*), and the Garber's spurge (*Chamaesyce garberi*) **(Table 2)**. Based on our review of the project plans and the incorporation of the minimization measures listed

in the final Programmatic Biological Assessment (PBA) as conditions of the projects where these species are known to exist, we concur with these determinations.

Table 1. Status of federally listed species within the Action Area that may be adversely affected by the shore protection activities.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH
Mammals		
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered(CH)
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered (CH)
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered (CH)
Birds		
Piping Plover*	*Charadrius melodus*	Threatened
Red Knot*	*Calidris canutus rufa*	Proposed
Reptiles		
Green sea turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle (Northwest Atlantic Ocean population)	*Caretta caretta*	Threatened (CH)

* Not covered by the revised SPBO

Table 2. Species and critical habitat evaluated for effects and those where the Service has concurred with a "may affect, not likely to adversely affect (MANLAA)" determination.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH	PRESENT IN ACTION AREA	MANLAA
Florida manatee	*Trichechus manatus latirostris*	Endangered (CH)	Yes	Yes
Roseate tern	*Sterna dougallii dougallii*	Threatened	Yes	Yes
Beach jacquemontia	*Jacquemontia reclinata*	Endangered	Yes	Yes
Garber's spurge	*Chamaesyce garberi*	Threatened	Yes	Yes

Florida Manatee

For all dredging activities, including offshore dredging activities associated with submerged borrow areas and navigational channel maintenance:

The Corps has determined that the proposed projects "may affect, but are not likely to adversely affect" the Florida manatee. The Service has reviewed the draft PBA and concurs that, if the 2011 Standard Manatee In-water Construction Conditions are made a condition of the issued permit or Corps project plan and implemented, these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed. The web link to these conditions: http://www.fws.gov/northflorida/Manatee/Manate_Key_Programmatic/20130425_gd_Appendix%20B_2011_Standard%20Manatee%20Construction%20Conditions.pdf.

For all dredging activities within estuaries and adjacent to the shore, inlets, and/or inshore areas including channels associated with submerged borrow areas and navigational channels:

If the 2011 Standard Manatee In-water Construction Conditions and the following additional conditions are made a condition of the issued permit or Corps project plan and implemented, the Service would be able to concur with a determination by the Corps that these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not

adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed.

Additional conditions:

1. Barges shall install mooring bumpers that provide a minimum 4-foot standoff distance under maximum compression between other moored barges and large vessels, when in the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate.

2. Pipelines shall be positioned such that they do not restrict manatee movement to the maximum extent possible. Plastic pipelines shall be weighted or floated. Pipelines transporting dredged material within the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate shall be weighted or secured to the bottom substrate as necessary to prevent movement of the pipeline and to prevent manatee entrapment or crushing.

3. In the event that such positioning has the potential to impact submerged aquatic vegetation (SAV) or nearshore hardbottom, the pipeline may be elevated or secured to the bottom substrate to minimize impacts to SAV.

For dredging activities located within Important Manatee Areas (IMAs), including Warm Water Aggregation Areas (WWAAs):

Important Manatee Areas (IMAs) are areas where large numbers of manatees occur because of the presence of warm water sites (including power plants, springs, etc.), feeding sites, drinking water sites, and other attractants. Manatees congregate at these sites to shelter from the cold, rest, feed and drink, travel, and engage in other activities. Current IMA maps, including maps of Warm Water Aggregation Areas (WWAAs) and areas of inadequate protection (AIPs), can be found at the Corps' weblink: http://www.saj.usace.army.mil/Missions/Regulatory/SourceBook.aspx.

Dredging activities that occur within the IMA sites (including WWAAs) are not included in this SPBO. For dredging activities within IMAs, the Corps shall contact the appropriate FWS Ecological Services Office for project-specific conditions. See Table 3.

Table 3. FWS Ecological Services (ES) offices and areas of responsibility (counties).

County	Service ES Office	Address	Telephone
Brevard, Citrus, Dixie, Duval, Flagler, Hernando, Hillsborough, Levy, Manatee, Nassau, Pasco, Pinellas, St Johns, Taylor, Volusia	North Florida ES Office	7915 Baymeadows Way Jacksonville, FL 32256	(904) 731-3336
Broward, Charlotte, Collier, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, St Lucie, Sarasota	South Florida ES Office	1339 20th Street Vero Beach, FL 32960	(772) 562-3909
Bay, Escambia, Franklin, Gulf, Jefferson, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton,	Panama City ES Office	1601 Balboa Avenue Panama City, FL 32405	(850) 769-0552

Although this does not represent a biological opinion for the manatee as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required regarding manatees. It also fulfills the requirements of the MMPA. If modifications are made in the programmatic action or additional information becomes available, re-initiation of consultation may be required.

Loggerhead Terrestrial Critical Habitat

The Corps has determined that the proposed projects "may affect, but are not likely to adversely affect" the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population. The Service concurs with the Corps' determination and furthermore concludes that the proposed projects will not adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.Designated Critical Habitat: The Service has designated terrestrial critical habitat for Northwest Atlantic loggerhead population on July 10, 2014. NOTE: The proposed rule was dated March 25, 2013 (78 FR 18000) and the notice of availability of the economic analysis for the proposed rule (78 FR 42921) was dated July 18, 2013. The final rule of terrestrial critical habitat includes 88 units encompassing approximately 1,102 kilometers (685 miles) of mapped shoreline along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi: http://www.fws.gov/northflorida/SeaTurtles/2014_Loggerhead_CH/Maps/2014_NWA_Loggerhead_Terrestrial_CH_index_maps.pdf.

Table 4. List of NWAO DPS loggerhead critical habitat in the terrestrial habitat Florida and ownership.

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-01: South Duval County Beaches–County line at Duval and St. Johns Counties	11.5 (7.1)	0 (0)	0 (0)	11.5 (7.1)
LOGG-T-FL-02: Fort Matanzas National Monument, St. Johns County	1.4 (0.9)	1.4 (0.9)	0 (0)	0 (0)
LOGG-T-FL-03: River to Sea Preserve at Marineland — North Peninsula State Park, Flagler and Volusia Counties	31.8 (19.8)	0 (0)	6.1 (3.8) North Peninsula State Park, Washington Oaks Garden State Park (in Guana Tolomato Matanzas NERR), and Gamble Rogers Memorial State Recreation Area at Flagler Beach	25.7 (16.0)
LOGG-T-FL-04: Canaveral National Seashore North, Volusia County	18.2 (11.3)	18.2 (11.3) Canaveral National Seashore	0 (0)	0 (0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-05: Canaveral National Seashore South — Merritt Island NWR-Kennedy Space, Brevard County	28.4 (17.6)	28.4 (17.6) includes Canaveral National Seashore (Brevard portion) and Merritt Island NWR/KSC	0 (0)	0 (0)
LOGG-T-FL-06: Central Brevard Beaches, Brevard County	19.5 (12.1)	0 (0)	0 (0)	19.5 (12.1)
LOGG-T-FL-07: South Brevard Beaches, Brevard County	20.8 (12.9)	4.2 (2.6) Archie Carr NWR	1.5 (1.0) Sebastian Inlet State Park	15.0 (9.3)
LOGG-T-FL-08: Sebastian Inlet — Indian River Shores, Indian River County	4.1 (2.5)	0.9 (0.6) Archie Carr NWR	3.2 (2.0) Sebastian Inlet State Park	0 (0)
LOGG-T-FL-09: Fort Pierce Inlet — St. Lucie Inlet, St. Lucie and Martin Counties	35.2 (21.9)	0 (0)	0 (0)	35.2 (21.9)
LOGG-T-FL-10: St. Lucie Inlet — Jupiter Inlet, Martin and Palm Beach Counties	24.9 (15.5)	4.8 (3.0) Hobe Sound NWR	3.7 (2.3) St. Lucie Inlet Preserve State Park	16.4 (10.2)
LOGG-T-FL-11: Jupiter Inlet — Lake Worth Inlet, Palm Beach County	18.8 (11.7)	0 (0)	2.5 (1.5) John D. MacArthur Beach State Park	16.3 (10.1)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-12: Lake Worth Inlet — Boynton Inlet, Palm Beach County	24.3 (15.1)	0 (0)	0 (0)	24.3 (15.1)
LOGG-T-FL-13: Boynton Inlet — Boca Raton Inlet, Palm Beach County	22.6 (14.1)	0 (0)	0 (0)	22.6 (14.1)
LOGG-T-FL-14: Boca Raton Inlet — Hillsboro Inlet, Palm Beach and Broward Counties	8.3 (5.2)	0 (0)	0 (0)	8.3 (5.2)
LOGG-T-FL-15: Long Key, Monroe County	4.2 (2.6)	0 (0)	4.2 (2.6) Long Key State Park	0 (0)
LOGG-T-FL-16: Bahia Honda Key, Monroe County	3.7 (2.3)	0 (0)	3.7 (2.3) Bahia Honda Key State Park	0 (0)
LOGG-T-FL-17: Longboat Key, Manatee and Sarasota Counties	16.0 (9.9)	0 (0)	0 (0)	16.0 (9.9)
LOGG-T-FL-18: Siesta and Casey Keys, Sarasota County	20.8 (13.0)	0 (0)	0 (0)	20.8 (13.0)
LOGG-T-FL-19: Venice Beaches and Manasota Key, Sarasota and Charlotte Counties	26.0 (16.1)	0 (0)	1.9 (1.2) Stump Pass Beach State Park	24.1 (15.0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-20: Knight, Don Pedro, and Little Gasparilla Islands, Charlotte County	10.8 (6.7)	0 (0)	1.9 (1.2) Don Pedro Island State Park	8.9 (5.5)
LOGG-T-FL-21: Gasparilla Island, Charlotte and Lee Counties	11.2 (6.9)	0 (0)	1.5 (1.0) Gasparilla Island State Park	9.6 (6.0)
LOGG-T-FL-22: Cayo Costa, Lee County	13.5 (8.4)	0 (0)	13.2 (8.2) Cayo Costa State Park	0.3 (0.2)
LOGG-T-FL-23: Captiva Island, Lee County	7.6 (4.7)	0 (0)	0 (0)	7.6 (4.7)
LOGG-T-FL-24: Sanibel Island West, Lee County	12.2 (7.6)	0 (0)	0 (0)	12.2 (7.6)
LOGG-T-FL-25: Little Hickory Island, Lee and Collier Counties	8.7 (5.4)	0 (0)	0 (0)	8.7 (5.4)
LOGG-T-FL-26: Wiggins Pass — Clam Pass, Collier County	7.7 (4.8)	0 (0)	2.0 (1.2) Delnor-Wiggins Pass State Park	5.7 (3.6)
LOGG-T-FL-27: Clam Pass — Doctors Pass, Collier County	4.9 (3.0)	0 (0)	0 (0)	4.9 (3.0)
LOGG-T-FL-28: Keewaydin Island and Sea Oat Island, Collier County	13.1 (8.1)	0 (0)	12.4 (7.7) Rookery Bay NERR	0.7 (0.5)
LOGG-T-FL-29: Cape Romano, Collier County	9.2 (5.7)	0 (0)	7.2 (4.5) Rookery Bay NERR	2.0 (1.2)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-30: Ten Thousand Islands North, Collier County	7.8 (4.9)	2.9 (1.8) Ten Thousand Islands NWR	4.9 (3.1) Rookery Bay NERR	0 (0)
LOGG-T-FL-31: Highland Beach, Monroe County	7.2 (4.5)	7.2 (4.5) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-32: Graveyard Creek — Shark Point, Monroe County	0.9 (0.6)	0.9 (0.6) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-33: Cape Sable, Monroe County	21.3 (13.2)	21.3 (13.2) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-34: Dry Tortugas, Monroe County	5.7 (3.6)	5.7 (3.6) Dry Tortugas National Park	0 (0)	0 (0)
LOGG-T-FL-35: Marquesas Keys, Monroe County	5.6 (3.5)	5.6 (3.5) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-36: Boca Grande Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-37: Woman Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-38: Perdido Key, Escambia County	20.2 (12.6)	11.0 (6.8) Gulf Islands National Seashore	2.5 (1.6) Perdido Key State Park	6.7 (4.2)
LOGG-T-FL-39: Mexico Beach and St. Joe Beach, Bay and Gulf Counties	18.7 (11.7)	0 (0)	0 (0)	18.7 (11.7)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-40: St. Joseph Peninsula, Gulf County	23.5 (14.6)	0 (0)	15.5 (9.7) T.H. Stone Memorial St. Joseph Peninsula State Park and St. Joe Bay State Buffer Preserve	8.0 (4.9)
LOST-T-FL-41: Cape San Blas, Gulf County	11.0 (6.8)	0 (0)	0.1 (0.1) St. Joseph Bay State Buffer Preserve	10.8 (6.7)
LOGG-T-FL-42: St. Vincent Island, Franklin County	15.1 (9.4)	15.1 (9.4) St. Vincent NWR	0 (0)	0 (0)
LOGG-T-FL-43: Little St. George Island, Franklin County	15.4 (9.6)	0 (0)	15.4 (9.6) Apalachicola NERR	0 (0)
LOGG-T-FL-44: St. George Island, Franklin County:	30.7 (19.1)	0 (0)	14.0 (8.7) Dr. Julian G. Bruce St. George Island State Park	16.7 (10.4)
LOGG-T-FL-45: Dog Island, Franklin County	13.1 (8.1)	0 (0)	0 (0)	13.1 (8.1)
Florida State Totals	**637.1 (396.4)**	**130.3 (81.0)**	**117.4.0 (72.9)**	**390.3 (242.6)**

The primary constituent elements (PCEs) for loggerhead terrestrial critical habitat are those specific elements of the biological and physical features (BPF) that provide for the species' life-history processes and are essential to the conservation of the species. PBFs include those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. The PBFs and PCEs are described as follows:

Physical and Biological Features (PBF):

PBF 1: Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

PBF 2: Habitats Protected from Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

Primary Constituent Elements (PCE):

(1) Suitable nesting beach habitat that has (a) relatively unimpeded nearshore access from the ocean to the beach for nesting females and from the beach to the ocean for both post-nesting females and hatchlings and (b) is located above MHW to avoid being inundated frequently by high tides.

(2) Sand that (a) allows for suitable nest construction, (b) is suitable for facilitating gas diffusion conducive to embryo development, and (c) is able to develop and maintain temperatures and a moisture content conducive to embryo development.

(3) Suitable nesting beach habitat with sufficient darkness to ensure nesting turtles are not deterred from emerging onto the beach and allows hatchlings and post-nesting females to orient successfully to the sea.

(4) Natural coastal processes or artificially created or maintained habitat mimicking natural conditions.

Substantial amounts of sand are deposited along Gulf of Mexico and Atlantic Ocean beaches to protect coastal properties in anticipation of preventing erosion and to mimic what otherwise would be natural processes of overwash and island migration. Constructed beaches tend to differ from natural beaches in several important ways for sea turtles. They are typically wider, flatter, and more compacted, and the sediments are moister than those on natural beaches (Nelson *et al*. 1987; Ackerman *et al.* 1991; Ernest and Martin 1999).

Regarding PCE 1 and PCE 4 for sand placement projects, construction on the beach during sea turtle nesting and hatching season can obstruct nesting females from accessing the beach and hatchlings from entering the water unimpeded. To minimize these impacts, the Corps has agreed to avoid construction during peak nesting and hatching season in the higher density beaches within the entire NWAO DPS of the loggerhead sea turtle as described. This SPBO includes required terms and conditions that minimize incidental take of turtles and reduces the impacts to the PCE 3 by limiting activities at night and placing equipment and staging areas off the nesting beach.

More nests are washed out on the wide, flat beaches resulting from sand placement than narrower steeply sloped natural beaches. This phenomenon may persist through the second postconstruction year and results from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping occur as the beach equilibrates to a more natural contour.

A study performed for the Florida Department of Environmental Protection (FDEP) promoted the test construction of a more "turtle-friendly" beach. The Service, along with the National Fish and Wildlife Foundation and the Florida Fish and Wildlife Conservation Commission (FWC), began a study to determine if statistically significant improvements in nesting success, nest densities, and/or hatchling production can be achieved through modifications to the traditional construction template for beach nourishment projects. It is anticipated that a more natural beach profile will reduce the incidence of scarping, improve nesting success, and reduce the proportion of nests placed along the seaward portion of the berm (those at increased risk of being lost to erosion

during profile equilibration), relative to a traditionally built beach. The Corps remains committed to incorporating the results of this study into future design templates.

A significantly larger proportion of turtles emerging on engineered beaches abandon their nesting attempts than turtles emerging on natural or prenourished beaches, even though more nesting habitat is available (Trindell *et al*. 1998; Ernest and Martin 1999; Herren 1999), with nesting success approximately 10 to 34 percent lower on nourished beaches than on control beaches during the first year post-nourishment. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics (beach profile, sediment grain size, beach compaction, frequency and extent of escarpments) associated with the nourishment project (Ernest and Martin 1999). This directly impacts PCE 2 above; however, on severely eroded sections of beach, where little or no suitable nesting habitat exists, and sand placement can result in increased nesting (Ernest and Martin 1999). The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than the eroding beach it replaces.

Regarding PCE 3, during construction, any lights directly visible on the beach during the nesting and hatching seasons are minimized by shielding and directing the lights downward and away from the nesting beach as required in the Terms and Conditions of this SPBO.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher probability of hatchling mortality due to disorientation. Changing to sea turtle compatible lighting can be accomplished at the local level through voluntary compliance or by adopting appropriate regulations. The Terms and Conditions in the Biological Opinion require a lighting survey prior to construction and post construction to determine the additional level of impacts as a result of the proposed project. The Terms and Conditions include working with the local sponsor to minimize the impacts of lighting as a result of the proposed project.

The Service has determined that with the incorporation of the conservation measures as described above, that the proposed projects will not adversely affect nor adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.

Migratory Birds

In order to comply with the Migratory Bird Treaty Act (16 U.S.C. 701 *et seq*.) and reduce the potential for this project to impact nesting shorebirds, the Corps or the Applicant should follow the latest Florida Fish and Wildlife Conservation Commission (FWC) standard guidelines to protect

against impacts to nesting shorebirds during implementation of this project during the periods from February 15 to August 31.

Consultation History

1980s and 1990s — Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s. During that time, sea turtle protection measures were developed based on research findings available at that time. These measures addressed sand compaction, escarpment formation, and timing restrictions for projects in six south Florida counties with high nesting densities. In the mid-1990s, a sea turtle Biological Opinion (BO) template was developed that included protection measures and information on the status of sea turtles. In 1995, an expanded version of the sea turtle template BO was developed to incorporate new guidance on the required format for BOs and a biological rationale for the Terms and Conditions to be imposed. This document underwent review by four State conservation agencies and the Corps, and was subsequently revised. The primary purposes of the template BO were to: (1) incorporate a standardized format and language required for use in all BOs based on guidance from the Service's Washington Office, (2) assist Service biologists in the preparation of BOs, (3) increase consistency among Service field offices, and (4) increase consistency between the Service and the State agencies.

March 7 and 8, 2006 — The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of that meeting was to begin discussions about a regional consultation for sand placement activities along the coast of Florida and preparation of a PBA for sand placement activities in Florida. In addition to sea turtles, other Federal and state protected species were included in the discussions. At that meeting, the following topics were discussed:

1. Sand placement activities;
2. Sand source and placement methods;
3. Species and habitat;
4. Geographic scope;
5. Information availability; and
6. Minimization of impacts.

July 13, 2006 — A second meeting was held to further discuss the draft PBA. The Service provided the Corps with copies of the latest BO templates for each species to be considered. The Service held conference calls with the species recovery leads during August 2006.

October 16, 2006 The Service received the draft PBA via email from the Corps for sand placement activities along the coast of Florida.

October 27, 2006 The Service provided the Corps with draft comments on the PBA via email.

October 31, 2006 The Corps provided a response to the Service's comments on the PBA via email.

November 9, 2006 The Service and the Corps held a conference call to discuss the comments.

December 20, 2006 The Service sent the Corps a letter with the final comments on the draft PBA.

September 18 and 19, 2007
The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of this meeting was to discuss the Terms and Conditions to be included in the BO.

October 5, 2007 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous meeting.

November 1, 2007 The Corps provided the Service with comments via email on the revised Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

March 31, 2008 The Service revised the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice. The Service also revised the minimization measures for the manatee. The revisions were sent to the Corps.

September 16, 2008 The Service sent the Corps via mail the draft SPBO.

October 2, 2008 The Corps provided the Service via email with a summary of the remaining issues concerning the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

October 15, 2008 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous email.

March 11, 2009	The Service received via email examples of previous agreements between the Corps and the local sponsor to carry out the Terms and Conditions in previous BOs.
April 7, 2009	The Service sent an email to the Corps with an update of the progress of our analysis of including piping plovers in the SPBO.
August 26, 2009	The Service sent to the Corps via email the latest Terms and Conditions for sea turtles and beach mice.
September 17, 2009	The Corps sent an email to the Service describing the actions to be taken for the completion and submittal of the PBA.
January 6, 2010	The Corps and the Service participated in a meeting to finalize the draft SPBO.
January 21, 2010	The Corps sent to the Service via email the revised draft PBA.
March 25, 2010	The Corps and the Service participated in an implementation meeting and submittal of the final PBA.
February 22, 2011	The Corps submitted the final PBA to the Service.
April 18, 2011	The Service sent the final Statewide PBO to the Corps.
June 21, 2010	The Corps provided written concerns with the final Statewide PBO
June 30, 2011	The Service revised the final Statewide PBO.
July 18, 2011	The Corps provided written agreement with the changes that were made and asked for additional changes.
July 22, 2011	The Service made additional revisions per the Corps request.
July 25, 2011	The Corps provided written agreement with the additional revisions.
March 25, 2013	The Service published the proposed rule for loggerhead terrestrial critical habitat.
March 3, 2014	The Corps contacted the Service on revising the SPBO to include loggerhead critical habitat in the terrestrial environment.
August 25, 2014	The Service provided the Corps with a Draft Revised SPBO

September 4, 2014	The Corps and Service met and discussed the Draft Revised SPBO at the annual SPBO meeting.
October 23, 2014	The Service received a letter from the Corps requesting the SPBO be revised to include loggerhead critical habitat.
November 3, 2014	The Service sent a draft Revised SPBO to the Corps for review and comment
November 20, 2014	The Corps agreed with the changes made to the draft Revised SPBO
November 24, 2014	The Corps submitted proposed section 7(a)(1) conservation recommendations
January 30, 2014	The Corps and Service agreed on proposed section 7(a)(1) conservation recommendations and finalized draft revised SPBO

This SPBO is based on the PBA, and information provided during meetings and discussions with the Corps' representatives and information from the Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute (FWC/FWRI) sea turtle databases. A complete administrative record of this consultation is on file in the Service's North Florida, Panama City, and South Florida Ecological Services Offices.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes all activities associated with the placement of compatible sediment on beaches of the Atlantic and Gulf coasts of Florida encompassing both South Atlantic Jacksonville (SAJ) and South Atlantic Mobile (SAM) Corps Districts. Additionally, the proposed action includes the replacement and rehabilitation of groins that are included as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This SPBO includes projects authorized through the Corps Regulatory Program, and funded or carried out as part of its Civil Works program. Corps Regulatory activities may include the involvement of other Federal agencies, such as the Department of Defense, Bureau of Ocean Energy Management, and the Federal Emergency Management Agency (FEMA). The shore protection activities covered in the SPBO encompass the following shore protection activities:

1. Sand placement originating from Dredged Material Management Areas (DMMAs), offshore borrow sites, and other compatible sand sources;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management;

3. Sand washed onto the beach from being placed in the swash zone;
4. Sand by-passing/back-passing (sand discharge on beach);
5. Current Operations and Maintenance (O&M) dredging of navigation channels with beach disposal (does not include new navigation projects or expansion (deepening or widening) of existing authorized navigation projects); and
6. Groins and jetty repair or replacement.

For nearshore borrow sites, the Corps must provide information to the Service on the sand flow when this sand is removed from these nearshore areas. If removal of sand from these nearshore areas is shown to cause increased erosion on the adjacent beach, a separate consultation will be required.

A detailed description of each activity is found in the final PBA. The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future beach placement actions addressed in this SPBO may include maintenance of these existing projects or beaches that have not experienced a history of beach placement activities.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment and the shoreline updrift and downdrift area of the project.

Corps Commitments as listed in the final PBA

The following paragraph from the final PBA summarizes the Corps' Commitments as listed below:

"For Corps projects, please note that "fish and wildlife enhancement" activities (which are beyond mitigation of project impacts) must be authorized as a project purpose or project feature or must be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 Jun 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority (ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)), authorization and funding for such is not expected."

<u>Sea Turtles</u>

1. Avoid construction during the peak nesting and hatching season in the higher density beaches, and to the maximum extent practicable during all other nesting times and locations;

2. Except for O&M disposal actions, implement sea turtle nest monitoring and relocation plan during construction if nesting window cannot be adhered to;

3. Except for O&M disposal actions, escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the Service. For Corps Civil Works projects, leveling of escarpments would be limited to the term of the construction or as otherwise may be authorized and funded;

4. Placement of pipe parallel to the shoreline and as far landward as possible so that a significant portion of available nesting habitat can be utilized, nest placement is not subject to inundation or washout, and turtles do not become trapped landward of the pipe;

5. Temporary storage of pipes and equipment will be located off the beach to the maximum extent possible;

6. The Corps will continue to work with the FDEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop and implement alternative design criteria that may minimize these impacts;

7. Except for O&M disposal actions, Service compaction assessment guidelines will be followed and tilling will be performed where appropriate. For Corps Civil Works projects, assessment of compaction and tilling will be limited to the term of the construction or as otherwise may be authorized and funded; and

8. All lighting associated with project construction will be minimized to the maximum extent possible, through reduction, shielding, angling, etc., while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements.

Beach Mice

1. Pipeline routes for beach construction projects will avoid identified primary constituent elements for beach mouse critical habitat to the maximum extent practicable;

2. Implementation of a trapping and relocation plan if avoidance alternatives of occupied habitat are not practical; and

3. Implementation of a lighting plan to reduce, shield, lower, angle, etc. light sources in order to minimize illumination impacts on nocturnal beach mice during construction.

Action Area

The Service has described the action area to include sandy beaches of the Atlantic Coast of Florida (Key West to Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State

Line) for reasons that will be explained and discussed in the "EFFECTS OF THE ACTION" section of this consultation.

Underlying Dynamics of a Barrier Island

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). The southeast coast of Florida consists of continuous, narrow, sandy barrier islands bordering a narrow continental shelf (Wanless and Maier 2007). The dynamics of the east coast shoreline are due to the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. More erosion events can also occur during late September through March due to nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Northwest (panhandle) and Southwest Florida beaches are considered to be low energy beaches with a gradual offshore slope and low sloped fine grained quartz sand beaches. As along the east coast of Florida, the shoreline dynamics are shaped by tropical storms and hurricanes. Although Gulf beaches may experience winter erosion, they are largely protected from the severe nor'easters.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of seven feet at the Florida-Georgia line to less than two feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than three feet (microtidal) except in the extreme south where it ranges from three to four feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Microtidal coasts have a high vulnerability to sea level rise and barrier islands respond by migrating landward. Migration occurs as a result of overwash from extreme storms that flatten topography and deposit sand on the backside of the island, extending the island landward (Young 2007). Significant widening can occur from a single storm event. For example, Dauphin Island, a barrier island in Alabama, has nearly doubled its width following Hurricanes Ivan and Katrina in 2004 and 2005, respectively.

Sea level has risen globally approximately 7.1 inches in the past century (Douglas 1997). Climate models predict a doubling of the rate of sea level rise over the next 100 years (Pendleton *et al.* 2004). Recent studies indicate a trend toward increasing hurricane number and intensity (Emanuel

2005, Webster *et al.* 2005). Barrier islands need to be able to move and respond to these conditions. By locking in a barrier island's location with infrastructure, the island loses its ability to migrate to higher elevations which can lead to its eventual collapse (Moore 2007).

Overwash from less intense storms can positively affect island topography. Low natural berms can develop along beach fronts, but generally can be exceeded by overwash from frontal storms. The berm is an accretionary feature at the landward extreme of wave influence. Sediment is transported over the berm crest and is deposited in a nearshore overwash fan and in breach corridors. Overwash deposition provides source sand for re-establishing dunes. Onshore winds transport the sediment from overwash fans to the dunes, gradually building back dune elevation during storm-free periods.

The interaction between the biology and geomorphology of barrier islands is complex. Just as the barrier island undergoes a process of continual change, so do the ecological communities present. Vegetation zones gradually re-establish following storms, and in turn affect physical processes such as sand accretion, erosion, and overwash. The beach front, dunes, and overwash areas all provide important habitat components. Many barrier island species are adapted to respond positively to periodic disturbance. As the island widens, new feeding habitat (sand/mud flats) is created for shorebirds such as the piping plover. The beaches provide nesting habitat for sea turtles. Early colonizer plants are favored as a food source by beach mice. These barrier island habitats are becoming increasingly rare as our Nation's coastlines rapidly develop and are stabilized.

SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. Five species of sea turtles are analyzed in this SPBO: the loggerhead, green, leatherback, hawksbill, and Kemp's ridley.

Loggerhead Sea Turtle

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 *Federal Register* [*FR*] 32800). The Service and the National Marine Fisheries Service (NMFS) listed the Northwest Atlantic Ocean distinct population segment (DPS) of the loggerhead sea turtle as threatened on September 22, 2011 (76 *FR* 58868). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NMFS 2009a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas.

Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al*. 1983, Dodd 1988, Weishampel *et al*. 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al*. 2003, NMFS and Service 2008).

Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

Green Sea Turtle

The green sea turtle was federally listed on July 28, 1978 (43 *FR* 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters.

The green sea turtle grows to a maximum size of about four feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2009b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Santa Rosa County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC 2009a).

Most green turtles spend the majority of their lives in coastal foraging grounds. These areas include fairly shallow waters both open coastline and protected bays and lagoons. While in these

areas, green turtles rely on marine algae and seagrass as their primary diet constituents, although some populations also forage heavily on invertebrates. These marine habitats are often highly dynamic and in areas with annual fluctuations in seawater and air temperatures, which can cause the distribution and abundance of potential green turtle food items to vary substantially between seasons and years (Carballo *et al.*, 2002). Many prey species that are abundant during winter and spring periods become patchy during warm summer periods. Some species may altogether vanish during extreme temperatures, such as those that occur during El Niño Southern Oscillation events (Carballo *et al.*, 2002).

Open beaches with a sloping platform and minimal disturbance are required for nesting.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). Leatherbacks have the widest distribution of the sea turtles; nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Foraging leatherback excursions have been documented into higher-latitude subpolar waters. They have evolved physiological and anatomical adaptations (Frair *et al.* 1972, Greer *et al.* 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving.

The adult leatherback can reach four to eight feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NMFS 2009c). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. This is the largest, deepest diving of all sea turtle species.

Leatherback turtle nesting grounds are distributed worldwide in the Atlantic, Pacific and Indian Oceans on beaches in the tropics and sub-tropics. The Pacific Coast of Mexico historically supported the world's largest known concentration of nesting leatherbacks.

The leatherback turtle regularly nests in the U.S. Caribbean in Puerto Rico and the U.S. Virgin Islands. Along the U.S. Atlantic coast, most nesting occurs in Florida (NMFS and Service 1992). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990, FWC 2009a); and in southwest Florida a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990). Nesting has also been reported in Georgia, South Carolina, and North Carolina (Rabon *et al.* 2003) and in Texas (Shaver 2008).

Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 Code of Federal Regulations (CFR) 17.95).

Hawksbill Sea Turtle

The hawksbill sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean.

Data collected in the Wider Caribbean reported that hawksbills typically weigh around 176 pounds or less; hatchlings average about 1.6 inches straight length and range in weight from 0.5 to 0.7 ounces. The carapace is heart shaped in young turtles, and becomes more elongated or egg-shaped with maturity. The top scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The head is elongated and tapers sharply to a point. The lower jaw is V-shaped (NMFS 2009d).

Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992, Meylan *et al.* 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was federally listed as endangered on December 2, 1970 (35 *FR* 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland.

Adult Kemp's ridleys, considered the smallest sea turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan 1994). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these

turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet (200 meters). The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon *et al.* 1993, Heppell 1998, Crouse 1999, Heppell *et al.* 1999, 2003, Musick 1999).

The generalized life history of Atlantic loggerheads is shown in **Figure 1** (from Bolten 2003).

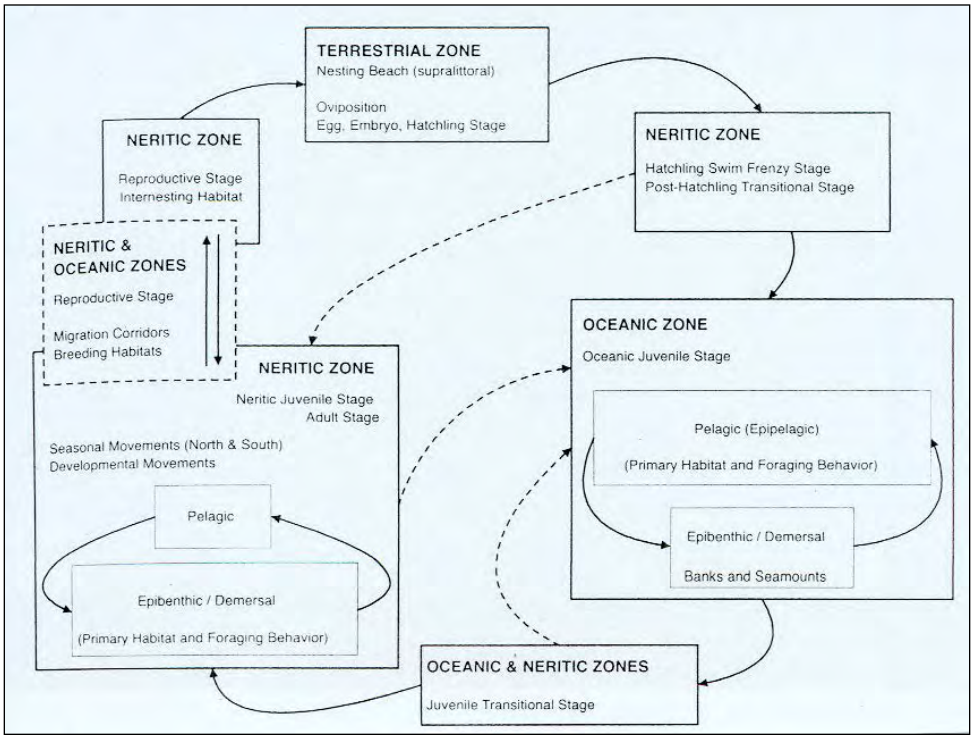

Figure 1. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al*. 2002). **Table 4** summarizes key life history characteristics for loggerheads nesting in the U.S.

Table 5. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).

Life History Trait	Data
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	84˚F[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70 percent[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<34 inches Curved Carapace Length) sex ratio	65-70 percent female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

[1] Dodd (1988).
[2] Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
[3] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 865).
[4] National Marine Fisheries Service (2001); Foley (2005).
[5] Mrosovsky (1988).
[6] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 1,680).
[7] Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al*. 2005; Scott 2006.
[8] Caldwell (1962), Dodd (1988).
[9] Richardson *et al.* (1978); Bjorndal *et al.* (1983).
[10] Snover (2005).
[11] Dahlen *et al.* (2000).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington

1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Mortimer 1982; Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a one to three day interval and move upward and out of the nest over a two to four day interval (Christens 1990). The time from pipping to emergence ranges from four to seven days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al.* 1990). Moran *et al*. (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon *et al.* 1992, Witherington and Martin 1996, Witherington 1997, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mitochondrial deoxyribonucleic acid (mtDNA), oceanic juveniles show no structure, neritic juveniles show moderate structure and nesting colonies show strong structure (Bowen *et al*. 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al*. 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

Green Sea Turtle

Green sea turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two or more years intervene between breeding seasons (NMFS and Service 1991). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about nine to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in six to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss *et al.* 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Kemp's Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as "arribadas or arribazones," to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal *et al.* 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Clutch size averages 100 eggs and eggs typically take 45 to 58 days to hatch depending on temperatures (Marquez-Millan 1994, Rostal 2007).

Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.1 nests per nesting season. Interannual remigration rate for female ridleys is estimated to be

approximately 1.8 (Rostal 2007) to 2.0 years (Marquez-Millan *et al.* 1989). Age at sexual maturity is believed to be between 10 to 17 years (Snover *et al*. 2007).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin *et al.* 2003, Ehrhart *et al.* 2003, Kamezaki *et al.* 2003, Limpus and Limpus 2003, Margaritoulis *et al.* 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in Florida, where 90 percent of nesting occurs, has fluctuated between 52,374 and 98,602 nests per year from 2009-2013 (FWC 2014, http://myfwc.com/media/2786250/loggerheadnestingdata09-13.pdf). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder *et al.* 2003, Foley *et al.* 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (Possardt 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

The majority of nesting occurs along the Atlantic coast of eastern central Florida, with an average of 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998b). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus *et al.* 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila *et al.* (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila *et al.* (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in 1980s, but during the 2003-2004 seasons a total of 120 nests was recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (TEWG 2007). In Florida, the number of nests has been increasing since 1979 (Stewart *et al.* 2011). The average annual number of nests in the 1980s was 63 nests, which rose to 263 nests in the 1990s and to 754 nests in the 2000s (Stewart *et al.* 2011). In 2012, 1,712 nests were recorded statewide (http://myfwc.com/research/wildlife/sea-turtles/nesting/).

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (TEWG 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80

percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, annual population growth rate was estimated to be 1.10 percent (TEWG 2007). Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001 (Garner *et al*. 2005). In the British Virgin Islands, annual nest numbers have increased in Tortola from zero to six nests per year in the late 1980s to 35 to 65 nests per year in the 2000s (TEWG 2007).

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon during the 1999-2000 nesting season (Billes *et al*. 2000). Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea) (Fretey *et al*. 2007). .

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2009, 16,273 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests

documented for all the monitored beaches in Mexico was 21,144 (Service 2009). In 2010, a total of 13,302 nests were documented in Mexico (Service 2010). In addition, 207 and 153 nests were recorded during 2009 and 2010, respectively, in the U.S., primarily in Texas.

Status and distribution

Loggerhead Sea turtle

Five recovery units have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries (NMFS and Service 2008). Recovery units are subunits of a listed species that are geographically or otherwise identifiable and essential to the recovery of the species. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species. The five recovery units identified in the Northwest Atlantic (**Figure 2**) are:

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range);

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida;

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida;

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas; and

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

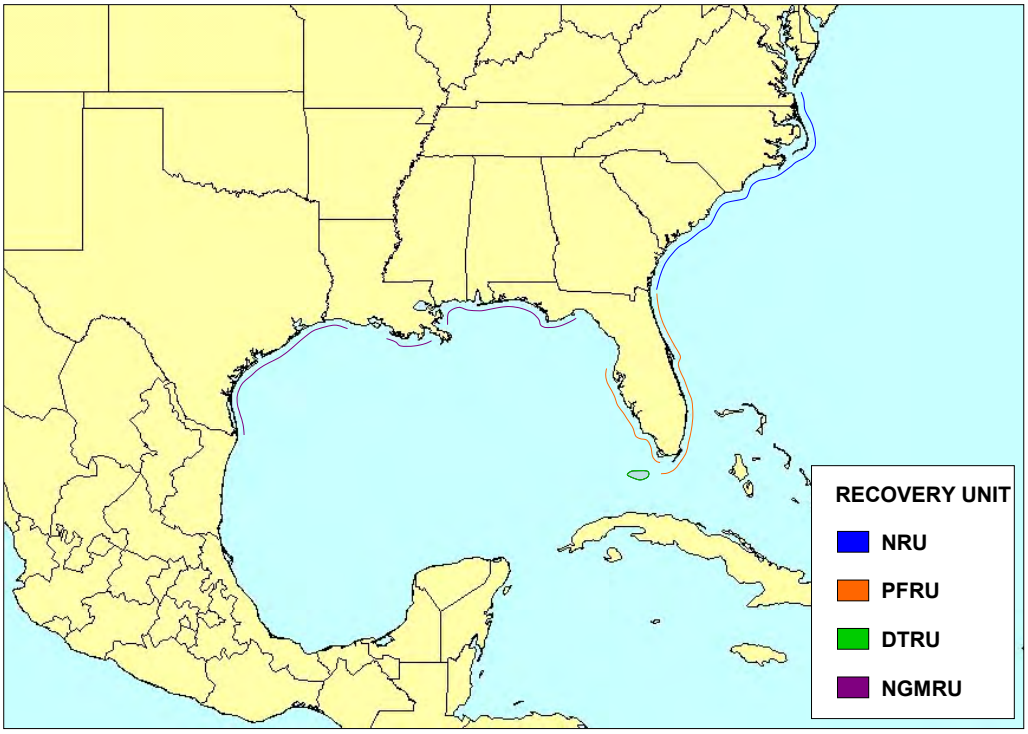

Figure 2. Map of the distribution of the loggerhead recovery units.

The mtDNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989, Foote *et al.* 2000, NMFS 2001, Hawkes *et al.* 2005). Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the GCRU that nest at Quintana Roo, Mexico (Encalada *et al.* 1999, Nielsen *et al*. 2012).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U.S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson *et al.* 1998, NMFS 2001, Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios

for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005, Wyneken *et al.* 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken *et al.* (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (NMFS and Service 2008), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline (NMFS and Service 2008).

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years (FWC 2009b). Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

INBS nest counts from 1989–2010 show a shallow decline. However, recent trends (1998–2010) in nest counts have shown a 25 percent decline, with increases only observed in the most recent 6-year period, 2008–2013 although there was no trend observed (FWC/FWRI 2014). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 187 miles) and 23 representative zones on Florida's southern Gulf coast (total length = 14.3 miles). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70 percent of statewide loggerhead nesting activity between 1989 and 2010.

The NGMRU is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 186 miles of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984; FWC 2008d). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-2008) of Florida INBS data for the NGMRU (FWC 2008d). A log-linear regression showed a significant declining trend of 4.7 percent annually (NMFS and Service 2008).

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (nine years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). Surveys after 2004 did not include principal nesting beaches within the recovery unit (*i.e.*, Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. There are nine years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend (NMFS and Service 2008).

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo and Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita *et al.* 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (NMFS and Service 2008). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

Recovery Criteria (only the Demographic Recovery Criteria are presented below; for the Listing Factor Recovery Criteria, please see NMFS and Service 2008)

1. Number of Nests and Number of Nesting Females
   a. Northern Recovery Unit
      i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is 2 percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is North Carolina =14 percent [2,000 nests], South Carolina =66 percent [9,200 nests], and Georgia =20 percent [2,800 nests]); and

ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

b. Peninsular Florida Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (one percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

c. Dry Tortugas Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

d. Northern Gulf of Mexico Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is Florida= 92 percent [3,700 nests] and Alabama =8 percent [300 nests]); and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

e. Greater Caribbean Recovery Unit
   i. The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, Bahamas) has increased over a generation time of 50 years; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. Trends in Abundance on Foraging Grounds
A network of in-water sites, both oceanic and neritic, across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance
   Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle was signed in 2008 (NMFS and Service 2008), and the Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle was signed in 1998 (NMFS and Service 1998e).

Green Sea Turtle

Annual nest totals documented as part of the Florida SNBS program from 1989-2008 have ranged from 435 nests laid in 1993 to 12,752 in 2007. The nest count for 2013 was more than twice the count from 2007 with a total of 36,195 nests recorded (http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/). Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, green turtle nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). Green sea turtle nesting in Florida is increasing based on 19 years (1989-2009) of INBS data from throughout the state (FWC 2009a). The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the Act afforded complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in State waters; (4) the likelihood that the majority of Florida green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data must be based on standardized surveys;

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) is in public ownership and encompasses at least 50 percent of the nesting activity;

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for U.S. Population of Atlantic Green Turtle was signed in 1991 (NMFS and Service 1991), the Recovery Plan for U.S. Pacific Populations of the Green Turtle was signed in 1998 (NMFS and Service 1998b), and the Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle was signed in 1998 (NMFS and Service 1998a).

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al.* (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200, and an upper limit of about 42,900. This is less than one-third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al.* (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (FWC 2009a, Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (FWC 2009b, TEWG Group 2007).

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting if the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Islands, and along the east coast of Florida;

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership; and.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1992 (NMFS and Service 1992), and the Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle was signed in 1998 (NMFS and Service 1998d).

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics.

Recovery Criteria

The U.S. Atlantic population of hawksbills can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument;

2. Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands and Puerto Rico is protected in perpetuity;

3. Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, U.S. Virgin Islands, and Florida; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for the Hawksbill Turtle in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1993 (NMFS and Service 1993), and the Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle was signed in 1998 (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the U.S. and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it can reduce egg viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the MMPA, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Continuation of complete and active protection of the known nesting habitat and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national protection project;

2. Elimination of mortality from incidental catch in commercial shrimping in the U.S. and Mexico through the use of TEDs and achievement of full compliance with the regulations requiring TED use;

3. Attainment of a population of at least 10,000 females nesting in a season; and

4. Successful implementation of all priority one recovery tasks in the recovery plan.

The Recovery Plan for the Kemp's Ridley Sea Turtle was signed in 1992 (Service and NMFS 1992). Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been completed by the Service and NMFS. The Bi-National Recover Plan for the Kemp's Ridley Sea

turtle (2011) provides updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions.

Common threats to sea turtles in Florida

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion; armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants (*Solenopsis* spp.), feral hogs (*Sus scrofa*), dogs (*Canis familiaris),* and an increased presence of native species (e.g., raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and opossums (*Didelphis virginiana*)), which raid nests and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching and fishery interactions. On April 20, 2010, an explosion and fire on the Mobile Offshore Drilling Unit *Deepwater Horizon* MC252 occurred approximately 50 miles southeast of the Mississippi Delta. A broken well head at the sea floor resulted in a sustained release of oil, estimated at 35,000 and 60,000 barrels per day. On July 15, the valves on the cap were closed, which effectively shut in the well and all sub-sea containment systems. Damage assessment from the sustained release of oil is currently ongoing and the Service does not have a basis at the present time to predict the complete scope of effects to sea turtles range-wide.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Analysis of the species/critical habitat likely to be affected

The threatened loggerhead sea turtle, the endangered green sea turtle, the endangered leatherback sea turtle, the endangered hawksbill sea turtle, and the endangered Kemp's ridley sea turtle are currently listed because of their reduced population sizes caused by overharvest and habitat loss with continuing anthropogenic threats from commercial fishing, disease, and degradation of remaining habitat. The proposed action has the potential to adversely affect nesting females of these species, their nests, and hatchlings on all nesting beaches where shore protection activities (including the placement of compatible sediment, repair or replacement of groins and jetties, and navigation channel maintenance on the beaches of the Atlantic and Gulf coasts of Florida) occur.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment.

In accordance with the Act, the Service completes consultations with all Federal agencies for actions that may adversely affect sea turtles on the nesting beach. The Service's analysis only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS assesses and consults with Federal agencies concerning potential impacts to sea turtles in the marine environment, including updrift and downdrift nearshore areas affected by sand placement projects on the beach.

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment as a result of construction activities in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches; disorientation of hatchling turtles resulting from project lighting on beaches adjacent to the construction area as they emerge from the nest and crawl to the water; disorientation that occurs after project construction due to landward lights impacting the elevated berm; and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion.

Some individuals in a population are more "valuable" than others in terms of the number of offspring they are expected to produce. An individual's potential for contributing offspring to future generations is its reproductive value. Because of delayed sexual maturity, reproductive longevity, and low survivorship in early life stages, nesting females are of high value to a population. The loss of a nesting female in a small recovery unit would represent a significant loss to the recovery unit. The reproductive value for a nesting female has been estimated to be approximately 253 times greater than an egg or a hatchling (NMFS and Service 2008). However, the SPBO includes avoidance and minimization measures that reduce the possibility of mortality of a nesting female on the beach as a result of the project. Therefore, we do not anticipate the loss of any nesting females on the beach as a result of the activities listed in this SPBO.

Sand placement projects are anticipated to result in decreased nesting and loss of nests that do get laid within the project area for two subsequent nesting seasons following the completion of the proposed sand placement. However, it is important to note that it is unknown whether nests that would have been laid in a project area during the two subsequent nesting seasons had the project not occurred are actually lost from the population or if nesting is simply displaced to adjacent beaches. Regardless, eggs and hatchlings have a low reproductive value; each egg or hatchling has been estimated to have only 0.004 percent of the value of a nesting female (NMFS and Service

2008). Thus, even if the majority of the eggs and hatchlings that would have been produced on the project beach are not realized for up to 2 years following project completion, the Service would not expect this loss to have a significant effect on the recovery and survival of the species, for the following reasons: 1) some nesting is likely just displaced to adjacent non-project beaches, 2) not all eggs will produce hatchlings, and 3) destruction and/or failure of nests will not always result from a sand placement project. A variety of natural and unknown factors negatively affect incubating egg clutches, including tidal inundation, storm events, and predation.

During project construction, direct mortality of the developing embryos in nests within the project area may occur for nests that are missed and not relocated. The exact number of these missed nests is not known. However, in two separate monitoring programs on the east coast of Florida where hand digging was performed to confirm the presence of nests and thus reduce the chance of missing nests through misinterpretation, trained observers still missed about 6 to 8 percent of the nests because of natural elements (Martin 1992, Ernest and Martin 1993). This must be considered a conservative number, because nests missed during surveys are not always discovered after hatching. In another study, Schroeder (1994) found that even under the best of conditions, about 7 percent of nests can be misidentified as false crawls by highly experienced sea turtle nest surveyors. Missed nests are usually identified by signs of hatchling emergences in areas where no nest was previously documented. Signs of hatchling emergence are very easily obliterated by the same elements that interfere with detection of nests.

In the U.S., consultations with the Service have included military missions and operations, beach nourishment and other shoreline protection projects, and actions related to protection of coastal development on sandy beaches along the coast. Much of the Service's section 7 consultation involves beach nourishment projects. A list of the Service's consultations completed over the last 5 years is included in Appendix A. The Act does not require entities conducting projects with no Federal nexus to apply for a section 10(a)(1)(B) permit. This is a voluntary process and is applicant driven. Section 10(a)(1)(A) permits are scientific permits that include activities that would enhance the survival and conservation of a listed species. Those permits are not listed as they are expected to benefit the species and are not expected to contribute to the cumulative take assessment.

A list of completed NMFS consultations is included in Appendix B.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

INBS nest counts represent approximately 69 percent of known loggerhead nesting in Florida, 74 percent of known green turtle nesting, and 34 percent of known leatherback nesting (FWC 2009a). The INBS program was established with a set of standardized data-collection criteria to measure seasonal nesting, and to allow accurate comparisons between both beaches and years. The reliability of these comparisons results from the uniformity of beach-survey effort in space and time, and from the specialized annual training of beach surveyors. Under the core INBS program,

178 miles of nesting beach have been divided into zones, known as core index zones, averaging 0.5 mile in length. These beaches are monitored daily beginning May 15 and ending August 31. On all index beaches, researchers record nests and nesting attempts by species, the location of each nest, and the date each nest was laid.

Nesting surveys begin at or just before sunrise. Turtle crawls are identified as a true nesting crawl or false crawl (*i.e.*, nonnesting emergence). Nests are marked with stakes and some are surrounded with surveyor flagging tape and, if needed, screened or caged to prevent predation. The marked nests are monitored throughout the incubation period for storm damage, predation, hatching activity and hatching and emerging success. Nest productivity surveys may continue into mid-November depending on nest incubation periods. All monitoring is conducted in accordance with the FWC's Marine Turtle Conservation Guidelines.

Loggerhead Sea Turtle

Five loggerhead sea turtle recovery units have been identified in the Northwest Atlantic (NMFS and Service 2008). Mitochondrial DNA analyses show that there is limited exchange of females among these recovery units (Foote *et al*. 2000, NMFS 2001, Hawkes *et al*. 2005). However, nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001). The NRU and NGMRU are believed to play an important role in providing males to mate with females from the more female-dominated recovery units.

Two (NGMRU and PFRU) of the five nesting subpopulations occur within the proposed Action Area. Northwest Florida, which accounts for 92 percent of the NGMRU in nest numbers, consists of approximately 234 miles of nesting shoreline. The PFRU makes up 1,166 miles of shoreline and consists of approximately was 69,982 nests per year (2008 to 2012)..

Recovery Units	**Nesting Range**
NGMRU	Escambia through Franklin Counties
PFRU	Pinellas through Nassau Counties

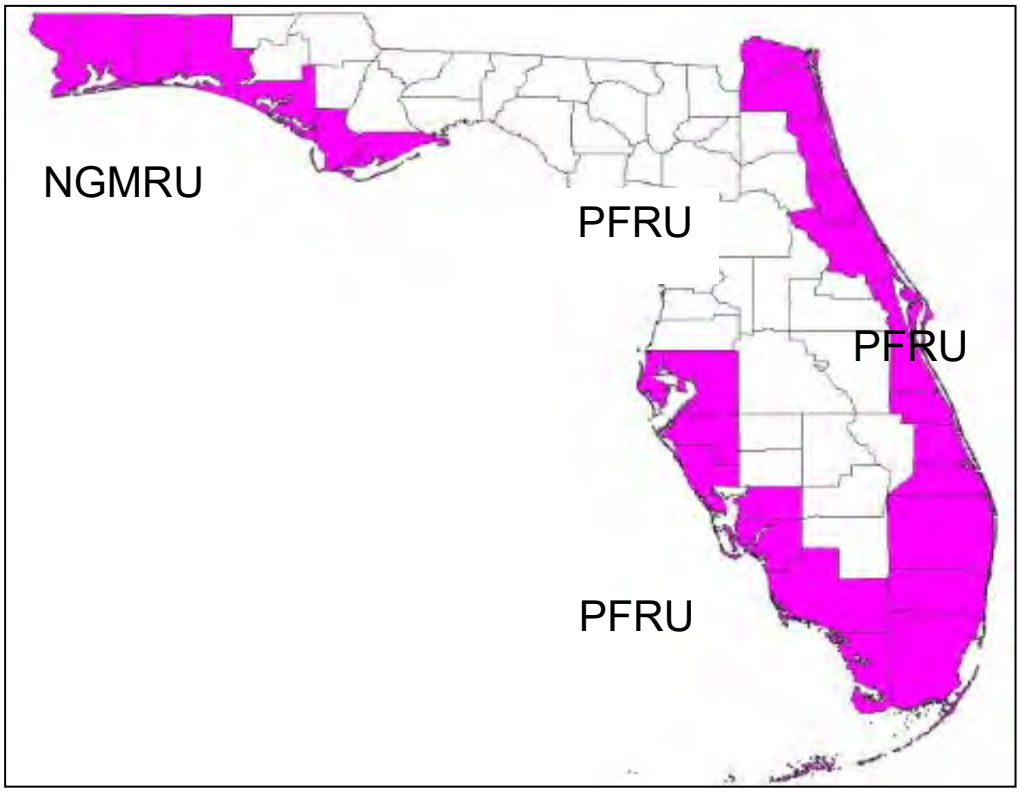

Figure 3. Distribution of loggerhead sea nesting in the PFRU and NGMRU in Florida.

The main loggerhead sea turtle nesting and hatching season throughout Florida is shown in **Table 5.**

Table 6. Loggerhead sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	April 1 through November 30
Southern Florida Atlantic	Brevard through Miami-Dade	March 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through November 30

An updated analysis by FWC/FWRI reveals a shallow decline in loggerhead nest numbers around the State of Florida based on INBS nest counts from 1989 through 2010 (FWC/FWRI 2010). Analysis of nest counts over the last six years (2009 through 2013) have found no trend, although when added to the data from 1989, the overall change is an increase in loggerhead nests since 1989 (FWC/FWRI 2014). The five year average (2008 to2012) for the PFRU was 69,982 nests. The five-year average (2008 to 2012) for the NGMRU was 966 nests.

Sea turtles play a vital role in maintaining healthy and productive ecosystems. Nesting sea turtles introduce large quantities of nutrients from the marine ecosystem to the beach and dune system (Bouchard and Bjorndal 2000). In the U.S., loggerheads play a particularly important role in this regard due to their greater nesting numbers. The nutrients they leave behind on the nesting beaches in the form of eggs and eggshells play an important role for dune vegetation and terrestrial predator populations (Bouchard and Bjorndal 2000). In a study at Melbourne Beach, Florida, Bouchard and Bjorndal (2000) estimated that only 25 percent of the organic matter introduced into nests by loggerheads returned to the ocean as hatchlings. They found that 29-40 percent of all nutrients were made available to detritivores, decomposers, and plants, while 26-31 percent of all nutrients were consumed by nest predators. Thus, all loggerhead recovery units play a vital role in the maintenance of a healthy beach and dune ecosystem within their geographic distribution.

Green Sea Turtle

Green turtle nest numbers are increasing in Florida with a record number of nests being recorded during the 2013 season (FWC 2014). The five year average (2008 to 2012) for green turtles within the action area was 10,384 nests. The number of green turtle nests recorded in Florida during the 2013 nesting season was a record high of 36,195.

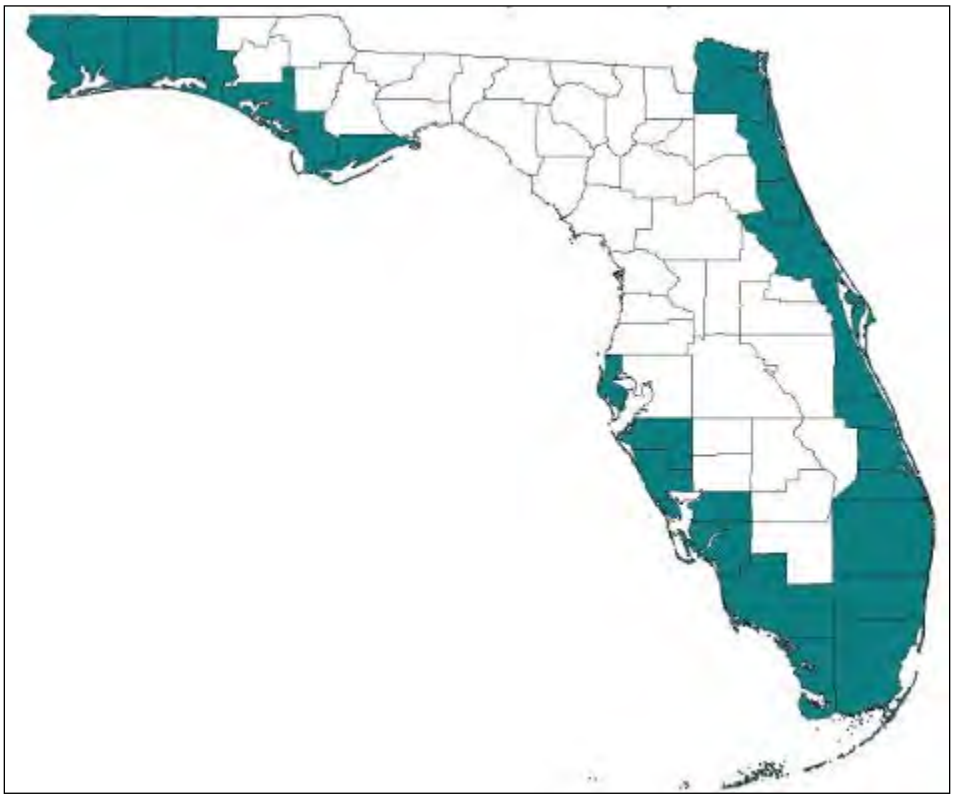

Figure 4. Distribution of green sea turtle nesting in Florida.

The main green sea turtle nesting and hatching season throughout Florida is shown in **Table 6**.

Table 7. Green sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 15 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	May 15 through October 31
Southern Florida Atlantic	Brevard through Miami-Dade	May 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	May 15 through November 15

Leatherback Sea Turtle

Leatherback nest numbers are increasing in Florida with a record number of leatherback nests recorded during the 2009 season (FWC 2009a). The five year average (2008 to 2012) for leatherback sea turtles within the action area was 1,435 nests with a total of 896 nests recorded in 2013.

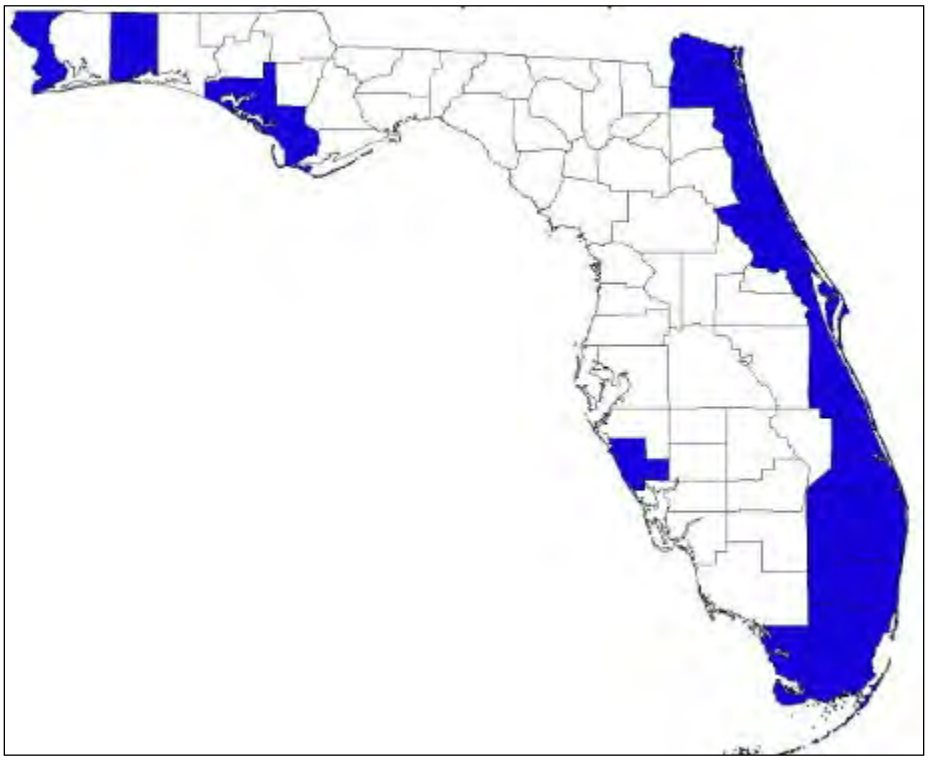

Figure 5. Distribution of leatherback sea turtle nesting in Florida.

The main leatherback sea turtle nesting and hatching season throughout Florida is shown in **Table 7**.

Table 8. Leatherback sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through September 30
Southern Florida Atlantic	Brevard through Miami-Dade	February 15 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through September 30

Hawksbill Sea Turtle

Forty-six hawksbill nests have been documented in Florida from 1979-2013 in Volusia, Martin, Palm Beach, Broward, Miami-Dade, Monroe, and Manatee counties (FWC/FWRI 2014a). The hawksbill sea turtle nesting and hatching season throughout Florida is shown in **Table 8**.

Table 9. Hawksbill sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Southern tip of Florida	Monroe	June 1 through December 31
Southern Florida Atlantic	Brevard through Miami-Dade	June 1 through December 31
Northeast Florida	Volusia	June 1 through December 31
Southwest Florida	Manatee	June 1 through December 31

Kemp's Ridley Sea Turtle

Eighty Kemp's ridley nests have been documented in Florida from 1979-2013 in Duval, Flagler, Volusia, Brevard, Martin, Palm Beach, Lee, Charlotte, Sarasota, Pinellas, Franklin, Gulf, Walton, Okaloosa, Santa Rosa, and Escambia counties (FWC/FWRI 2014).

Factors affecting species habitat within the action area

In accordance with the Act, the Service completes consultations with all federal agencies for actions that may adversely affect sea turtles. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development on sandy beaches of Florida's Atlantic Coast (Key West to

Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State Line) (**Appendix A**).

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in Florida. Beachfront development not only causes the loss of suitable nesting habitat, but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach emergency berm construction and repair, and beach nourishment which cause changes in, additional loss of, or impact to, the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain, which can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action, inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat in a natural state with no development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a loss of nesting habitat.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the

majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

A common question is whether the 2004 and 2005 hurricane seasons contributed to reduced loggerhead nest numbers observed from 2004-2007. Although Florida has been subject to numerous hurricanes in recent years, these storm events cannot account for the recent decline (1998-2010) observed in the number of loggerhead nests on Florida beaches. The hurricanes have a very limited effect on nesting activity of adult female turtles. Because loggerheads that hatch on Florida beaches require some 20 to 30 years to reach maturity, storm impacts would not manifest themselves for many years. Moreover, hurricane impacts to nests tend to be localized and often occur after the main hatching season for the loggerhead is over (FWC 2008a).

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Management Funding Assistance Program http://www.dep.state.fl.us/beaches/programs/becp/index.htm. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2009). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976, Mann 1977, Witherington and Martin 1996). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators, or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has

documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 to 2010 sea turtle nesting seasons in Florida, turtle hatchlings that were documented as being disoriented ranged from 44,828 to more than 64,000 hatchlings per year (**Table 9**) (FWC/FWRI 2014b). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (FWC 2007a).

Table 10. Documented disorientations along the Florida coast (FWC 2007a).

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1,192	49,623	62
2009	1,274	44,828	42
2010	1,513	46,978	82

Predation

Predation of sea turtle eggs and hatchlings by native and introduced species occurs on almost all nesting beaches. Predation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U.S. are ghost crabs (*Ocypode quadrata*), raccoons, feral hogs, foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos, and fire ants (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U.S., raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980, Talbert *et al.* 1980, Schroeder 1981, Labisky *et al.* 1986). In response to increasing predation of sea turtle nests by coyotes, foxes, hogs, and raccoons, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by interrupting or striking a female turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over nests or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach which interfere with hatchlings crawling to the ocean. Hatchlings appear to become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

The physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward. Since the vehicles also inhibit plant growth, and open the area to wind erosion, dunes may become unstable, and begin to migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches or low dunes on an eroding beach may cause an accelerated rate of overwash and beach erosion (Godfrey *et al.* 1978). If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly reestablish provided the mechanical impact is removed.

In 1985, the Florida Legislature severely restricted vehicular driving on Florida's beaches, except that which is necessary for cleanup, repair, or public safety. This legislation also allowed an exception for five counties to continue to allow vehicular access on coastal beaches due to the availability of less than 50 percent of its peak user demand for off-beach parking. The counties affected by this exception are Volusia, St. Johns, Gulf, Nassau, and Flagler Counties, as well as limited vehicular access on Walton County beaches for boat launching.

Climate Change

The varying and dynamic elements of climate science are inherently long term, complex, and interrelated. Regardless of the underlying causes of climate change, glacial melting and expansion of warming oceans are causing sea level rise, although its extent or rate cannot as yet be predicted with certainty. At present, the science is not exact enough to precisely predict when and where climate impacts will occur. Although we may know the direction of change, it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007a) describes changes in natural ecosystems with potential widespread effects on many organisms,

including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the U.S. Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007c).

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases relative to the effects of global climate change on sea turtles and its designated critical habitat, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Florida is one of the areas most vulnerable to the consequences of climate change. Sea level rise and the possibility of more intense hurricanes are the most serious threats to Florida potentially from climate change. Florida has over 1,350 miles of coastline, low-lying topography, and proximity to the hurricane-prone subtropical mid-Atlantic Ocean and Gulf of Mexico.

One of the most serious threats to Florida's coasts comes from the combination of elevated sea levels and intense hurricanes. Florida experiences more landings of tropical storms and hurricanes than any other state in the U.S. Storm surges due to hurricanes will be on top of elevated sea levels, tides, and wave action. As a result, barrier islands and low-lying areas of Florida will be more susceptible to the effects of storm surge. An important element of adaptation strategy is how to protect beaches, buildings and infrastructure against the effects of rising seas and wind, wave action, and storm surge due to hurricanes while maintaining viable nesting habitat along Florida's coasts.

Temperatures are predicted to rise from 1.6^{o}F to 9^{o}F for North America by the end of this century (IPCC 2007a,b). Alterations of thermal sand characteristics could result in highly female-biased sex ratios because sea turtles exhibit temperature dependent sex determination (e.g., Glen and Mrosovsky 2004, Hawkes *et al*. 2008).

Along developed coastlines, and especially in areas where shoreline protection structures have been constructed to limit shoreline movement, rising sea levels will cause severe effects on nesting females and their eggs. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting females from reaching suitable nesting sites (National Research Council

1990a). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation or washout by waves and tidal action.

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles and their designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or their designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on nesting sea turtles, nests, eggs, and hatchling sea turtles within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term and permanent impacts could include a change in the nest incubation environment from the sand placement activities. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the nesting or hatching period, from changes in the physical characteristics of the beach from the placement of the sand including the profile and from sediment-induced changes in the nest incubation environment.

Proximity of action: Sand placement activities would occur within and adjacent to nesting habitat for sea turtles and dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead, green, leatherback, hawksbill, and Kemp's ridley nesting females, their nests, nesting habitat, and hatchling sea turtles.

Distribution: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur along Gulf of Mexico and Atlantic Ocean coasts.

Timing: The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles when conducted between March 1 and November 30.

Nature of the effect: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles, diminish nesting success, and reduce hatching and emerging success. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in Florida.

Duration: The sand placement activity may be a one-time activity or a multiple-year activity and each sand placement project may take between three and seven months to complete. Thus, the direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

Disturbance frequency: Sea turtle populations in Florida may experience decreased nesting success, hatching success, and hatchling emergence success that could result from the sand placement activities being conducted at night during one nesting season, or during the earlier or later parts of two nesting seasons. Disturbance due to alterations of the incubation substrate and beach profile could persist for several years, depending on continued presence of placed sand in the nesting beach.

Disturbance intensity and severity: Depending on the amount (including post-disaster work) and the timing of the sand placement activities during sea turtle nesting season, effects to the sea turtle populations of Florida, and potentially the U.S. populations, could be important.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach nourishment can have adverse effects on nesting female sea turtles and hatchlings and sea turtle nests. Results of monitoring sea turtle nesting and beach nourishment activities provide additional information on how sea turtles respond to nourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach nourishment monitoring is used to manage beach nourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach nourishment can be accomplished. Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles. Because of the long history of sea turtle monitoring in Florida, it is not necessary to require studies on each project beach to document those effects each time.

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although sand placement activities may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement activities during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about seven percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al.* 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

In a 1994 Florida study comparing loggerhead hatching and emerging success of relocated nests with nests left in their original location, Moody (1998) found that hatching success was lower in relocated nests at nine of 12 beaches evaluated. In addition, emerging success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach nourishment may persist over time. These direct effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, repair/replacement of groins and jetties and future sand migration.

Equipment

The use of heavy machinery on beaches during a construction project may also have adverse effects on sea turtles. Equipment left on the nesting beach overnight can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a female turtle on the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over nesting females or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al*. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

Depending on when the dune project is completed, dune vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey *et al.* 1978). Driving along the beachfront should be limited to between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, work areas for the truck transport and bulldozer/bobcat equipment should be designated and marked.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976, Mann 1977, FWC 2007a). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of selected nourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent the first nesting season after project construction and up to 542 percent the second year compared to prenourishment reports (Trindell *et al.* 2005).

Specific examples of increased lighting disorientations after a sand placement project include Brevard and Palm Beach Counties, Florida. A sand placement project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the nourished area. Disorientations on beaches in the County that were not nourished remained constant (Trindell 2007). This same result was also documented in 2003 when another beach in Brevard County was nourished and the disorientations increased by 480 percent (Trindell 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including nourished beaches. A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida, between August 1997 and April 1998. Lighting disorientation events increased after nourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the nourished area in 1998 and 66 percent of the reports were in the nourished area in 1999 (Howard and Davis 1999).

While the effects of artificial lighting have not been specifically studied on each beach that is nourished in Florida, based on the experience of increased artificial lighting disorientations on other Florida beaches, impacts are expected to potentially occur on all nourished beaches statewide.

Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting appropriate regulations. Of the 27 coastal counties in Florida where sea turtles are known to nest, 21 have passed beachfront lighting ordinances in addition to 58 municipalities (http://myfwc.com/media/418420/seaturtle_lightordmap.pdf). Local governments have realized that adopting a lighting ordinance is the most effective method to address artificial lighting along the beachfront.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

Increased susceptibility to catastrophic events

Nest relocation within a nesting season may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al.* 1998).

Increased beachfront development

Pilkey and Dixon (1996) stated that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987, Nelson 1988).

Beach nourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 6**).

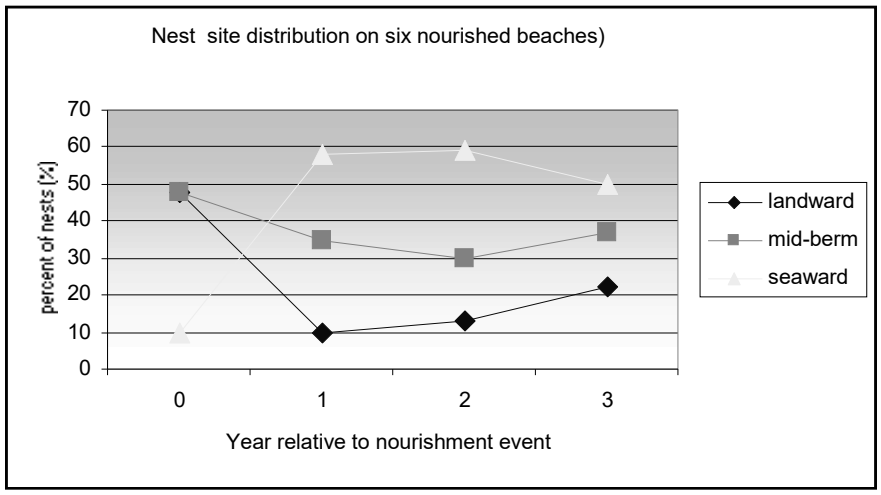

Figure 6. Review of sea turtle nesting site selection following nourishment (Trindell 2005).

Beach compaction and unnatural beach profiles resulting from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e.*, false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to one year. Multi-year beach compaction monitoring and, if necessary, tilling would ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments should resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to

lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along the water line interface as the beach adjusts from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Construction of groins and jetties

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979, Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983, Pilkey *et al.* 1984, National Research Council 1987), a process that results in degradation of sea turtle nesting habitat. As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983).

Jetties are placed at ocean inlets to keep transported sand from closing the inlet channel. Together, jetties and inlets are known to have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Witherington *et al.* (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting. Following construction, the presence of groins and jetties may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation.

Escarpments may develop on beaches between groins as the beaches equilibrate to their final profiles. These escarpments are known to prevent females from nesting on the upper beach and can cause them to choose unsuitable nesting areas, such as seaward of an escarpment. These nest sites commonly receive prolonged tidal inundation and erosion, which results in nest failure (Nelson and Blihovde 1998). As groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites and trap both hatchlings and nesting turtles.

Species' response to a proposed action

The following summary illustrates sea turtle responses to and recovery from a nourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or prenourished beaches. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural conditions. However, tilling (minimum depth of 36 inches) is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year monitoring and result from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occur as the beach equilibrates to a more natural contour.

The principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicated that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

BEACH MICE

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The formal taxonomic classification of beach mouse subspecies follows the geographic variation in pelage and skeletal measurements documented by Bowen (1968). This peer-reviewed, published classification was also accepted by Hall (1981). Since the listing of the beach mice, further research concerning the taxonomic validity of the subspecific classification of beach mice has been initiated and/or conducted. Preliminary results from these studies support the separation of beach mice from inland forms, and support the currently accepted taxonomy (Bowen 1968) (*i.e.*, each beach mouse group represents a unique and isolated subspecies). Recent research using mitochondrial DNA data illustrates that Gulf Coast beach mouse subspecies form a well-supported and independent evolutionary cluster within the global population of the mainland or inland old field mice (Van Zant and Wooten 2006).

The old-field mouse (*Peromyscus polionotus)* is different in form and structure as well as being genetically diverse throughout its range in the southeastern U.S. (Bowen 1968, Selander *et al.* 1971). Currently there are 16 recognized subspecies of old-field mice (Hall 1981). Eight subspecies occupy coastal rather than inland habitat and are referred to as beach mice (Bowen 1968). Two existing subspecies of beach mouse and one extinct subspecies are known from the Atlantic coast of Florida and five subspecies live along the Gulf coast of Alabama and northwestern Florida.

Rivers and various inlets bisect the Gulf and Atlantic beaches and naturally isolate habitats in which the beach mice live. The outer coastline and barrier islands are typically separated from the mainland by lagoons, swamps, tidal marshes, and flatwood areas with hardpan soil conditions. However, these dispersal barriers are not absolute; sections of sand peninsulas may from time to time be cut off by storms and shift over time due to wind and current action. Human development has also fragmented the ranges of the subspecies. As a consequence of coastal development and the dynamic nature of the coastal environment; beach mouse populations are generally comprised of various disjunct populations.

Atlantic Coast beach mice

The southeastern beach mouse (SEBM) was listed as a threatened species under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for this subspecies. SEBM is also listed as threatened by the State of Florida. The original distribution of the SEBM was from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami in Miami-Dade County. It is currently restricted to Volusia, Brevard, and Indian River Counties. Formerly, this subspecies occurred along about 175 miles of Florida's southeast coast; it now occupies about 50 miles, a significant reduction in range (**Figure 7**).

This subspecies uses both beach dunes and inland areas of scrub vegetation. The most seaward vegetation typically consists of sea oats (*Uniola paniculata*), bitter panicgrass (*Panicum amarum*), railroad vine (*Ipomoea pes-caprae*), beach morning-glory (*Ipomoea stolonifera*), and camphorweed (*Heterotheca subaxillaris*). Further landward, vegetation is more diverse, including beach tea (*Croton punctatus*), pricklypear (*Opuntia humifusa*), saw palmetto (*Serenoa repens)*, wax myrtle (*Myrica cerifera)*, and sea grape (*Coccoloba uvifera*).

Anastasia Island beach mice

The Anastasia Island beach mouse (AIBM), was listed as endangered under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for the subspecies. AIBM is also listed as an endangered species by the State of Florida. The distribution of the AIBM has declined significantly, particularly in the northern part of its range. AIBM was historically known from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Frank and Humphrey 1996). Included in their range, AIBM populations are found along 14.5 miles of Anastasia Island, mainly on 3.5 miles at Anastasia State Park (ASP) and one mile at Fort Matanzas National Monument (FMNM). AIBM have been found at low densities in dunes on the remainder of the island. Beach mice have also been located along sections of the 4.2 miles of dune habitat at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)-Guana River. Anastasia Island is separated from the mainland of Florida to the west by extensive salt marshes and the Mantazas River, to the north by the St. Augustine Inlet, and to the south by the Matanzas Inlet which are both maintained and open. This has restricted the range of AIBM to 14.5 mile length of Anastasia Island and sections of GTMNERR-Guana River (**Figure 8**).

In 1992 to 1993, the Service funded the reintroduction of AIBM to GTMNERR in St. Johns County where historical habitat for the subspecies existed (Service 1993). GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) is nine miles north of the existing population of beach mice at ASP. Fifty-five mice (27 females and 28 males) were trapped at FMNM and ASP from September 24, to November 12, 1992, and placed in soft-release enclosures at the state park on September 27, and November 12, 1992. During follow-up trapping conducted in February 1993, beach mice occupied the entire 4.2-mile length of the park; 34 were captured and it was estimated that the population totaled 220. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss alteration from storms or habitat conditions. Sneckenberger 2001 indicates that the scrub habitat found in the tertiary dunes provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level, which may be an issue for this population as A1A Highway separates/bisects the primary dune from the secondary dunes and scrub dune habitats.

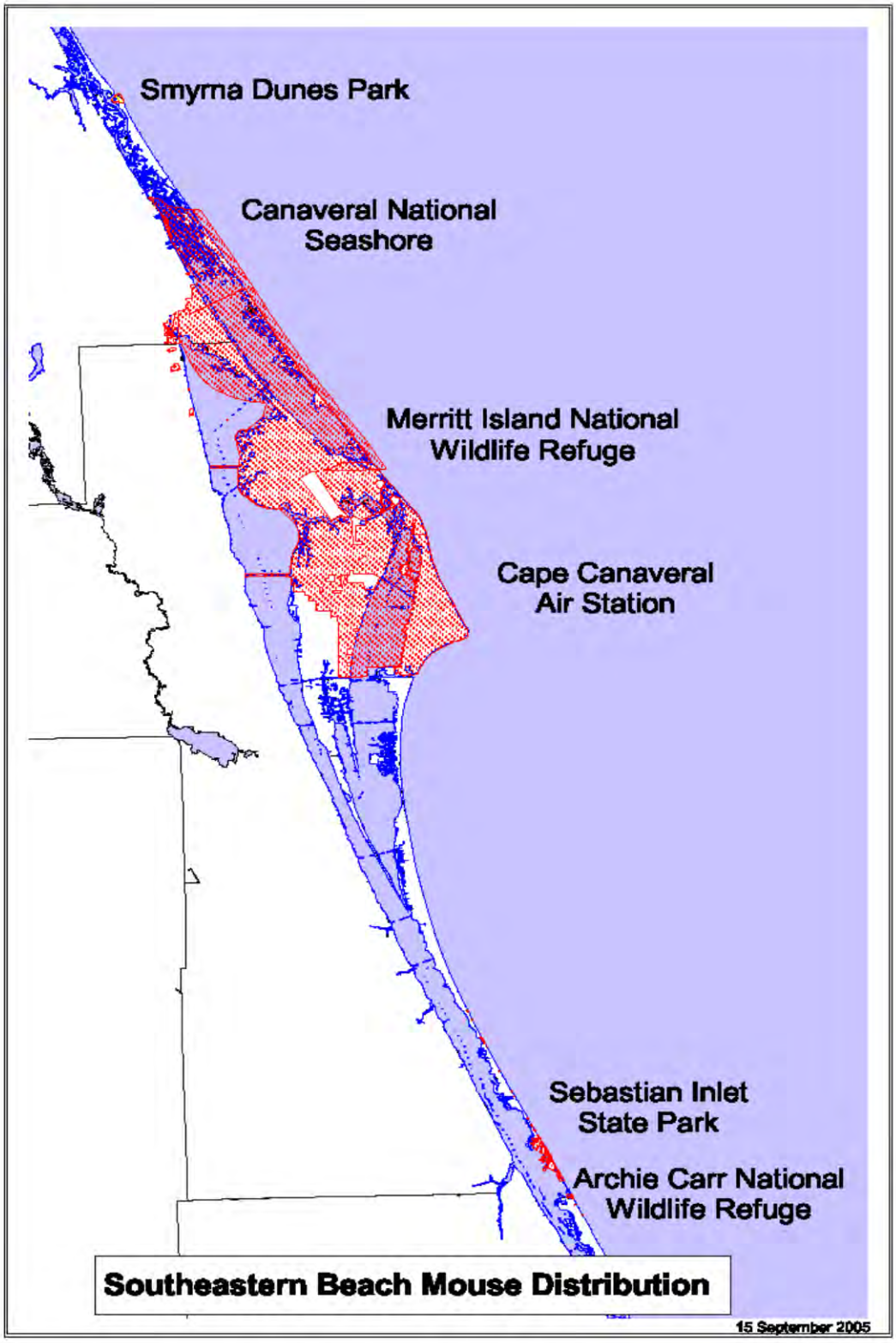

Figure 7. The distribution of the southeastern beach mouse.

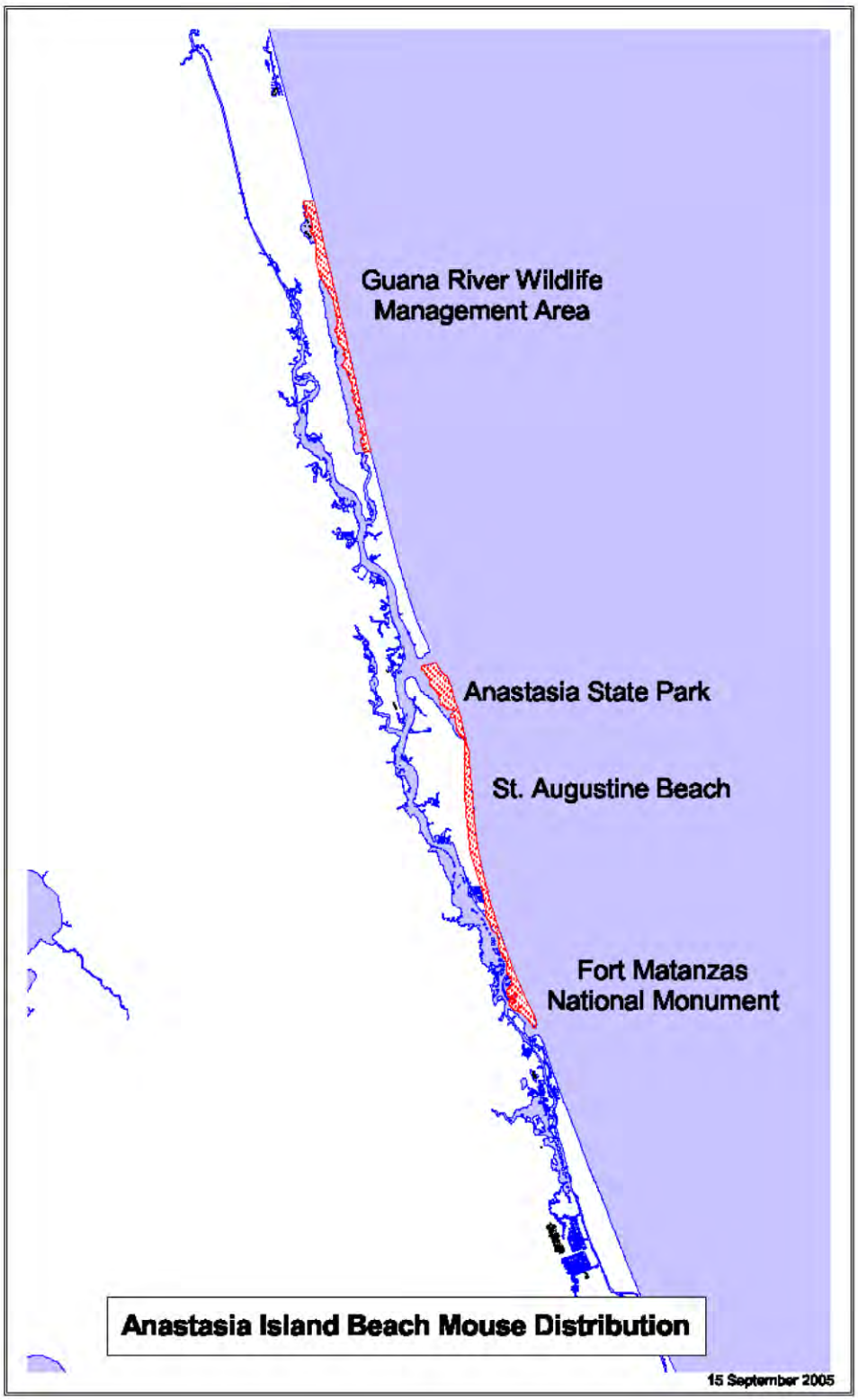

Figure 8. The distribution of the Anastasia Island beach mouse.

Gulf Coast Beach Mice

The CBM and the PKBM were listed with the Alabama beach mouse (ABM) (*Peromyscus polionotus ammobates*), as endangered species under the Act in 1985 (50 *FR* 23872). The SABM was listed under the Act in 1998 (63 *FR* 70053). CBM, SABM, and PKBM are also listed as endangered species by the State of Florida (FWC 2010). Critical habitat was designated for the CBM, and PKBM at the time of listing; however, critical habitat was revised in 2006 (71 *FR* 60238). Critical habitat was also designated for the SABM in 2006 (71 *FR* 60238).

The historical range of the CBM extended 53 miles between Destin Pass, Choctawhatchee Bay in Okaloosa County and East Pass in St. Andrew Bay, Bay County, Florida. PKBM historically ranged along the entire length of Perdido Key for 16.9 miles between Perdido Bay, Alabama (Perdido Pass) and Pensacola Bay, Florida (Bowen 1968). The historical range of the SABM extended 38 miles between Money Bayou in Gulf County, and Crooked Island at the East Pass of St. Andrews Bay, Bay County, Florida including the St. Joseph peninsula and the coastal mainland adjacent to St. Joseph Bay, Florida (**Figure 9**).

Critical habitat

Since the listing of the PKBM and CBM in 1985, research has refined previous knowledge of Gulf Coast beach mouse habitat requirements and factors that influence their use of habitat. Based on the current knowledge of the life history, biology, and ecology of the subspecies and the requirements of the habitat to sustain the essential life history functions of the subspecies, the primary constituent elements (PCE) of critical habitat for Gulf Coast beach mice consist of:

1. A contiguous mosaic of primary, secondary scrub vegetation, and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites;

2. Primary and secondary dunes, generally dominated by sea oats that despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes provide abundant food resources, burrow sites, and protection from predators;

3. Scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane induced storm surge;.

4. Functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas; and

5. A natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth and viability of all life stages.

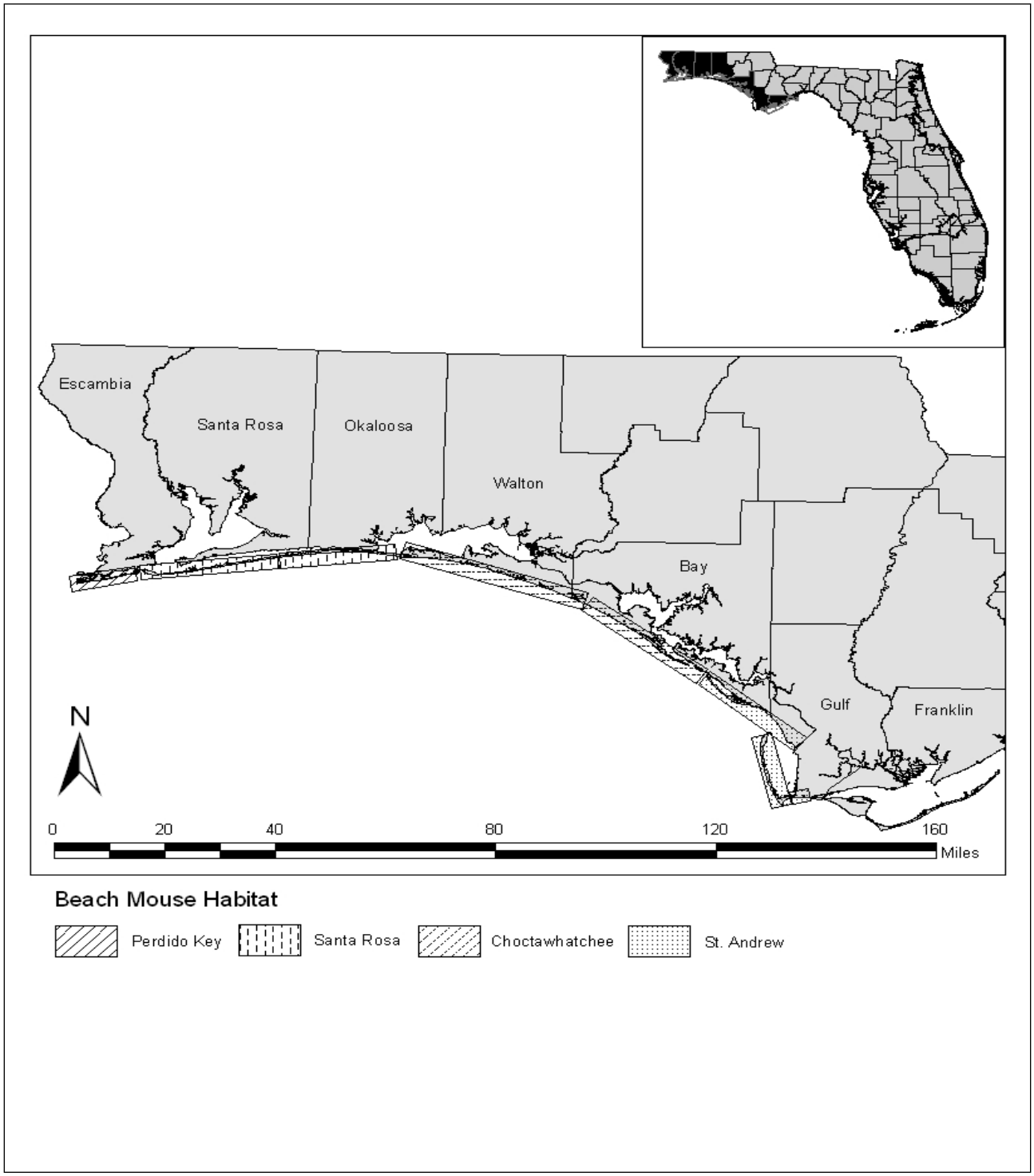

Figure 9. Historical range of Gulf Coast beach mouse subspecies.

Thirteen coastal dune areas (critical habitat units) in southern Alabama and the panhandle of Florida have been determined to be essential to the conservation of PKBM, CBM, and SABM and are designated as critical habitat (**Figures 10 through 12**). These 13 units include five units for PKBM, five units for CBM, and three units for the SABM. These units total 6,194 acres of coastal dunes, and include 1,300 acres for the PKBM in Escambia County, Florida and Baldwin County, Alabama (**Table 10**); 2,404 acres for the CBM, in Okaloosa, Walton, and Bay Counties, Florida (**Table 11**); and 2,490 acres for the SABM in Bay and Gulf Counties, Florida (**Table 12**).

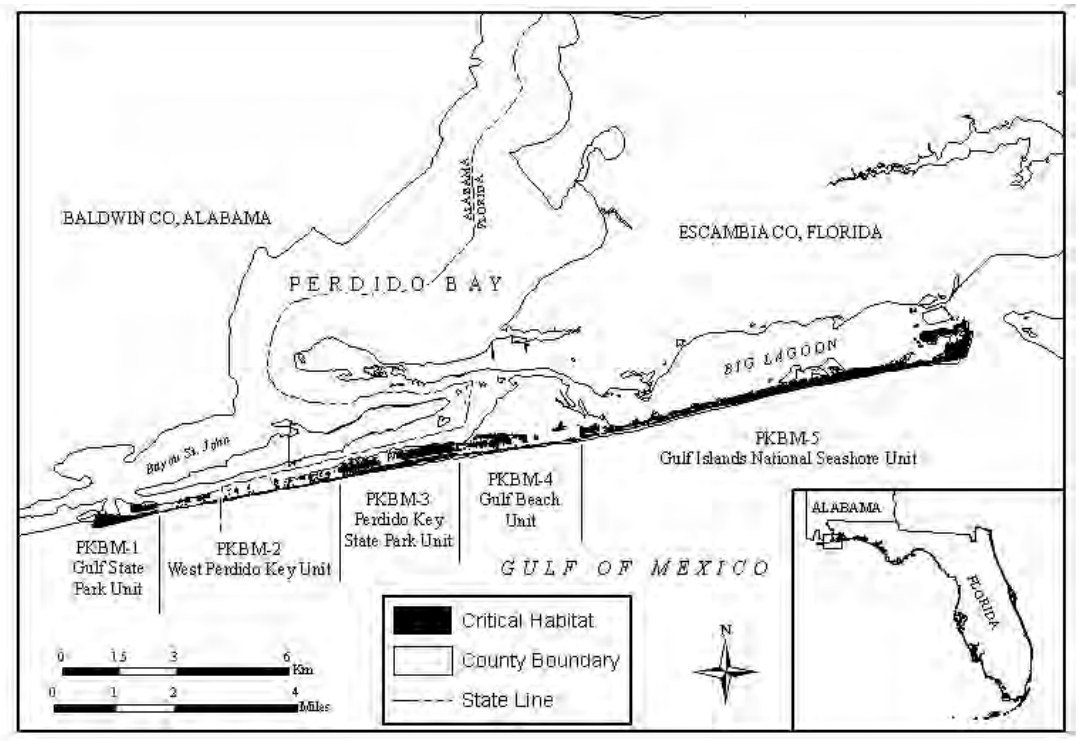

Figure 10. Critical habitat units designated for the Perdido Key beach mouse.

Table 11. Critical habitat units designated for the Perdido Key beach mouse.

Perdido Key Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Gulf State Park Unit	0	115	0	115
2. West Perdido Key Unit	0	0	147	147
3. Perdido Key State Park Unit	0	238	0	238
4. Gulf Beach Unit	0	0	162	162
5. Gulf Islands National Seashore Unit	638	0	0	638
Total	638	353	309	1300

Gulf State Park

The Gulf State Park Unit (PKBM-1) consists of 115 acres of PKBM habitat in southern Baldwin County, Alabama, on the westernmost region of Perdido Key. PKBM were known to inhabit this unit during surveys in 1979 and 1982, and by 1986 this was the only known existing population of the subspecies (Humphrey and Barbour 1981; Holler *et al*. 1989). This population of less than 30 individuals was the donor for the reestablishment of PKBM into Gulf Islands National Seashore in 1986. This project ultimately saved Perdido Key beach mice from extinction as the population at Gulf State Park was considered extirpated in 1998 due to tropical storms and predators (Moyers *et al*. 1999). In 2010, captive bred mice are released at Gulf State Park. This reintroduction was deemed a success and the population has continued to increase. The track tube monitoring was established at GSP in 2010, which began with only a 9 percent occurrence rate and the end of the year yielded an 83 percent occurrence rate, 2011 started with an 85 percent occurrence rate and continued to increase slightly until September 2011 which yielded a 73 percent occurrence rate in the tracking tubes (FWC 2012a and FWC 2014b). A 3-day trapping effort the week of May 7, 2012, continued to find PKBM distributed throughout habitat south of Highway 182. Two reproductively-active male PKBM were found north of Highway 182 (J. Gore pers. comm. 2012). The release appears to have been a success and PKBM are occupying all three public lands for the first time since being listed as endangered. Recent track tube data for 2013 shows an average of 93 percent occurrence of PKBM in the tracking tubes at GSP (FWC 2013a and FWC 2013b).

Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Because scrub habitat is separated from the frontal dunes by a highway in some areas, the population inhabiting this unit can be especially vulnerable to hurricane impacts, and therefore further linkage to scrub habitat and/or habitat management would improve connectivity. This unit is managed by the Alabama Department of Conservation and Natural Resources and provides primary constituent elements (PCEs) 2, 3, 4, and 5. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit, which contains interior scrub habitat as well as primary and secondary dunes, serves as a re-designation and expansion of the original critical habitat designation (50 *FR* 23872). The original designation did not include scrub habitat which we now know is necessary for the long-term persistence of beach mouse populations.

The West Perdido Key Unit (PKBM-2) consists of 114 acres in southern Escambia County, Florida, and 33 acres in southern Baldwin County, Alabama. This unit encompasses essential features of beach mouse habitat from approximately 1.0 mile west of where the Alabama-Florida State line bisects Perdido Key east to 2.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands and ultimately includes essential features of beach mouse habitat between Perdido Key State Park (Unit 3) and GSP (Unit 1). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and provides PCEs 2, 3, and 4.

Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. This area was not known to be occupied at the time of listing. While no trapping has been conducted on these private lands to determine presence, sign of beach mouse presence was confirmed by the Service in 2013 and 2014 through observations of beach mouse burrows and tracks, and this unit is contiguous with two occupied units. Therefore, we have determined this unit to be currently occupied. This unit provides essential connectivity between two core population areas (PKBM-3 and PKBM-1), provides habitat for expansion, natural movements, and re-colonization, and is therefore essential to the conservation of the species. Specifically, this unit may have historically provided for the re-colonization of GSP (PKBM-1) and/or may facilitate similar re-colonization in the future as the habitat recovers from recent hurricane events.

The Perdido Key State Park Unit (PKBM-3) consists of 238 acres in southern Escambia County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of PKSP from approximately 2.0 miles east of the Alabama–Florida State line to 4.0 mile east of the State line and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. This unit provides PCEs 2, 3, 4, and 5 and is essential to the conservation of the species. Improving and/or restoring habitat connections would increase habitat quality and provide more functional connectivity for dispersal, exploratory movements, and population expansion. This unit is managed by the Florida Park Service. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit serves as a redesignation and expansion of a zone included in the initial critical habitat designation (50 *FR* 23872); however, the zone did not include scrub habitat, which we now know is necessary for the long-term persistence of beach mouse populations.

Trapping efforts in this area were limited in the past. In 2000, a successful relocation program reestablished mice at PKSP. In 2004 and 2005, hurricane/tropical storm damage to the habitat at PKSP dropped PKBM detection to only 10 percent of the available habitat, indicating low densities (Loggins 2007). In 2005, the FWC started monitoring the presence of PKBM on public lands by tracking tubes. The Service and other land managers have relied on this data as a means of tracking the presence of PKBM in GSP, PKSP, and GINS. Tracking data from June 2006 indicated that about 25 percent of the available habitat was occupied at PKSP (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 found no mice on PKSP (J. Himes pers. comm. 2008). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM

occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands.

The number of track tubes visited by mice has increased over the past several years and recent years indicate almost all track tubes contain PKBM tracks. This is likely due to the fact that the storm-impacted coastal habitats have basically recovered and development and predator pressures have decreased. Data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b).

There were effects to the Unit resulting from the overwash and inundation by storm surge that occurred several times during the 2004 and 2005 storm seasons. Blow outs occurred on the west and east portions of the PKSP. Two sections of the Hwy 292 were washed out. Park facilities were destroyed. Dune vegetation was significantly impacted, but has been restored passively and actively. Park facilities have been reconstructed in accordance with protected species guidelines.

The Gulf Beach Unit (PKBM-4) consists of 162 acres in southern Escambia County, Florida. This unit includes essential features of beach mouse habitat between GINS and Perdido Key State Park from approximately 4.0 miles east of the Alabama–Florida State line to 6.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. While not known to be occupied at the time of listing, a single beach mouse was trapped within the unit as a result of trapping efforts in 2004 (Service 2004). There have been no data collected within this unit to confirm either absence or presence since this single trapping event in 2004. However, Service personnel have observed burrows and tracks indicating PKBM are occupying the area. This unit provides PCEs 2, 3, and 4 and is essential to the conservation of the species. This unit includes high-elevation scrub habitat and serves as a refuge during storm events and as an important repopulation source if storms extirpate or greatly reduce local populations. This unit currently provides essential connectivity between two core populations GINS (PKBM-5) and PKSP (PKBM-3) and provides essential habitat for expansion, natural movements, and recolonization (PCE 4).

The Gulf Islands National Seashore Unit (Unit 5) consists of 638 acres in southern Escambia County, Florida, on the easternmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of Gulf Islands National Seashore–Perdido Key Area (also referred to as Johnson Beach) from approximately 6.0 miles east of the Alabama–Florida State line to the eastern tip of Perdido Key at Pensacola Bay and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists mainly of primary and secondary dune habitat, but provides the longest contiguous expanse of frontal dune habitat within the historic range of the PKBM. PBKM were known to inhabit this unit in 1979. No beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). However the population was impacted by Hurricane Frederic (1979), and considered unoccupied at the time of listing. However, no beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). In 1986, PKBM were re-established to GINS as part of the State of Florida and Service recovery efforts. In 2000 and 2001, PKBM captured from this site served as donors to re-establish beach mice at PKSP. Due to damage from storm surge during the 2004 and 2005 storm seasons, PKBM are detected on approximately 30 percent of the beach mouse habitat available (Loggins 2007). Tracking data from June 2006 indicated that about 32 percent of the available habitat was occupied at GINS (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

PKBM-5, in its entirety, possesses all five PCEs and is essential to the conservation of the species. However, most of this unit consists of frontal dunes, making the population inhabiting this unit particularly threatened by storm events. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit is managed by the National Park Service–Gulf Islands National Seashore. This unit was included in the initial critical habitat designation (50 *FR* 23872) as well as the 2006 revision (71 *FR* 60238). The majority of this unit was overwashed and inundated by storm surge several times during the 2004 and 2005 storm seasons. Park facilities were destroyed and most of the Park road was destroyed. Dune vegetation was washed away or covered with sand. Habitat has since recovered and was comprised of natural and human facilitated dune restoration by GINS staff. Park structures were reconstructed landward of their former locations and in accordance with protected species guidelines.

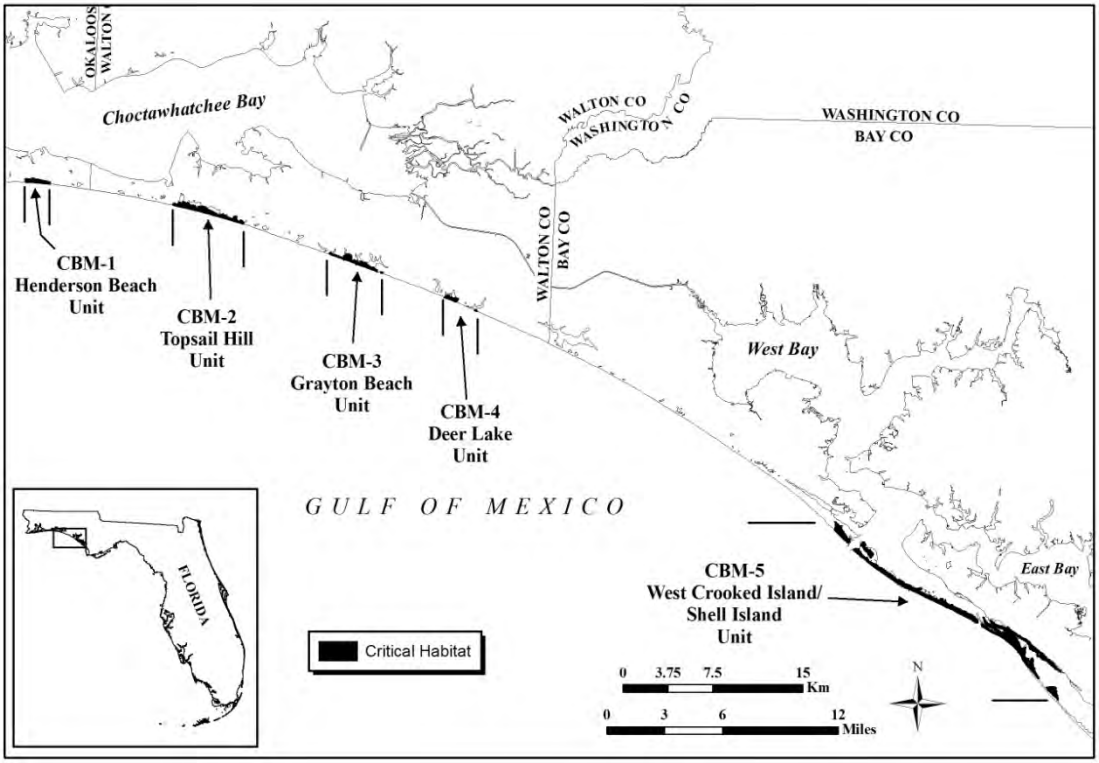

Figure 11. Critical habitat units designated for the Choctawhatchee beach mouse.

Table 12. Critical habitat units designated for the Choctawhatchee beach mouse.

Choctawhatchee Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Henderson Beach Unit	0	96	0	96
2. Topsail Hill Unit	0	277	31	308
3. Grayton Beach Unit	0	162	17	179
4. Deer Lake Unit	0	40	9	49
5. W. Crooked Island/Shell Island Unit	1333	408	30	1771
Total	1333	982	87	2404

The Henderson Beach unit (CBM–1) consists of 96 acres in Okaloosa County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Henderson Beach State Park from 0.5 miles east of the intersection of Highway 98 and Scenic Highway 98 to 0.25 miles west of Matthew Boulevard and the area from the MHWL north to the seaward extent of the

maritime forest. This westernmost unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3). This unit is within the historical range of the subspecies; however, it was not known to be occupied at the time of listing and current occupancy is unknown because no recent efforts have been made to document beach mouse presence or absence. Because this unit includes protected, high-elevation scrub habitat, it may serve as a refuge during storm events and as an important source population if storms extirpate or greatly reduce local populations or populations to the east.

This unit is managed by the Florida Park Service and is essential to the conservation of the species. Threats specific to this unit that may require special management considerations include habitat fragmentation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Topsail Hill Unit (CBM–2) consists of 308 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Topsail Hill Preserve State Park, as well as adjacent private lands from 0.1 miles east of the Gulf Pines subdivision to 0.6 miles west of the Oyster Lake outlet and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Its large, contiguous, high-quality habitat allows for natural movements and population expansion. Choctawhatchee beach mice were confirmed present in the unit in 1979 (Humphrey *et al*. 1987), were present at the time of listing, and are still present.

Beach mice have been captured on Stallworth County Park and Stallworth Preserve subdivision, a private development within the unit, and east of the Park (Service 2003a and Yanchis pers comm 2014). The population of Choctawhatchee beach mice inhabiting this unit appears to harbor unique genetic variation and displays a relatively high degree of genetic divergence considering the close proximity of this population to other populations (Wooten and Holler 1999).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include Park and residential development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the Habitat Conservation Plan (HCP) for the Stallworth County Preserve (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Grayton Beach Unit (CBM–3) consists of 179 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Grayton Beach State Park, as well as adjacent private lands and inholdings, from 0.3 mi west of the Alligator Lake outlet east to 0.8 miles west of Seagrove Beach and the area from the MHWL north to the seaward

extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity (PCE 4) and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Beach mice were not detected in the unit in 1979 (Holler 1992a); however, they were found to be present in 1995 after Hurricane Opal (Moyers *et al.* 1999). While it seems likely that beach mice were present at the time of listing (and may have been present, but not detected, in 1979), the Service does not have data to confirm this assumption. Therefore, the Service considered this unit to be unoccupied at the time of listing. A program to strengthen and reestablish the population began in 1989 and yielded a persistent population at Grayton Beach State Park. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Beach mice are also known to currently occupy the private lands immediately east of the park.

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include hurricane impacts that may require dune restoration and revegetation, excessive open, unvegetated habitat due to recreational use or storm impacts that may require revegetation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the Choctawhatchee beach mouse within the area covered under the HCP for the Watercolor development (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Deer Lake Unit (CBM–4) consists of 49 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Deer Lake State Park as well as adjacent private lands from approximately one mile east of the Camp Creek Lake inlet west to approximately 0.5 miles west of the inlet of Deer Lake and the area from the MHWL north to the seaward extent of maritime forest or human development. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity to adjacent lands (PCE 4), and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Because live-trapping efforts in this area have been limited to incidental trapping, and beach mice were not detected in 1998 (Moyers *et al*. 1999), the Service considered this unit to be unoccupied at the time of listing. CBM were translocated from Topsail Hill Preserve State Park to private lands adjacent to this unit in 2003 and 2005 (Service 2003b, 2005a, 2005b, 2005c, 2005d). Tracking within the adjacent State park lands have indicated expansion of the population into the park. Recent track tube data from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include artificial lighting, presence of

feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the HCP/Incidental Take Permit (ITP) for Watersound (71 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act (see Application of Section 4(a)(3) and Exclusions Under Section 4(b)(2) of the Act section below). This excluded area is 0.5 miles west of the Camp Creek Lake inlet to 0.5 miles east of the Camp Creek Lake inlet.

The West Crooked Island/ Shell Island Unit (CBM–5) consists of 1,771 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat within the boundaries of St. Andrew State Park mainland from 0.1 miles east of Venture Boulevard east to the entrance channel of St. Andrew Sound, Shell Island east of the entrance of St. Andrew Sound east to East Pass, and West Crooked Island southwest of East Bay and east of the entrance channel of St. Andrew Sound, and areas from the MHWL north to the seaward extent of the maritime forest. Shell Island consists of State lands, Tyndall Air Force Base (AFB) lands, and small private inholdings. Choctawhatchee beach mice were known to inhabit the majority of Shell Island in 1987 (Holler 1992b) and were again confirmed present in 1998 (Moyers *et al*. 1999), 2002, and 2003 (Lynn 2003a). Because beach mice inhabited nearly the entire suitable habitat on the island less than two years prior to listing and were reconfirmed after listing, the Service considered this area to be occupied at the time of listing. The West Crooked Island population is the result of a natural expansion of the Shell Island population after the two islands became connected in 1998 and 1999, a result of Hurricanes Opal and Georges (Service 2003b). Shell Island was connected to the mainland prior to the 1930s when a navigation inlet severed the connection on the western end. Beach mice were documented at St. Andrew State Park mainland as late as the 1960s (Bowen 1968), though no records of survey efforts exist again until Humphrey and Barbour (1981) and Meyers (1983) at which time beach mice were not detected. Therefore, it seems likely that this area was not occupied at the time of listing. Current beach mouse population levels at this site are unknown, and live-trapping to document the absence of mice has not been conducted. Similar to the original designation, this Park was designated as critical habitat because it has features essential to the CBM. It is also within the historical range of the mouse. This unit supports the easternmost population of CBM, with the next known population 22 miles to the west.

This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Portions of this unit are managed by the Florida Park Service, while the remaining areas are federally (Tyndall AFB) and privately owned.

Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high residential or recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Figure 12. Critical habitat units designated for the St. Andrew beach mouse.

Table 13. Critical habitat units designated for the St. Andrew beach mouse.

St. Andrew Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. East Crooked Island Unit	649	0	177	826
2. Palm Point Unit	0	0	162	162
3. St. Joseph Peninsula Unit	0	1280	222	1502
Total	649	1280	561	2490

The East Crooked Island Unit (SABM–1) consists of 826 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat on East Crooked Island from the entrance of St. Andrew Sound to one mile west of Mexico Beach, and the area from the MHWL to the seaward extent of the maritime forest (not including Raffield Peninsula). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and possesses all five PCEs. SABM were known to inhabit the unit in 1986 and 1989 (James 1992), though the population was

presumably extirpated after 1989 due to impacts from hurricanes. The East Crooked Island population was reestablished with donors from St. Joseph State Park in 1997. This unit was occupied at the time of listing. Live-trapping in 2002 confirmed occupation of mice (Moyers and Shea 2002, Lynn 2002a, Slaby 2005). Recent track tube data indicates mice are still present in this unit (FWC 2013a and FWC 2013b). This unit maintains connectivity along the island and this unit is essential to provide a donor population following storm events.

The majority of this unit is federally owned (Tyndall AFB), while the remaining habitat is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational and military use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Palm Point Unit (SABM–2) consists of 162 acres of private lands in Gulf County, Florida. This unit encompasses habitat from Palm Point 1.25 miles northwest of the inlet of the Gulf County Canal to the southeastern boundary of St. Joseph Beach and the area from the MHWL to the seaward extent of the maritime forest. SABM were documented in the area by Bowen (1968) and were considered to have been present in this unit at the time of listing. Since SABM beach mouse habitat is limited to only two other areas, protecting this mainland site located within the species' historical range is needed for the subspecies' long-term persistence. As other viable opportunities are limited or nonexistent, this unit is essential to reduce the threats of stochastic events to this subspecies. Furthermore, as this unit is on the mainland, it is somewhat buffered from the effects of storm events. This area provides frontal and scrub dune habitat (PCEs 2 and 3), but may provide limited connectivity between habitats. Threats specific to this unit that may require special management considerations include habitat fragmentation, habitat loss, artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, and high residential use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The St. Joseph Peninsula Unit (SABM–3) consists of 1,502 acres in Gulf County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of St. Joseph Peninsula State Park (Park) as well as south of the Park to the peninsula's constriction north of Cape San Blas (also known as the "stumphole" region) and area from the MHWL to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat, and provides a relatively contiguous expanse of habitat within the historical range of the SABM. This unit possesses all five PCEs and was occupied at the time of listing. SABM were known to inhabit this unit in 1986 and 1987 (James 1987, 1992, 1995, Gore 1994, Moyers *et al.* 1999, Slaby 2005). In addition, recent trapping and tracking efforts suggest that mice continue to occupy private lands south of the Park (K. Yanchis pers comm., FWS 2012). The Park alone does not provide sufficient habitat to allow for population expansion along the peninsula, which may be necessary for a population anchored by the tip of a historically dynamic peninsula. A continuous presence of beach mice along the peninsula is the species' best defense against local and complete extinctions due to storm events. The population of SABM inhabiting

this unit appears to possess unique genetic variation, and displays greater than expected genetic divergence from other populations (Wooten and Holler 1999).

The Florida Park Service manages portions of this unit, while the remaining area is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, habitat fragmentation and habitat loss, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality. The population inhabiting this unit may also be particularly susceptible to hurricanes due to its location within St. Joseph Bay (the peninsula is a thin barrier peninsula with a north–south orientation).

Life history (All subspecies of beach mice)

Beach mice are differentiated from the inland subspecies by the variety of fur (pelage) patterns on the head, shoulders, and rump. The overall dorsal coloration in coastal subspecies is lighter in color and less extensive than on those of the inland subspecies (Sumner 1926, Bowen 1968). Similarly, beach mouse subspecies can be differentiated from each other by pelage pattern and coloration.

The SEBM averages 5.47 inches in total length (average of 10 individuals = 5.07 inches, with a 2.04-inch tail length (Osgood 1909, Stout 1992). Females are slightly larger than males. These beach mice are slightly darker in appearance than some other subspecies of beach mice, but paler than inland populations of *P. polionotus* (Osgood 1909). SEBM have pale, buffy coloration from the back of their head to their tail, and their underparts are white. The white hairs extend up on their flanks, high on their jaw, and within 0.07 to 0.12 inches of their eyes (Stout 1992). There are no white spots above the eyes as with AIBM (Osgood 1909). Their tail is also buffy above and white below. Juvenile SEBM are more grayish in coloration than adults; otherwise they are similar in appearance (Osgood 1909).

The AIBM averages 5.45 inches in total length (average of 10 individuals); with 2.05 inches mean tail length (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The SABM has head and body lengths averaging 2.95 inches, and tail mean lengths averaging 2.05 inches (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath and along the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The PKBM is slightly smaller than the other Gulf coast beach mouse subspecies (Bowen 1968). Head and body length ranges from 2.7 to 3.3 inches (Holler 1992b). The pigmentation of PKBM

is gray to gray-brown with the underparts white and coloration on the head is less pronounced. The line between pigmented and unpigmented pelage runs dorsally posterior above the eyes and behind the ears. Pigmentation patterns on the rump are either squared or squared superimposed on a tapered pattern (Bowen 1968). There is no tail stripe.

CBM have head and body lengths ranging from 2.7 to 3.5 inches (Holler 1992a). This beach mouse is distinctly more orange-brown to yellow-brown than the other Gulf coast beach mouse subspecies (Bowen 1968). Pigmentation on the head either extends along the dorsal surface of the nose to the tip, or ends posterior to the eyes leaving the cheeks white. A dorsal tail stripe is either present or absent.

Behavior

Peromyscus polionotus is the only member of the genus that digs an extensive burrow. Beach mice are semifossorial, using their complex burrows as a place to rest during the day and between nightly foraging bouts, escape from predators, have and care for young, and hold limited food caches. Burrows of *P. polionotus* generally consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are usually placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 23.6 to 35.4 inches, and the escape tunnel rises from the nest chamber to within 9.8 inches of the surface (Blair 1951). Nests of beach mice are constructed in the nest chamber of their burrows, a spherical cavity about 1.5 to 2.5 inches in diameter. The nest comprises about one-fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949). Beach mice have been found to select burrow sites based on a suite of biotic and abiotic features including dune slope, soil compaction, vegetative cover, and height above sea level (Lynn 2000a, Sneckenberger 2001). A shortage of potential burrow sites is considered to be a possible limiting resource.

Reproduction and Demography

Studies on *Peromyscus* species in peninsular Florida suggest that these species may achieve greater densities and undergo more significant population fluctuations than their temperate relatives, partially because of their extended reproductive season (Bigler and Jenkins 1975). Subtropical beach mice can reproduce throughout the year; however, their peak reproductive activity is generally during late summer, fall, and early winter. Extine (1980) reported peak reproductive activity for SEBM on Merritt Island during August and September, based on external characteristics of the adults. This peak in the timing and intensity of reproductive activity was also correlated to the subsequent peak in the proportion of juveniles in the population in early winter (Extine 1980). Peak breeding season for Gulf Coast beach mice is autumn and winter, declining in spring, and falling to low levels in summer (Rave and Holler 1992, Blair 1951). However, pregnant and lactating beach mice have been observed in all seasons (Moyers *et al.* 1999).

Sex ratios in beach mouse populations are generally 1:1 (Extine 1980, Rave and Holler 1992).

Beach mice are believed to be generally monogamous (Smith 1966, Foltz 1981, Lynn 2000a). While a majority of individuals appear to pair for life, paired males may sire extra litters with unpaired females. Beach mice are considered sexually mature at 55 days of age; however some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Fleming and Holler 1990). Littering intervals may be as short as 26 days (Bowen 1968).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama have demonstrated that their average life span is about nine months (Swilling 2000). Other research indicated that 63 percent of Alabama beach mice lived (or remained in the trapping area) for four months or less, 37 percent lived 5 months or greater and two percent lived 12 to 20 months (Rave and Holler 1992). Less than half (44 percent) of beach mice captured for the first time were recaptured the next season (Holler *et al*. 1997). Greater than 10 percent of mice were recaptured three seasons after first capture; and four to eight percent were recaptured more than one year after initial capture. Beach mice held in captivity have lived three years or more (Blair 1951, Holler 1995).

Habitat and Movement

Beach mice inhabit coastal dune ecosystems on the Atlantic and Gulf Coasts of Florida and the Gulf Coast of Alabama. The dune habitat is generally categorized as: primary dunes (characterized by sea and other grasses), secondary dunes (similar to primary dunes, but also frequently include such plants as woody goldenrod (*Chrysoma pauciflosculosa*), false rosemary (*Conradina canescens*), and interior or scrub dunes (often dominated by scrub oaks and yaupon (*Ilex vomitoria*). Contrary to the early belief that beach mice were restricted to (Howell 1909, 1921, Ivey 1949), or preferred the frontal dunes (Blair 1951, Pournelle and Barrington 1953, Bowen 1968), recent research has shown that scrub habitat serves an invaluable role in the persistence of beach mouse populations (Swilling *et al.* 1998, Sneckenberger 2001). Beach mice occupy scrub dunes on a permanent basis and studies have found no detectable differences between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling *et al.* 1998, Swilling 2000, Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

The sea oat zone of primary dunes is considered essential habitat of beach mice on the Atlantic Coast (Humphrey and Barbour 1981, Humphrey *et al.* 1987, Stout 1992). The SEBM has also been reported from sandy areas of adjoining coastal strand/scrub vegetation (Extine 1980, Extine and Stout 1987), which refers to a transition zone between the fore dune and the inland plant community (Johnson and Barbour 1990). Beach mouse habitat is heterogeneous, and distributed in patches that occur both parallel and perpendicular to the shoreline (Extine and Stout 1987). Because this habitat occurs in a narrow band along Florida's coast, structure and composition of

the vegetative communities that form the habitat can change dramatically over distances of several feet.

Primary dune vegetation described from SEBM habitat includes sea oats, bitter panicgrass, railroad vine, beach morning-glory, saltmeadow cordgrass (*Spartina patens*), lamb'squarters (*Chenopodium album*), saltgrass (*Distichlis spicata*), and camphorweed (Extine 1980). Coastal strand and inland vegetation is more diverse, and can include pricklypear, saw palmetto, wax myrtle, Florida rosemary (*Ceratiola ericoides*), sea grape, and sand pine (*Pinus clausa*) (Extine and Stout 1987). Extine (1980) observed this subspecies as far as 0.62 miles inland on Merritt Island; he concluded that the dune scrub communities he found them in represent only marginal habitat for the SEBM. SEBM have been documented in coastal scrub more than a mile from the beach habitat at Kennedy Space Center/Merritt Island National Wildlife Refuge (NWR) and Cape Canaveral Air Force Station (CCAFS) (Stout *et al*. 2006). Extine (1980) and Extine and Stout (1987) reported that the SEBM showed a preference for areas with clumps of palmetto, sea grape, and expanses of open sand.

Essential habitat of the AIBM is characterized by patches of bare, loose, sandy soil (Humphrey and Frank 1992a). Although they are mainly found in the sea oat zone of the primary zone, they will occur in sandy areas with broomsedge (*Andropogon* sp.) (Service 1993). Ivy (1949) reported AIBM to occur in woody vegetation as far as 500 feet inland. Pournelle and Barrington (1953) found this subspecies in scrub as far as 1,800 feet from the dunes. Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of only a few feet. Much of the habitat within the range of the AIBM has been converted to condominiums and housing developments. The majority of the high quality habitat, densely occupied by beach mice, remains along the length of both ASP and FMNM, at either end of Anastasia Island.

Two main types of movement have been identified for small mammals: within home-range activity and long-range dispersal. Such movements are influenced by a suite of factors, such as availability of mates, predation risk, and habitat quality. Movement and home range studies have been conducted for most beach mouse subspecies, but are limited to natural habitat (*i.e*., research has been conducted on public lands within contiguous beach mouse habitat, not within a development or in a fragmented landscape). Novak's (1997) study of the home range of CBM on Shell Island indicated males had a mean home range of 1.0 ± 4.1 acres and females had a mean home range of 0.81 ± 2.18 acres. Lynn (2000a) found male and female radio-tagged ABM had a mean home range of 1.68 ± 0.27 acres and 1.73 ± 0.40 acres, respectively. Swilling *et al.* (1998) observed one radio-collared ABM to travel over 328 feet during nightly forays after Hurricane Opal to obtain acorns from the scrub dunes. Using radio telemetry, Lynn (2000a) documented an ABM that traveled one mile within a 30-minute period. Moyers and Shea (2002) trapped a male and female CBM that moved about 637 feet and 2,720 feet in one night, respectively. Gore and Schaefer (1993) documented a marked Santa Rosa beach mouse crossing State Road (SR) 399, a two-lane highway. Lynn and Kovatch (2004) through mark and recapture trapping documented PKBM that crossed SR 292, a two-lane highway and right-of-way (100-feet wide).

Sneckenberger (2001) found significant seasonal differences in the movement of ABM, and suggested that this was a result of seasonal fluctuations in food availability, food quality, and nutritional needs. Smith (2003) found that Santa Rosa beach mice demonstrated an increase in movement as habitat isolation increased suggesting that longer travel distances were needed to obtain necessary resources. Smith also found that Santa Rosa beach mice had a preference for vegetation cover and connectivity, which is likely a behavioral response to increased predation risk in open areas. Thus, while beach mice are able and do travel great distances the travel pathways should have vegetated cover and no large gaps or open areas. Previous connectivity research suggests critical thresholds exist for species persistence in fragmented landscapes (With and Crist 1995). As fragmentation increases and connectivity is lost, species' ability to move through and between habitats is reduced in a nonlinear fashion.

Foraging

Beach mice are nocturnal and forage for food throughout the dune system. Beach mice feed primarily upon seeds and fruits, and appear to forage based on availability and have shown no preferences for particular seeds or fruits (Moyers 1996). Beach mice also eat small invertebrates, especially during late spring and early summer when seeds are scarce (Ehrhart 1978, Moyers 1996). Research suggests that the availability of food resources fluctuates seasonally in Gulf Coast coastal dune habitat, specifically that the frontal dunes appear to have more species of high quality foods, but these sources are primarily grasses and annuals that produce large quantities of small seeds in a short period of time. Foods available in the scrub consist of larger seeds and fruits that are produced throughout a greater length of time and linger in the landscape (Sneckenberger 2001). Nutritional analysis of foods available in each habitat revealed that seeds of plant species in both habitats provide a similar range of nutritional quality.

Population dynamics

Population size

Estimating animal abundance or population size is an important and challenging scientific issue in wildlife biology (Otis *et al.* 1978, Pollock *et al.* 1990). A number of different census methods are available to estimate wildlife populations, each with particular benefits and biases. Beach mouse surveys involve live trapping mark-recapture studies, which is a common method with small mammals. A five-night minimum trapping period has been standard practice since 1987 for Gulf Coast beach mice. As the referenced trapping events were not designed similarly or using a standardized sampling techniques, data should not be compared between subspecies or trapping events, nor should densities (mice per 100 trap nights) be inferred beyond the trapping area during that trapping session.

Population densities of beach mice typically reach peak numbers in the late autumn into spring (Rave and Holler 1992, Holler *et al*. 1997). Peak breeding period occurs in autumn and winter, apparently coinciding with the increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and Holler 1992, Holler *et al.* 1997). Food supplementation studies showed that old field mouse

populations increased when foods were abundant; thus, populations of old field mice appear to be food-limited (Smith 1971, Galindo-Leal and Krebs 1998). Similar studies have not been conducted with beach mouse populations.

Gulf Coast Beach Mice

In 1979, Humphrey and Barbour (1981) estimated about 515 CBM existed on Topsail Hill and Shell Island. That estimate was used during the Federal listing of the CBM in 1985. Population estimates on Shell Island from February 1993 to March 1994, ranged from 105 to 338 CBM on a 23-acre study area (Novak 1997). Just prior to Hurricane Opal in 1995, it was estimated that Shell Island supported 800 to 1,200 CBM (Gore 1999). Three years following Hurricane Opal in June 1998, one trapping effort at six different sites on Shell Island resulted in a cumulative population estimate of 195 CBM (164 CBM captured) (Moyers *et al*. 1999). The east portion of the island has been trapped from 2000 to 2003. Population estimates have ranged between 24 and 67 CBM (Lynn 2004b). At Topsail Hill Preserve State Park, trapping conducted in March 2003 and March 2005 yielded a population estimate of 190 to 250 CBM (Service 2003a, Sneckenberger 2005). From late 2006 through 2007 results of tracking tubes surveys at Topsail Hill Preserve State Park suggested that the CBM population was not densely distributed (FWC 2008b). Trapping of four 100-trap transects yielded population estimates of 190, 250, less than 10 (too few to estimate), and 87 in 2003, 2005, 2006, and 2007, respectively (Service 2007a). The track and trapping data together indicate that Topsail Hill Reserve State Park currently does not support a high population of beach mice. In 2003 and again in 2005, a total of 26 mice were translocated from Topsail Hill Preserve State Park to the WaterSound private development adjacent to Deer Lake State Park. Trapping has been sporadic on WaterSound but has yielded population estimates of 5 to 46 individuals in 2003 to 2007 (Moyers 2007). Deer Lake State Park has not been trapped; however, tracks have been observed as recently as 2006 (FWC 2008b). Population estimates from trapping at Grayton Beach State Park (main unit) from 1995 to 2000, ranged from 25 to 116 CBM (Moyers *et al.* 1999, Van Zant 2000). The central unit was trapped for three nights in August 2002; however, no mice were captured (Lynn 2002b). Limited tracking surveys were accomplished in 2003, 2004 and 2005 and beach mouse tracks were observed (Kovatch 2003, Toothacker 2004, FWC 2008b). The western area, although it provides CBM habitat, has not been documented as occupied by CBM (Moyers *et al.* 1999, Van Zant 2000). The population estimates for the WaterColor development for the two years prior to and one year following development ranged from 3 to 7 CBM (St. Joe Company 1999). CBM were last captured in February of 2001 at WaterSound; quarterly trapping has continued on the site through mid-2008 without CBM being captured (St. Joe/Arvida 2003). Auburn University trapped West Crooked Island in October 2000, and the Service trapped the area in 2001 to 2003. The population estimate ranged from a low of 174 to a high of 244 CBM (Lynn 2000b, 2002d, 2002e, 2002f, 2002g, 2003b). The Service estimated the total population of CBM in 2003, to be about 600 to 1,000 beach mice. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Recent track tube data

from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

Since its listing in 1985, PKBM population estimates never reached more than 400 to 500 individuals until 2003. Before Hurricane Ivan (2004) a population estimate of 500 to 800 was divided between two populations - the Johnson Beach Unit of GINS and PKSP (Service 2004). The status of PKBM at Gulf State Park (GSP) is uncertain, likely extirpated in 1999. In October 2005, following the active hurricane seasons of 2004 and 2005, a trapping effort of less than one-third of the habitat available on public lands yielded captures of less than 30 individuals. Tracking data from June 2006 indicated that about 25 and 32 percent of the available habitat was occupied at PKSP and GINS, respectively (Loggins 2007). Trapping at PKSP and GINS in March 2007, was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (Loggins 2007). With no tracks observed in the tube surveys the PKBM may now be absent from PKSP (FWC 2008b). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands. Recent data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b). At GINS, the number of PKBM has not increased since the initial high levels in winter of 2005-2006 (FWC 2008b). However, population estimates indicate there may be a few hundred PKBM at GINS (Gore 2008). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences at GINS have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

The SABM even at its lowest population probably numbered several hundred individuals (Gore as cited in 63 *FR* 70055). James (1992) estimated that the East Crooked Island subpopulation to be about 150. However, by 1996, SABM were no longer found on East Crooked Island. Following Hurricane Opal in 1995, Mitchell *et al.* (1997) estimated the St. Joe Peninsula State Park population to be between 300 and 500 mice. In November 1997 and January 1998, 19 pairs of St. Andrew beach mice were relocated from St. Joseph Peninsula State Park to East Crooked Island,

Tyndall Air Force Base (Moyers *et al.* 1999). Trapping surveys conducted on East Crooked Island in 2000 and 2002 through 2007 indicated that beach mice occupied the entire island (Lynn 2002c, FWC 2008b). Population estimates ranged from 71 to 133 mice (Lynn 2002c). The FWC (2008b) estimates 22 miles of habitat as occupied by SABM throughout the mouse's historical range with population estimates of about 3,000 mice at East Crooked Island and about 1,775 mice in the front dunes at St. Joseph State Park. Data from 2008-2012 on East Crooked Island showed a decrease in SABM, with average track tube occurrences of 97 percent, 97 percent, 96 percent, 87 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). However, recent data from 2013 indicates 95 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b). Surveys conducted from 2008-2012 at Rish Park yielded average track tube occurrence that fluctuated between 79 percent, 91 percent, 76 percent, 79 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). More recent data in 2013 showed an average of 73 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b).

Atlantic Coast Beach Mice

Populations of the SEBM have been estimated to be around 5,000 to 6,000 mice. Recent surveys have confirmed that SEBM are found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Prior to 2006, populations of the SEBM were thought extirpated from both sides of the Sebastian Inlet (Bard 2004). However, during surveys in June 2006, a single mouse was located at the very southern end of the Sebastian Inlet State Park. Mice were also found at Jungle Trail on the Pelican Island National Wildlife Refuge, another area where they where thought extirpated. Additional surveys of other areas south of Brevard County have not located any mice and indicate the distribution of this subspecies in the counties south of Brevard, severely fragmented. SEBM are no longer believed to occur at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

Although the distribution of the AIBM has declined significantly, particularly in the northern part of its range, the populations at ASP and FMNM have continued to fluctuate seasonally between two and 90 mice per acre. It is thought that populations should be characterized by a range rather than a static value (Frank and Humphrey 1996). Quarterly surveys of these two sites have shown that the populations have remained stable. Due to the limited dune habitat at the ASP, this population has not been able to maintain a stable population and it is unknown how many mice remain.

Population variability

Beach mouse populations fluctuate on a seasonal and annual basis. Attempts to explain population dynamics have revealed an incomplete understanding of the species and its population cycles. It is clear that beach mice, like all rodents, are known for high reproductive rates and experience extreme highs and lows in population numbers. Depressed beach mouse populations may be associated with tropical storms and drought, perhaps resulting from reduced habitat and food

resources. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling 2000).

Population stability

Population viability analysis (PVA) is essentially a demographic modeling exercise to predict the likelihood a population will continue to exist over time (Groom and Pascual 1997). The true value in using this analytical approach is not to determine the probability of a species' extinction, but to clarify factors that have the most influence on a species' persistence. From 1996 to 1999, the Service funded Auburn University to develop a PVA for beach mice (Holler *et al*. 1999, Oli *et al.* 2001). Four subpopulations of Gulf Coast beach mice subspecies were modeled. They consisted of two subpopulations of PKBM, one at GINS-Perdido Key Area and one at Florida Point, and two subpopulations of ABM, one at Bon Secour NWR and one at Fort Morgan State Park. They used a stochastic (random) differential equation (Wiener-drift) model, applied to long term demographic data. The model is stochastic because it incorporates the variable effects of the environment upon population change. However, it did not model the effects of hurricanes on the habitat or population of beach mice.

The Oli *et al.* (2001) analyses indicated that all four subpopulations were at risk of extinction, with habitat fragmentation as the most influential factor. The GINS-Perdido Key Area had the highest risk for extinction; the PKBM had a 100 percent chance of reaching one individual (becoming functionally extinct) within 21 (mode) or 45 (median) years. At Florida Point, the PKBM had a low risk of becoming functionally extinct (1.3 percent) within 13 to 20 years. However, following Hurricane Opal in 1995, and subsequent predation pressure, the PKBM population at Florida Point was believed extirpated in 1999. This localized extirpation clearly demonstrates that while PVA's are useful in determining significant factors in species survival, they have limited use in predicting the time to extinction for a given species.

More recently, the Conservation Breeding Specialist Group (Traylor-Holzer 2004, 2005, 2006) was contracted by the Service to conduct a population and habitat viability analysis (PHVA) on ABM using the Vortex population simulation model (Lacy 1993). The goal was to develop an ABM population model and use the model to assess the status of the ABM habitat, and populations and projections for continued existence. The PHVA results projects the ABM to have a 26.8 percent $\pm$ 1.0 percent likelihood of extinction over the next 100 years. Much of this risk is due to hurricane impacts on ABM populations and habitat, which can result in population declines. The model suggests that hurricanes are a driving force for ABM populations, both directly and also indirectly as their impacts interact with other factors, including development of higher elevation (scrub) habitat and predation by cats. Due to the similarities in the subspecies and proximal location, it can be inferred that these factors also have a strong influence on the persistence of PKBM populations. When reviewing PHVA results, it is crucial that the actual values for the risk of extinction are not the focus of the interpretation. The true value of a PHVA is the ability to compare management strategies and development scenarios, run sensitivity analyses, and determine the main influence(s) on population persistence.

Similar to the land use arrangement on Perdido Key, the Fort Morgan peninsula (occupied by ABM) consists of three areas of public lands separated by two areas of private lands, which allow for limited (varied) dispersal between the public lands. The current level of dispersal between public lands through private lands is unknown, but is affected by development and habitat degradation. Without dispersal between public lands through private lands, the PHVA results project the ABM to have a 41.2 percent ± 1.1 percent likelihood of extinction. If all privately-owned habitat between the public lands is lost, the likelihood of extinction increases to 46.8 percent ± 1.1 percent. Again, it can be inferred that a similar increase in risk of extinction would occur with the PKBM if dispersal could not occur through private lands.

Despite the similarities in the subspecies, it is important to note that carrying capacity (K), which was found to be a strong influence on the model, would be different in PKBM. For ABM, K was estimated using maximum ABM density estimates (4.5 to 11.6 ABM per acre) and acres of habitat (2,989 acres). As density estimates for PKBM would likely be lower, and remaining PKBM habitat is less than 1,300 acres, the Vortex model for PKBM would likely project a greater likelihood of extinction.

The Service contracted with the Georgia Cooperative Fish and Wildlife Research Unit to critique the PVAs for the ABM accomplished by Oli *et al.* (2001) and Conservation Breeding Specialist Group (Traylor-Holzer 2006). Conroy and Runge (2006) indicated that neither PVA provided reliable estimates of extinction probability for ABM. They recommended that future PVA work should incorporate sampling, temporal, and possibly spatial variance for input variables and should clearly and explicitly express uncertainty in extinction output. Until this can be done, reliable estimates of extinction probability for the ABM (and other beach mouse subspecies) cannot be estimated.

Species that are protected across their ranges have lower probabilities of extinction (Soulé and Wilcox 1980). Beach mouse populations persist naturally through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increase and dispersal occurred from adjacent populated areas. In addition, from a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As human development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline is no longer possible and any hurricane can impact the entire range of each subspecies, the probability of beach mice persisting would be enhanced by the presence of contiguous tracts of suitable habitat occupied by multiple independent populations (Shaffer and Stein 2000). The history of the PKBM alone illustrates the need for multiple populations (a now potentially extirpated population was the source of the two remaining populations of the subspecies) (Holler *et al.* 1989, 71 *FR* 60238). While maintaining multiple populations of beach mouse subspecies provides protection from total loss (extinction), especially when migration and relocations are possible (Oli *et al.* 2001), conservation of each subspecies necessitates protection of genetic variability throughout their ranges (Ehrlich 1988).

Preservation of natural populations is therefore crucial, as the loss of a population of beach mice can result in a permanent loss of alleles (Wooten and Holler 1999). This loss of genetic variability cannot be regained through translocations or other efforts.

Status and Distribution

The distribution of all the beach mouse subspecies is significantly reduced from their historical ranges due to modification and destruction of the coastal dune ecosystem inhabit. Habitat loss and alteration was likely a primary cause of the extinction of one subspecies, the Pallid beach mouse, which was endemic to barrier beach between Matanzas and Ponce de Leon inlets in Volusia and Flagler Counties (Humphrey and Barbour 1981).

Atlantic Coast Beach Mice

The distribution of the SEBM has declined significantly, particularly in the southern part of its range. Historically, it was reported to occur along about 174 miles of Florida's central and southeast Atlantic coast from Ponce (Mosquito) Inlet, Volusia County, to Hollywood Beach, Broward County (Hall 1981). Bangs (1898) reported it as extremely abundant on all the beaches of the east peninsula from Palm Beach at least to Mosquito (Ponce) Inlet. During the 1990s, the SEBM was reported only from Volusia County (Canaveral National Seashore); in Brevard County (Canaveral National Seashore, Kennedy Space Center/Merritt Island NWR, and CCAFS); a few localities in Indian River County (Sebastian Inlet State Park, Treasure Shores Park, and several private properties), and St. Lucie County (Pepper Beach County Park and Fort Pierce Inlet State Park) (Humphrey *et al*. 1987, Robson 1989, Land Planning Group, Inc. 1991, Humphrey and Frank 1992b, Service 1993). The SEBM is geographically isolated from all other subspecies of beach mice.

Populations of the SEBM are still found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Populations from the north side of Sebastian Inlet appear to be extirpated (Bard 2004). SEBM were documented on the south side of Sebastian Inlet in 2006, although none have been found since then.

The status of the species south of Brevard County is currently unknown. The surveys conducted during the mid-1990s indicated the distribution of this subspecies in the counties south of Brevard County was severely limited and fragmented. There are not enough data available to determine population trends for these populations. These surveys revealed that it occurred only in very small numbers where it was found. In Indian River County, the Treasure Shores Park population experienced a significant decline in the 1990s, and it is uncertain whether populations still exist at Turtle Trail or adjacent to the various private properties (Jennings 2004). Trapping efforts documented a decline from an estimated 300 individuals down to numbers in the single digits. In 2006, a population off Jungle Trail at Pelican Island NWR was discovered (Van Zant 2006). No beach mice were found during surveys in St. Lucie County and it is possible that this species is

extirpated there. The SEBM no longer occurs at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

The primary reason for the significant reduction in the range of the SEBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated SEBM habitat in the southern part of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a pronounced affect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation and harassment by free-roaming cats and dogs. A healthy population of SEBM on the north side of Sebastian Inlet State Park in Brevard County was completely extirpated by 1972, presumably by free-roaming cats (Bard 2004). Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice (*Mus musculus*) and introduced rats.

The distribution of the beach mouse is limited due to modification and destruction of its coastal habitats due mostly to developmental pressures. One additional Atlantic coast subspecies, the pallid beach mouse (*P. p. decoloratus*), was formerly reported from two sites in Volusia County, but extensive surveys provide substantial evidence that this subspecies is extinct (Humphrey and Barbour 1981).

The distribution of the AIBM has declined significantly, particularly in the northern part of its range. Historically, it was reported to occur from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Humphrey and Frank 1992a). It currently occurs only on Anastasia Island, primarily at the north (ASP) and south (FMNM) ends of the island, although beach mice still occur at low densities in remnant dunes along the entire length of the island (Service 1993). The original distribution consisted of about 50 miles of beach; current populations occupy about 14 miles of beach with possibly only 3 miles supporting viable populations (Service 1993).

In 1992 to 1993, 55 mice (27 females and 28 males) were reintroduced to GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) in St. Johns County. In 1993, the population was estimated at 220 mice. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss or alteration from storms and or habitat conditions.

The primary reason for the significant reduction in the range of the AIBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated AIBM habitat in the northern two-thirds of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune

maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a severe effect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation by free-roaming cats and dogs. ASP has successfully reduced feral cat populations at the recreation area and has seen a benefit to the beach mice. Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice and introduced rats.

Gulf Coast Beach Mice

PKBM populations have existed since the late 1970s as isolated populations along its historical range (16.9 miles). The effects of Hurricane Frederic (1979) coupled with increased habitat fragmentation due to human development led to the extirpation of all but one population of PKBM. The less than 30 individuals at Gulf State Park (at the westernmost end of Perdido Key) were once the only known existing population of PKBM (Holler *et al*. 1989). Beach mice from this site were used to reestablish PKBM at Gulf Islands National Seashore (GINS) between 1986 and 1988 (Holler *et al.* 1989). Then in 1999 the population at Gulf State Park was considered extirpated (Moyers *et al.* 1999). In 2000, 10 PKBM (five pairs) was relocated from GINS to PKSP. In February of 2001, this relocation was supplemented with an additional 32 PKBM (16 pairs). The PKBM were released on both north and south sides of SR 292 in suitable habitat. Two years of quarterly survey trapping indicated that the relocations of PKBM to PKSP were successful and this was considered an established population (Lynn and Kovatch 2004). PKBM were also trapped on private land between GINS and PKSP in 2004, increasing documentation of current occurrences of the mouse (Lynn 2004a). Based on the similarity of habitat between these areas and the rest of Perdido Key, as well as the continuity of the habitat, the mouse is believed to inhabit other private properties where suitable habitat exists north and south of SR 292. The PKBM is considered to occur on 42 percent of Perdido Key (1,227 acres of 2,949 acres) (**Table 14**).

Table 14. Perdido Key beach mouse habitat on Perdido Key in Florida and Alabama.

Area	Total in AL & FL		Total in Florida		Total in Alabama	
	Acres	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Perdido Key	2,949	100	2,615	89	334	11
PKBM habitat	**1,292**	100	**1,146**	**88**	148	12
Private lands	1,440	49	1,278	43	162	5
PKBM habitat	**302**	**23**	**270**	**24**	33	3
Public lands	1,509	51	1,337 GINS 1,052 PKSP 285	45	172 GSP 172	6
PKBM habitat	990	76	876 GINS 638 PKSP 238	67	114 GSP 114	9

[1]Data calculated by Service's Panama City, Florida using 2004 Digital Orthophoto Quarter-Quadrangle (DOQQ) aerial photography, 2005 parcel data from Baldwin County, Florida and 2005 parcel data from Escambia County, Florida and revised June 2006.

The listing of PKBM was based on data collected in 1983-84, and at that time the mouse was recovering from the effects of Hurricane Frederick in 1979. Following Hurricane Frederic estimated population numbers based on trapping were 13 PKBM found at one location (Gulf State Park). Just prior to listing, only one PKBM was captured in trapping surveys, this again being at Gulf State Park. Since that time, numbers have fluctuated dramatically based on hurricanes and/or translocation efforts, but were at their highest estimate ever documented just prior to Hurricane Ivan in 2004 at between 500-800 individuals. This was a result of significant partnership efforts and included translocation and habitat restoration on public lands. Even with the destructive hurricanes in 2004 and 2005, current numbers of PKBM, while low (no population estimates are available), are greater than one mouse and mice have been confirmed from two areas (PKSP and GINS). Survey efforts (tracking and trapping) have also been sporadic and inconsistent; therefore, it is difficult to establish long term trend information at this time.

CBM subpopulations currently persist along approximately 15 miles of Gulf of Mexico shoreline consisting of four isolated areas along 11 miles of beachfront within its former range. Another 5 miles outside of the CBM's known historical range has been recently colonized (Lynn, 2000a, 2003a). In the 1950s, the CBM was widespread and abundant at that time according to Bowen (1968). By 1979, Humphrey and Barbour (1981) reported only 40 percent of the original habitat remained undeveloped in noncontiguous areas. They also documented that the CBM had been extirpated from seven of its nine historical localities being restricted to the Topsail Hill area in

Walton County and Shell Island in Bay County. In 1985 when the CBM became federally protected, CBM were still only known from the Topsail Hill area and Shell Island, an area consisting of about 10 miles of coastline (50 *FR* 23872). In 1989, a cooperative interagency effort reintroduced CBM onto the central and west units of Grayton Beach State Park increasing the occupied coastline by another mile (Holler *et al*. 1989). In 1999, with the closing of East Pass and Shell Island connecting to West Crooked Island, CBM increased their range by approximately four miles (Lynn 2000b). CBM are now known to occupy approximately 15 miles of Gulf of Mexico beachfront; 12 of the 15 miles are publicly owned lands.

There are four subpopulations of CBM that exist: 1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands), 2) Shell Island (includes St. Andrew State Park mainland and Shell Island with private inholdings and Tyndall AFB), 3) Grayton Beach (and adjacent eastern private lands), and 4) West Crooked Island. Approximately 96 percent of the lands known to be occupied by CBM are public lands. Translocations to establish a fifth subpopulation of CBM occurred in March of 2003 and 2005. CBM from Topsail Hill Preserve State Park were moved to private lands at Camp Creek/Water Sound in Walton County, Florida (Lynn 2003a, Service 2005a, 2005b, 2005c, 2005d).

Topsail Hill Preserve State Park consists of 1,637 acres of which 262 acres provide CBM habitat; the majority being occupied by CBM. The Florida Park Service prepared a Unit Management Plan for the Preserve that explicitly plans for conservation and protection of CBM habitats (FDEP 2007). Private lands on the east side consist of approximately 9.63 acres. Of that, 7 acres consist of the development known as the Stallworth Preserve. The Service issued an ITP for CBM associated with the Stallworth Preserve HCP in 1995; an amendment to the permit was issued in 1999. The remaining 2.63 acres has been purchased by Walton County with a grant from the Service. Private lands on the west side of the Preserve consist of 24 acres and include Four-Mile Village, a low density single family development, and the Coffeen Nature Preserve managed by the Sierra Club.

Shell Island consists of lands within the St. Andrew State Park, Tyndall AFB, and private lands. The Unit Management Plan for the State Park was completed in 1999. The plan identifies the need for protection and management of the CBM. Tyndall AFB manages their portion of Shell Island under the installation's Integrated Natural Resources Management Plan. The Service has joined with the State Park and Tyndall AFB since 1995 by providing funding to protect and restore CBM habitats on Shell Island.

The St. Andrew State Park mainland consists of 1,260 acres of which 123 acres are beach mouse habitat. Several tracking efforts looking for signs of CBM on the mainland were made between 1995 and 1998; no evidence was found that indicated the presence of the beach mouse (Moyers 1996, Moyers *et al.* 1999). However, live-trapping to document the absence of the mouse has not been conducted. Reintroduction of this area is considered an action to support recovery of CBM.

The Grayton Beach subpopulation consists of two units in Grayton Beach State Park. The Park is divided into a central and western unit and is currently connected by a narrow band of primary

dunes. Total acreage of the Park is 2,236 acres with 153 acres providing suitable CBM habitat. The Unit Management Plan for the Park identified the protection of the CBM as an important component. The Park has requested and received funds from the Service to implement CBM habitat restoration and protection. Portions of private lands (WaterColor and Seaside developments) on the east side of the central unit are occupied by CBM or provide suitable habitat.

West Crooked Island consists of 1,558 acres of which 730 acres provide CBM habitat and remains occupied by CBM (Lynn 2004b). The West Crooked Island subpopulation resulted from its connection to Shell Island in 1998-1999. The construction of the St. Andrew Pass navigation inlet in the early 1930s severed Shell Island from the mainland on its western end. Since then, the original pass, East Pass (or Old Pass) began to close. After passage of Hurricane Opal in 1995, East Pass temporarily closed and reopened; however, after passage of hurricanes Earl and Georges in 1998, the pass closed (Coastal Tech 1999, Middlemas 1999). CBM dispersed onto West Crooked Island from Shell Island colonizing most of the island within two years (Lynn 2004b). East Pass was reopened as a joint venture between Tyndall AFB and Bay County in December of 2001 but has since closed again.

SABM is now known to consist of two subpopulations, East Crooked Island and St. Joseph Peninsula State Park. The majority of the East Crooked Island subpopulation is located on Tyndall AFB and the other on the St. Joseph Peninsula State Park. Other important public lands for the conservation of the mouse would include Eglin Air Force Base lands at Cape San Blas and Billy Joe Rish Park. Private lands adjacent to Tyndall AFB and the State Park are either known to be occupied by SABM or contain habitat. Trapping by St Joe/Arvida on about 111 acres of SABM habitat at East Crooked Island was conducted in 2000, 2001, and 2003. The trapping confirmed existence of SABM on the property (Moyers and Shea 2002). However, trapping their property in St. Joseph Beach did not result in capture of any beach mice (Moyers and Shea 2002). Although SABM is thought to continue to occupy habitat south of St. Joseph Peninsula State Park, only tracking has been conducted to confirm its presence on private lands since the late 1990s. Private lands adjacent to public lands are available for population dispersal and food source during periods of high population and after severe weather events. However, subpopulations on large tracts of private land within the historical range of the subspecies are needed for conservation of the SABM.

Land development has been primarily responsible for the permanent loss of SABM habitat along its approximately 40-mile long historical range. In addition, construction of U.S. highway 98 accelerated the habitat loss from associated development. By the mid 1990's about 12 linear miles were known to be occupied (Gore 1994, 1995), indicating a 68 percent reduction in it historical distribution (63 *FR* 70053). An effort to re-establish the SABM back into its historical range was initiated around the time of listing (Moyers *et al.* 1999); however, the range reduction described above did not take this into account since the success of the reintroduction was not known at the time (63 *FR* 70053). Similar analyses have not been conducted since.

Our best documentation of the species' decline can be seen from trapping or tracking surveys conducted at various times throughout its range. By the mid to late 1980's concerns were raised

when trapping efforts failed to result in captures at West Crooked Island (Gore 1987). By 1990 the SABM appeared to only inhabit a small portion (approximately 11 linear miles) of its original range: west end of East Crooked Island and within St. Joseph Peninsula State Park (Gore 1990). SABM's apparent decline continued into the mid-1990's when in 1994, the population on East Crooked Island was "presumed to be extinct" (Wooten and Holler 1999), leaving only one known population on St. Joseph Peninsula (Moyers *et al.* 1999). Subsequent reintroduction efforts in 1997-1998 appeared to have re-established the population on East Crooked Island (Moyers *et al.* 1999).

Recovery Criteria

The Recovery Plan for the SEBM identifies the primary recovery objectives for the subspecies (Service 1993). The SEBM can be considered for delisting if 10 viable, self-sustaining populations can be established throughout a significant portion of its historical range. More specifically, delisting can be considered if the following conditions are met:

1. Viable populations are maintained on the five public land areas where the subspecies currently occurs. Each population should not fluctuate below an effective breeding size of 500 individuals;

2. Five additional viable populations are established throughout the historical range of the subspecies; and

3. These populations should be monitored for at least five years.

The Recovery Plan for the AIBM identifies the primary recovery objectives for the subspecies (Service 1993). The AIBM can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies' historical range has been permanently destroyed, it is not likely that it can be fully recovered or delisted. For the AIBM to be considered for downlisting to threatened, it is required that those populations at the northern and southern end of Anastasia Island continue to be viable. Each population should support a breeding population of 500 individuals. Two additional viable populations shall be established within the mainland portion of the historical range. All of these populations should be monitored for five years.

The Recovery Plan for the PKBM, CBM, and ABM identifies the primary recovery objectives to be the stabilization of present populations by preventing further habitat deterioration, and the reestablishment of populations in areas where they were extirpated (Service 1987). For each of the subspecies to be considered for downlisting to threatened, it is required that there be a minimum of at least three distinct self-sustaining populations in designated critical habitat with at least 50 percent of the critical habitat being protected and occupied by beach mice (Service 1987).

While this is the currently approved Recovery Plan for the three beach mouse subspecies, studies and research since the Recovery Plan publication provided additional information concerning

recovery needs for the subspecies. Protection and enhancement of existing populations and their habitat, plus reestablishment of populations in suitable areas within their historical ranges, are necessary for the subspecies survival and recovery. Core beach mouse populations remain isolated and are vulnerable to natural and anthropogenic factors that may further reduce or degrade habitat and/or directly reduce beach mouse population sizes. Maximizing the number of independent populations is critical to species survival. Protection of a single, isolated, minimally viable population risks the extirpation or extinction of a species as a result of harsh environmental conditions, catastrophic events, or genetic deterioration over several generations (Kautz and Cox 2001). To reduce the risk of extinction through these processes, it is important to establish multiple protected populations across the landscape (Soulé and Simberloff 1986, Wiens 1996). Through the critical habitat designation process we are addressing this by designating five independent units for the subspecies spaced throughout its historical range, depending on the relative fragmentation, size, and health of habitat, as well as availability of areas with beach mouse PCEs.

The Service completed a five-year status review of the CBM and PKBM in August 2007 (Service 2007a, 2007b). For both subspecies the following was recommended: designate a beach mouse recovery coordinator; revise the recovery plan; accomplish viable populations, monitor habitat improvement, corridor persistence and hurricane response; conduct genetic studies and translocations as necessary; participate in education and outreach and complete an emergency response plan.

A Recovery Plan for the SABM was finalized in 2010 and the recovery objectives are to reestablish additional populations, threat minimization or removal, habitat protection and/or restoration, and outreach/education to the public. This recovery plan is up to date and includes current threats to SABM.

In accordance with the Act, Federal agencies (including the Service) consult with the Service for actions that may adversely affect beach mice and their designated habitat. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development (**Table 14**).

Table 15. Previous biological opinions within Florida that have been issued for projects that had adverse impact to the nesting beach mice.

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
GINS Dune Protection (PKBM)	2000	0.01 acre (CH)
Translocation to PKSP (PKBM)	2000	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)
Supplemental translocation to PKSP (PKBM)	2003	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
FEMA Berm Orange Beach, AL (PKBM)	2003	0.14 acre non-CH
Service scientific collecting permit program (PKBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
Florencia Development (within Action Area) (PKBM)	2005	3.5 acres (non-CH)
PKSP Re-build (PKBM)	2005	1.99 acres (CH)
FEMA Berm Emergency consultation (within Action Area) (PKBM)	2005	Consultation not complete (non-CH)
GINS road rebuild (PKBM)	2005	1.7 acres (CH)
Magnolia West Development (within Action Area) (PKBM)	2006	5.2 acres (not CH at time of construction, presently CH)
Palazzo Development (PKBM)	2006	0.58 acre (not CH at time of construction, presently CH)
Searinity Development (PKBM)	2006	0.32 acre (not CH at time of construction, presently CH)
Retreat Development (PKBM)	2006	0.21 acre (not CH at time of construction, presently CH)
Bond Residence (PKBM)	2006	0.17 acre (CH)
Three-batch condo (Island Club, Marquesas, Lorelei) (PKBM)	2007	0.95 acres (CH)
Naval Air Station Pensacola Pensacola Pass navigation channel dredging (PKBM)	2007	6.3 miles (CH)
Paradise Island development (PKBM)	2007	0.91 acres (CH)
Calabria condo development (PKBM)	2008	0.33 acres (non-CH)
Escambia County beach nourishment (PKBM)	2008	0.16 acres (partial CH)
Seabreeze Condominiums (PKBM)	2009	0.39 acres
Spanish Key Parking Lot (PKBM)	2009	0.28 acres

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Perdido Key Fire Station (PKBM)	2010	0.43 acres (CH)
Evans Residence	2012	0.21 acre
Stern Residence	2012	0.07 acre
Whalen Residence	2012	0.18 acre
Carbone Residence	2012	0.74 acre
Lost Key	2012	26.1 acre
Stallworth Preserve Development (CBM)	1995	7 acres (CH)
Navy Panama City Beach site 4 construction (CBM)	2000	0.01 acre (CH)
East Pass Re-opening (CBM)	2001	Temporary, indirect take (CH)
WaterColor and WaterSound Developments (CBM)	2000	7.6 acres (non-CH)
Service scientific collecting permit (CBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
FEMA beach berms post hurricane Ivan emergency consultation (CBM)	2005	Consultation not complete (partial CH)
Western Lake Reopening consultation (CBM)	2006	2.7 acres annually for 5 years (CH)
FEMA Statewide post-disaster berm programmatic BO (PKBM, CBM, SABM, AIBM, and SEBM)	2007	75 miles for eroded shoreline(partial CH)
Angelos Development (CBM)	2009	0.42 acres
Bonfire Beach (SABM)	2008	38 acres
Ovation (SABM)	2010	5.41 acres (CH)
Sea Colony Development (AIBM)	1998	0.7 acres (non-CH)
Anastasia State Park beach nourishment (AIBM)	2005	50 linear feet (non-CH)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Service scientific collecting permit program (AIBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
Rodent Control Program on CCAFS (SEBM)	2002	50 beach mice
Cape Canaveral Air Force borrow source (SEBM)	2007	300 linear feet (non-CH)
Service scientific collecting permit program (SEBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
CCAFS Routine Maintenance Programmatic (SEBM)	2008	Temporary loss of habitat during trenching/digging for pipeline installation and repair, roadside mowing, soil remediation, pole placement, wells, soil boring, lines of sight, scrub restoration

Common Threats to Beach Mice in Florida

Habitat Loss or Degradation

Coastal dune ecosystems are continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport and depletion, and fluctuations in sea level. The location and shape of barrier island beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, sand pine scrub, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island.

The quality of the dune habitat (primary, secondary, and scrub) is an important factor in maintaining and facilitating beach mouse recovery. Habitat manipulation is an old and widely used tool in wildlife management. It is especially useful in improving habitat suitability to increase local populations of a species. For beach mice, improving habitat can enhance the abundance and diversity of food resources, increase the chances of meeting a mate, and reduce competition for food and burrow sites.

Long term trapping data has shown that beach mouse densities are cyclic and fluctuate by order of magnitude on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling

2000, Sneckenberger 2001). Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation and extinction, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources.

Habitat loss and fragmentation associated with residential and commercial real estate development is the primary threat contributing to the endangered status of beach mice (Holler 1992a, 1992b, Humphrey and Frank 1992a). Coastal commercial and residential development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by cats), diseases, and competition with house mice, are intensified in small, isolated populations, which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation.

The conservation of multiple large, contiguous tracts of habitat is essential to the persistence of beach mice. At present, large parcels of land exist mainly on public lands. Protection, management, and recovery of beach mice on public areas have been complicated by increased recreational use as public lands are rapidly becoming the only natural areas left on the coast. Public lands and their staff are now under pressure to manage for both the recovery of endangered species and recreational use. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local and complete extinctions due to storms and other stochastic events (Danielson 2005). Protecting multiple populations increases the chance that at least one population within the range of a subspecies will survive episodic storm events and persist while vegetation and dune structure recover.

Habitat connectivity also becomes essential where mice occupy fragmented areas lacking one or more habitat types. If scrub habitat is lacking from a particular tract, adjacent or connected tracts with scrub habitat are necessary for food and burrow sites when resources are scarce in the frontal dunes, and are essential to beach mouse populations during and immediately after hurricanes. Trapping data suggests that beach mice occupying the scrub following hurricanes recolonize the foredune once vegetation and some dune structure have recovered (Swilling *et al*. 1998, Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract and a functional pathway to frontal dune habitat does not exist, beach mice may not be able to attain the resources necessary to expand the population and reach the densities necessary to persist through the harsh summer season or the next storm. Functional pathways may allow for natural behavior such as dispersal and exploratory movements, as well as gene flow to maintain genetic variability of the population within fragmented or isolated areas. To that end, contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

A lack of suitable burrow sites may be a consequence of habitat degradation. Beach mice use burrows to avoid predators, protect young, store food, and serve as refugia between foraging bouts and during periods of rest. Beach mice have been shown to select burrow sites based on a suite of abiotic and biotic factors. A limitation in one or more factors may result in a shortage of suitable sites and the availability of potential burrow sites in each habitat may vary seasonally. Beach mice tend to construct burrows in areas with greater plant cover, less soil compaction, steep slopes, and higher elevations above sea level (Lynn 2000a, Sneckenberger 2001). These factors are likely important in minimizing energy costs of burrow construction and maintenance while maximizing the benefits of burrow use by making a safe and physiologically efficient refuge. Similar to food resources, this fluctuation in availability of burrow sites suggests that a combination of primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

Predation

Beach mice have a number of natural predators including coachwhip (*Masticophis flagellum*) corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox, gray fox, skunk (*Mephitis mephitis*), weasel (*Shallela frenata*), and raccoon (Blair 1951, Bowen 1968, Holler 1992a, Novak 1997, Moyers *et al.* 1999, Van Zant and Wooten 2003). Predation of beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern. However, predation pressure from natural and non-native predators may result in the extirpation of small, local populations of beach mice.

Free-roaming cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978) and are considered to be the main cause of the loss of at least one population of beach mice (Holliman 1983). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers *et al.* 1999). The PHVA for the ABM indicated that if each population had as few as one cat, which ate one mouse a day, rapid extinction would occur in over 99 percent of all iterations (Traylor-Holzer 2005).

In response to increasing depredation of sea turtle nests by coyote, fox, hogs, and raccoon, multi-agency cooperative effort have been initiated and are ongoing throughout Florida, in particular on public lands. These programs also benefit beach mice.

Hurricanes

Hurricanes can severely affect beach mice and their habitat, as tidal surge and wave action overwash habitat, leaving a flat sand surface denuded of vegetation; sand is deposited inland, completely or partially covering vegetation; blowouts between the ocean and bays and lagoons leave patchy landscapes of bare sand; primary dunes are sheared or eroded; and habitat is completely breached, creating channels from the ocean to bays and lagoons. Other effects include direct mortality of individuals, relocation/dispersal, and subsequent effects of habitat alterations

(that impact such factors as forage abundance/production and substrate elevation). Habitat impacts can be widespread, encompassing the range of the subspecies.

Until frontal dune topography and vegetation redevelop, scrub habitat maintains beach mice populations and provides the majority of food resources and potential burrow sites (Lynn 2000a, Sneckenberger 2001). While storms temporarily reduce population densities (often severely), this disturbance regime maintains open habitat and retards plant succession, yielding a habitat more suitable for beach mice than one lacking disturbance. The low-nutrient soil of the coastal dune ecosystem often receives a pulse of nutrients from the deposition of vegetative debris along the coastline (Lomascolo and Aide 2001). Therefore, as the primary and secondary dunes recover, beach mice recolonize this habitat readily as food plants develop to take advantage of the newly available nutrients. Recovery times vary depending upon factors such as hurricane characteristics (*i.e.*, severity, amount of associated rain, directional movement of the storm eye, storm speed), successional stage of habitat prior to hurricane, elevation, and restorative actions post hurricane. Depending on these factors, recovery of habitat may take from one to over 40 years.

The impact of hurricanes on plant communities temporarily affects food availability, and hence can limit population densities in impacted habitats soon after storms. Observations indicate that Hurricane Opal (a Category 3 storm in November 1995) caused a decrease in one population of ABM by 30 percent (Swilling *et al.* 1998). However, population densities in scrub habitat typically increased following hurricanes (Swilling *et al.* 1998). Sneckenberger (2001) also found atypical numbers of ABM in scrub following a hurricane. Five months post-storm, "densities (individuals/km) were up to 7.5 times greater in scrub areas than in frontal dune grids." Impacts of the storm may have been apparent as long as 17 months after the storm when scrub densities remained triple those of frontal dunes (Sneckenberger 2001). Moyers *et al.* (1999) found similar results for CBM at Grayton Beach State Park. When frontal and primary dunes sustained extensive damage during Hurricane Opal in 1995, beach mice were captured behind what remained of primary dune habitat. By 1998, however, primary dunes and the immediate habitat inland appeared to support higher numbers of beach mice.

In addition to the overall change in post Hurricane Opal distribution of ABM, Swilling *et al*. (1998) found the mean percent of newly marked individuals increased from 14 percent for the three trapping periods before the storm to an average of 26.7 percent for the same interval post hurricane. The average for the three trapping periods immediately following was even higher, at 42.7 percent of the individuals captured. Swilling *et al.* (1998) concluded that this increased presence of new individuals reflected increased reproduction. A statistical analysis of the data indicated that the number of females exhibiting signs of reproduction was significantly higher than normal (18.9 percent higher). Moyers *et al.* (1999) also found similar results at Topsail Hill Preserve State Park. Four to five months following Hurricane Opal, all female CBM captured were pregnant or lactating. Trapping six months after the hurricane, Moyers *et al.* (1999) noted that 51.5 percent of captured CBM were new unmarked beach mice.

Although hurricanes can significantly alter beach mouse habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes are probably responsible

for maintaining coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Holler *et al.* (1999) suggested that hurricanes could function to break up population subgroups and force population mixing. The resultant breeding between members of formerly isolated subgroups increases genetic heterogeneity and could decrease the probability of genetic drift and bottlenecks.

Beachfront Lighting

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. Foraging activities and other natural behaviors are influenced by many factors. Artificial lighting alters behavior patterns causing beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird *et al.* 2004).

The presence of vegetative cover reduces predation risk and perceived predation risk of foraging beach mice, and allows for normal movements, activity, and foraging patterns. Foraging in sites with vegetative cover is greater and more efficient than in sites without cover (Bird 2002). Beach mice have also been found to select habitat for increased percent cover of vegetation, and decreased distance between vegetated patches (Smith 2003).

Genetic variability

Selander *et al.* (1971) conducted an electrophoretic study on 30 populations of *P. polionotus*, including populations of beach mouse subspecies. Based on 30 allozyme loci, they estimated that the level of allozyme variation found in beach mouse populations was at least 40 percent lower than the level of variation in nearby inland populations. This work indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population. Lower levels of heterozygosity has been linked to less efficient feeding, fewer demonstrations of social dominance and exploratory behavior, and smaller body size (Smith *et al.* 1975, Garten 1976, Teska *et al.* 1990). Research focused on inbreeding depression in old-field mice (including one beach mouse subspecies), determined that the effects of inbreeding negatively influenced factors such as litter size, number of litters, and juvenile survivorship (Lacy *et al.* 1995).

In 1995, the Service contracted with Auburn to conduct genetic analysis of: 1) post-reestablishment gene structure in PKBM and CBM; 2) microgeographic patterning and its relevance to alternate management approaches for ABM on the Bon Secour NWR; and 3) if feasible, the historical relationship of SABM from Crooked Island relative to CBM from Shell Island and SABM from St. Joseph Peninsula.

Results of the work for CBM found: 1) founder effects were observed in the Grayton Beach State Park population (fixation of alleles common to the donor population and allele frequency shifts); 2) incongruity in number and size of several alleles was observed between Grayton Beach State Park and Shell Island; 3) overall genetic divergence between the donor and reestablished

population was moderate; 4) genetic differences between Topsail Hill Preserve State Park and other CBM sites were higher than expected given the spatial proximity; 5) Topsail Hill Preserve State Park appears to be a reservoir for unique variation within the remaining populations of CBM; and 6) the overall relatedness estimated for Grayton Beach State Park suggested that any mating would involve close relatives (Wooten and Holler 1999).

Wooten and Holler (1999) recommended strategies for management of CBM based on genetics. Management of the Grayton Beach State Park population for genetic characteristics appears to be needed; however, additional genetic analyses will be needed. Relocation of CBM to Grayton Beach State Park from Shell Island should be continued.

Results of the work for PKBM found that: 1) founder effect (from Florida Point to GINS) did impact the GINS-Perdido Key Area subpopulation. Loss of rare alleles and allele frequency shifts were noted; 2) a low to moderate level of overall genetic divergence was observed; 3) data suggests that some effects of genetic drift were mediated by continued transfer of individuals; 4) levels of heterozygosity were unexpected given recent history; 5) average levels of relatedness among individuals is high which may portend future inbreeding related problems (however, no evidence of existing inbreeding was observed in the data); and 6) the overall level of microsatellite variation retained in the GINS-Perdido Key Area subpopulation was higher than anticipated. Wooten and Holler (1999) recommended management of PKBM based on genetics by: 1) preserving the natural population to the maximum extent possible since the loss of the Florida Point subpopulation resulted in the permanent loss of alleles; 2) using the GINS-Perdido Key Area subpopulation as a donor for reestablishment of other populations because of the retention of a substantial amount of genetic variation; and 3) reestablishment plans should include transfers between donor and reestablished subpopulations. In addition, translocations should be accomplished in pairs.

Analysis of genetic work focused on SABM indicated that there are two possible genetic histories for Crooked Island beach mice: 1) the last known beach mice from Crooked Island were derived from CBM or 2) the last known beach mouse from Crooked Island were unique from both CBM found on Shell Island or SABM found on St. Joseph peninsula (Van Zant 2003).

Climate Change (refer to page 49)

Analysis of the Species/Critical Habitat Likely to be Affected

Beach mice are currently federally protected because of their low numbers caused by habitat loss with continuing threats to their habitat (including critical habitat for CBM, PKBM, and SABM) and resulting affects from storm and post-storm events. The primary reason for the significant reduction in their range is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated beach mouse habitat. Coastal urbanization has also increased the recreational use of beachfront areas. Dune habitat maintenance is an important component of beach mouse conservation. Providing a healthy and continuous dune system assures mouse population stability. Integral to this is keeping visitors to the beach off the

dunes and replanting as necessary when impacts occur or are observed. The extremely active 2004 and 2005 hurricane seasons also had a severe effect on Florida's beaches and beach mouse habitat.

Critical habitat for three (PKBM, CBM, and SABM) of the five subspecies of beach mice has been designated and will be discussed. No critical habitat has been designated for the other two subspecies (SEBM and AIBM). Therefore, the proposed action would have no effect on designated critical habitat for these two subspecies because none is designated.

Generally, sand placement activities or dredged navigation channel material is not placed on existing beach mouse habitat consisting of vegetated dunes. Typical effects from these activities to beach mice and their habitats consist of the staging and storage of equipment, work vehicles, or materials and beach access for sand placement activities or dredged material placement. These effects may result in the permanent and temporary loss, degradation, or fragmentation of beach mouse habitat and changes in essential life history behaviors (dispersal and movement, foraging, seeking mates, breeding, and care of young). Beach mice spend their entire lives within the dune ecosystem and are nocturnal. Sand placement projects may occur at anytime of the year depending on their location and are usually conducted on a 24/7 schedule. The quality of the placed sand could affect the suitability of the beach and dunes to support beach mouse burrow construction and food sources. The effect of the activities covered under the consultation with incorporation of the proposed conservation measures on beach mice overall survival and recovery are considered in this SPBO.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area (all subspecies of beach mice)

The action area encompasses the entire range of five subspecies of beach mice, and designated critical habitats of three beach mouse subspecies. Therefore, the previous discussion in "Status of the Species" applies here. The known distribution of the five subspecies of beach mice is a result of cursory surveys and intermittent trapping involving different projects. There has not been a systematic trapping study done in order to determine the status of each subspecies throughout their ranges.

Factors affecting the species environment within the action area

Coastal development

Beach mice were listed as endangered and threatened species primarily because of the fragmentation, adverse alteration, and loss of habitat due to coastal development. The threat of development-related habitat loss continues to increase. Other contributing factors include low population numbers, habitat loss from a variety of reasons (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the existing strength or lack of regulations regarding coastal development.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes can impact beach mice either directly (e.g., drowning) or indirectly (e.g., loss of habitat). Depending on their frequency, storms can affect beach mice on either a short-term basis (e.g., temporary loss of habitat) or long term (e.g., loss of food, which in turn may lead to increased juvenile mortality, resulting in a depressed breeding season). How hurricanes affect beach mice also depends on the characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining habitat, frequent or successive severe weather events could compromise the ability of certain populations of beach mice to survive and recover. Beach mice evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed beach mice to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to beach mice survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a major loss of habitat for beach mice.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

Beachfront Lighting

Artificial lighting along developed areas of both coastlines continues to cause increase susceptibility to predators, altered foraging and breeding habits which impact beach mouse recovery. While a majority of coastal local governments and counties have adopted beachfront lighting ordinances compliance and enforcement is lacking in some areas. Further, the lighting in areas outside the beachfront ordinance coverage areas continues to be unregulated resulting in

urban glow. Even the darker areas of conservation managed lands are subject to surrounding sky glow.

Predation

A major continuing threat to beach mice is predation by free-roaming cats and other nonnative species. The domestic cat is not native to North America and is considered a separate species from its wild ancestral species, *Felis silvestris*. Cats are hunters, retaining this behavior from their ancestors. However, wildlife in the western Hemisphere did not evolve in the presence of a small, abundant predator like the domestic cat, and thus did not develop defenses against them. Cats were introduced to North America a few hundred years ago.

Free-roaming pets prey on small mammals, birds, and other native wildlife. In the U.S., on a nationwide basis, cats kill over a billion small mammals and hundreds of millions of birds each year. Worldwide, cats are second only to habitat destruction in contributing to the extinction of birds. Cats have been documented to take beach mice, sea turtle hatchlings, shorebirds, and migratory birds. A significant issue in the recovery of beach mice is predation by free-ranging pet and feral cats. Beach mice have a number of natural predators including snakes, owls, herons, and raccoons. Predation is part of the natural world. However, predation pressure from both natural and nonnative predators may result in the extirpation of small, local populations of beach mice in a very short time (Bowen 1968, Linzey 1978).

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of beach mice and its designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting beach mice or its designated critical habitat nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

Factors to be considered

Aspects of the sand placement and dredged material placement activities will occur within habitat that is used by beach mice year round. The activities include the storage of equipment, work vehicles, or materials and creation, expansion, or use of beach access points for sand placement activities or dredged material placement. The work, depending on the location, may be conducted any time of the year. Most effects would be expected to be temporary. These short-term and temporary impacts could include loss of foraging habitat, altered beach mouse movement and dispersal activities. Long-term and permanent impacts from the sand placement activities such as excavation of dune habitat and degradation could impact beach mice by fragmentation of their habitat including critical habitat for the PKBM, CBM, and SABM.

There are typically different "levels" of access sites needed for a project. The primary access is a "lay-down" yard, where pipe is delivered and stored, and storage trailers, and other equipment and materials are stored. These are typically big paved parking lots, so that the Corps's trucks can access the area to drop off and pick up equipment. There's typically a beach access at that point to get the pipe and equipment onto the beach and that access is usually at least 50-ft wide (pipe sections are typically 40 to 50 feet long). In NW Florida and Alabama, these yards have been approximately eight miles apart.

“Intermediate areas" are used at about the quarter points of the project length. These are used for the fuel tank, welding equipment, and other items or systems that get used a couple of times a day. These locations can vary from two to three miles apart. In addition, there are access points to allow project vehicles and trucks on and off the beach. Based on previous projects it would be expected to have single-vehicle entry points at one-half to one-mile intervals.

Protective, avoidance, and minimization measures have been incorporated into the project plan to avoid or minimize the potential impacts from the sand placement and dredged material placement activities. However, even with these measures, impacts to beach mice are expected to occur from some aspects of the project activities. The activities are expected to directly or indirectly adversely affect beach mice and/or their habitat including designated critical habitat for the PKBM, CBM, and SABM. The work may occur on public and/or private lands.

Proximity of Action: Some aspects of the sand placement and dredged material placement activities would occur directly in beach mouse habitat. The storage or staging of pipe and other equipment, and vehicles, use or creation of beach access points, and placement of pipe, nourishment or dredged material could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM. Beach mice spend their entire life cycle within the coastal dune system.

Distribution: The storage or staging of pipe and other equipment and vehicles and use of beach access points that could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM may vary depending on the individual project length and existing beach accesses and non-beach mouse habitat that can be used for storage and staging.

Timing: The timing of the activities would directly and indirectly impact beach mice and their habitat depending on the season. Beach mice reproduce year-round with more mice being produced in the late winter and early spring. Impacts could include but would not be limited to disrupting mice seeking mates, constructing nest burrows, foraging for food, caring for their young, and young mice leaving the nest burrow dispersing into new habitat.

Nature of the Effect: The effects of the activities may include the temporary loss of habitat including the loss of a few beach mice from excavation of habitat for beach access and reduction of beach mouse activity including feeding, reproduction, and movement from loss or alteration of habitat. Activities that decrease the amount or quality of dune habitat or movement could affect beach mice by reducing the amount of available habitat and fragmenting the habitat.

Duration: Time to complete the project construction may vary depending on the project length, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). Project work could take as little as a month and as long as a one or two years. Beach mouse habitats would remain disturbed until the project is completed and the habitats are restored. Dune restoration could be complete from 6 to 12 months after the project has been completed. The short generation time of beach mice combined with the time frames provided in this document (projects from 1 month to 2 years, dune restoration 6 to 12 months following project completion) will impact multiple generations of beach mice. The time to complete a project and restore the habitat can be a complete loss of habitat availability and use for multiple generations of beach mice.

Disturbance frequency: Depending on the sand placement activity and dredging project frequency, this could result in impacts to beach mice and their habitats at any time during the year on a minimum cycle of every 2 years. Following initial sand placement, activities could occur every year depending on the project location and erosion events. The actual number of times the sand placement would occur is unknown. Following initial sand placement or dredge material placement, maintenance activities could occur every two to 10 years depending on the project location and situation (erosion, long shore sand transportation, upstream activities, and weather events). Thus, impacts related to the subject activities would be expected to occur no more often than every two to three years. However, while not anticipated, work could occur annually in response to emergency events. The actual number of times the nourishment and dredging material disposal activities is unknown but can be based on previous work.

Disturbance intensity and severity: Depending on the frequency needed to conduct the nourishment and dredged material work and the existence of staging areas and beach access points, effects to the recovery of beach mouse may vary. However, the action area encompasses entire range of each subspecies and the overall intensity of the disturbance is expected to be minimal. The severity is also likely to be slight as few if any mice would be lost and dune habitats can be restored quickly if protected from other impacts (pedestrians and vehicles).

The staging and storage of equipment and materials and beach access points could occur within habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM and could be adjacent to designated critical habitat for the PKBM, CBM, and SABM. Beach mice are permanent inhabitants of the coastal ecosystem conducting all their life cycles in this environment. While the current status of individual beach mouse subspecies is unknown, their general distribution is known.

Analysis for effects of the action

The action area consists of the Atlantic or Gulf beachfront including the wet and dry unvegetated beach, developing foredunes and interdunal swales, and areas that were formerly primary or secondary dunes. Sand placement or dredged material placement work would not occur on existing vegetated primary or secondary dunes. However, construction of or expansion of an existing beach access could be located through scrub, secondary, or primary dunes. Beach mice

would generally be found inhabiting stable primary, secondary, and scrub dunes on a permanent basis with other habitats being used periodically on a daily or seasonal basis for feeding and movement. Some of these areas also include critical habitat.

Direct and Indirect Impacts

Direct impacts are effects of the action on the species occurring during project implementation and construction (sand placement or dredged material placement). Direct loss of individual beach mice may occur during the creation or expansion of beach access points when heavy equipment clears the habitat and packs the sand. In general the length of time between project maintenance work is expected to be sufficient for beach mouse habitat to be restored. Thus, it is not anticipated that the nourishment and dredged material placement activities would result in permanent beach mouse habitat destruction (including critical habitat). However, habitat for all the beach mouse subspecies and critical habitat for the PKBM, CBM, and SABM that provides food or cover may be temporarily destroyed or altered from the activities.

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. The indirect effect of the sand placement and dredged material placement activities would be newly created or expanded existing beach access points that act as barriers to beach mouse movement for foraging, or population expansion or dispersal. Maintaining the connectivity among habitats is vital to persistence of beach mice recovery. Recovery actions needed to assure the connectivity include restoration and maintenance of the dune system following project completion.

For the Service to determine if the project impacts on designated critical habitat would be an adverse modification, the Service shall determine if the impact on the habitat appreciably diminishes the capability of the critical habitat to satisfy essential requirements of beach mice. The long-term maintenance of the beach mouse populations in the project areas could be compromised if the sand placement and dredged material placement activities occur too frequently resulting in a long-term barrier to mice movement. However, our evaluation indicates the impacts to critical habitat should be temporary in nature based on past history of nourishment projects. In addition, the area to be directly affected within the individual subspecies would be a small percentage of the overall critical habitat and would not be expected to reduce the carrying capacity of the recovery unit or appreciably diminish the ability of the PCE's to provide for the essential functions of the critical habitat units.

Species' response to a proposed action

This SPBO is based on effects that are anticipated to beach mice (all life stages) as a result of the temporary physical disturbance of beach mice habitat from beach nourishment or dredged material placement and associated activities. Some individual beach mice (all life stages) may be lost during the initial construction or expansion of beach accesses where heavy equipment destroys dune habitat and compacts the sand within the access corridor. Any mice that survive the initial construction may move outside of the disturbed area and construct burrows elsewhere in the vicinity. This will result in increased exposure to predation due to the removal of their burrows.

Following access construction, a bare gap of sand could form a barrier to limit beach mouse movement within the area altering regular movement patterns. The bare areas could not be used for foraging, breeding or sheltering. These impacts are expected to be limited to the construction phase of the project (one month to two years). As the life span of a beach mouse is estimated to be approximately nine months, the loss of individual mice or the temporary loss of habitat could affect several generations of beach mice, but because beach mice can reproduce rapidly with adequate resources, colonization or recolonization of the restored habitat would be expected.

Beach mice have evolved to adapt to catastrophic weather events. Additional factors such as surrounding development pressure and nonnative predators may affect the species' ability to recover from the loss of individuals. However, the temporary loss of the habitat itself is not expected to permanently impact the populations as all beach mouse habitat within the project areas not permanently destroyed would be restored or maintained as part of the conservation measures committed to by the Corps or the Applicant. The temporary nature of the impacts to dune habitats is not expected to alter the function and conservation role of the remaining beach mouse habitat including designated critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this SPBO. Future Federal actions that are unrelated to the proposed project are not considered in this opinion and require separate consultation pursuant to section 7 of the Act.

It is reasonably certain to expect that coastal development, human occupancy and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. Redevelopment along with new developments following the hurricane seasons of 2004 and 2005 are occurring as allowed by local zoning standards. It is unknown how much influence a nourished beach would contribute to the development and recreational use of the shoreline. Any projects that are within endangered or threatened species habitat will require section 7 consultation or section 10(a) (1)(B) permitting from the Service.

In recognizing the importance of coastal barrier islands along the Atlantic and Gulf coasts, Congress passed the Coastal Barrier Resources Act (CBRA) of 1982 and Coastal Barrier Improvement Act in 1991. The purpose of CBRA is "…to minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts by restricting future Federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers." Congress established the Coastal Barrier Resources System units that apply to the CBRA.

Escambia County is currently in the final permitting stages of a beach nourishment project for Perdido Key. The project would cover approximately 4 miles of beachfront along county and private lands, not including state and Federal lands. The Service completed an endangered species

consultation for the project in 2008. The project construction is expected to begin in late 2009-2010. The beach nourishment project is likely to enhance beach mouse habitat by providing an additional buffer to the dune habitats from storm events.

The Pensacola Naval Air Station has proposed to dredge their navigation channel resulting in the need to place eight million cubic yards of dredged material that is beach compatible. Because of cost, Perdido Key is the closest area to receive the material. Receiving areas include the Perdido Key Gulf beachfront (in lieu of the County implementing their project described above), PKSP, and GINS, Escambia County. The project could result in the placement of dredged material on 16 miles of beachfront including private, county, state, and Federal lands. The Navy has received their permits to complete the project. The Service completed an endangered species consultation for the project in 2007. The full project is on hold due to funding. However, the Federal navigation channel in the lower portion of the project area is expected to be maintenance dredged in 2009-2010.

Gulf County is currently completing a beach restoration project on St. Joseph peninsula and St. Joseph Peninsula State Park. The project will cover approximately 7.5 miles of Gulf of Mexico beachfront. The Service completed an endangered species consultation for the project. The project was completed in 2008.

CONCLUSION

Sea Turtles

After reviewing the current status of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of the proposed activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that work conducted under the Statewide Programmatic action, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

The conservation of the five loggerhead recovery units in the Northwest Atlantic is essential to the recovery of the loggerhead sea turtle. Each individual recovery unit is necessary to conserve genetic and demographic robustness, or other features necessary for long-term sustainability of the entire population. Thus, maintenance of viable nesting in each recovery unit contributes to the overall population. Three of the five loggerhead recovery units in the Northwest Atlantic occur within the action area, the PFRU, the DTRU, and the NGMRU. Sand placement is not expected to occur within the DTRU. The NGMRU averages about 1,000 nests per year. Northwest Florida accounts for 92 percent of this recovery unit in nest numbers (920 nests) and consists of approximately 234 miles of nesting shoreline. Of the available nesting habitat within the NGMRU, with most sand placement projects have a project life of five to seven years and channel maintenance activities occurring every two to three years, on average, sand placement impacts will

occur on 8.8 miles of sea turtle nesting shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

The PFRU averages 64,513 nests per year. The entire recovery unit occurs within Florida and consists of approximately 595 miles of sandy shoreline (http://www.dep.state.fl.us/beaches/publications/pdf/fl_beach.pdf). Of the available nesting habitat within the PFRU, sand placement activities will occur on 18.9 miles of nesting shoreline per year during nonemergency years. This is based on the average linear feet of beach on which sand placement occurred during non-emergency years from 2001 to 2008.

Generally, green, leatherback, hawksbill, and Kemp's ridley nesting overlaps with or occurs within the beaches where loggerhead sea turtles nest on both the Atlantic and Gulf of Mexico beaches. Thus, for green, leatherback, hawksbill, and Kemp's ridley sea turtles, sand placement activities will affect an average of 27.7 miles of shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

For all species of sea turtles, post-hurricane sand placement activities occurred on approximately 205 miles of shoreline for the 2004-2005 period following the emergency events (declared disasters and Congressional Orders). These activities are within the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

Beach Mice

The PKBM, CBM, and SABM occur on both public and private lands throughout their historical ranges. Both the SEBM and the AIBM are located completely on county, state, or federally protected lands, except for a small area in St. Johns County in which the AIBM are found on private lands along the Florida coast.

After reviewing the current status of the species of the SEBM, AIBM, PKBM, CBM, and SABM, the environmental baseline for the action area, the effects of beach nourishment and dredged material placement and associated activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that the Statewide Programmatic action for these projects, as proposed, is not likely to jeopardize the continued existence of any of the above subspecies of beach mice and is not likely to destroy or adversely modify designated critical habitat for the PKBM, CBM, or SABM.

As discussed in the Effects of the Action section of this SPBO, we would not expect the carrying capacity of beach mouse habitat within the action area to be reduced. Beach mouse habitat will continue to provide for the biological needs of the subspecies as demonstrated below:

1. No permanent loss of beach mouse habitat will occur within the action area from the project construction or maintenance;

2. Temporary impacts to beach mouse habitat will be restored within the action area after project completion; and

3. A full complement of beach mouse habitat will remain within the action area after project completion.

Temporary impacts are expected to be limited to the construction/maintenance phase of the project and habitat restoration period following the project, which could be completed between one month and two years.

While a few beach mice may be lost, beach mice recover well from population size reductions (Wooten 1994) given sufficient habitat is available for population expansion after the bottleneck occurs. Therefore, we do not consider the potential loss of individuals to be significant.

Also, 50 feet of beach mouse critical habitat for each subspecies (PKBM, CBM, and SABM) could be temporarily affected each time a project is completed as a result of the sand placement activities. We would not anticipate that the loss of the critical habitat would alter or affect the remaining critical habitat in the action area for each subspecies (PKBM, CBM, and SABM) to the extent that it would appreciably diminish the habitat's capability to provide the intended conservation role for the subspecies in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the

agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and shall be implemented by the Corps so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps shall report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF ANTICIPATED TAKE

Sea Turtles

The Service anticipates that no more than 27.7 miles of highly eroded shoreline along the Florida coastline (no more than 8.8 miles within the NGMRU and no more than 18.9 miles within the PFRU) would receive sand placement per year during nonemergency calendar years with a maximum of 102 miles of shoreline (38 miles within the NGMRU and 64 miles of shoreline within the PFRU) receiving sand during or following an emergency event (declared disaster or Congressional Order) as a result of the Statewide Programmatic action. This represents two percent of the entire shoreline per year during a nonemergency year and seven percent of the entire shoreline during an emergency year. Over the last 10 years, one Congressional Order occurred due to emergency events in the 2004-2005 period. The increased sand placement on 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events. Incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because
    a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
    b. Human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;

2. The total number of hatchlings per undiscovered nest is unknown;

3. The reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown;

4. An unknown number of females may avoid the project beach and be forced to nest in a less than optimal area;

5. Lights may misdirect an unknown number of hatchlings and cause death; and

6. Escarpments may form and prevent an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species due to disturbance and sand placement on suitable turtle nesting beach habitat can be anticipated because (1) turtles will continue to nest within the project site during and following sand placement; (2) sand placement activities will likely occur during a portion of the nesting season; (3) sand placement activities will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter or misdirect nesting females and hatchlings during and following sand placement.

Take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

According to Schroeder (1994), there is an average survey error of seven percent; therefore, there is the possibility that some nests within the Action Area may be misidentified as false crawls and missed. However, due to implementation of the sea turtle protection measures, we anticipate that the take will not exceed seven percent of the nesting average in the action area. This number is not the level of take anticipated because the exact number cannot be predicted nor can the level of incidental take be monitored.

Beach Mouse

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated from the sand placement activities may occur any time of the year within a ten-year period. The Service anticipates incidental take of beach mice would be difficult to detect for the following reasons: (1) an unknown number of beach mice may be injured, crushed or buried during beach access construction work and remain entombed in the sand; (2) beach mice are nocturnal, are small, and finding a dead or injured body is unlikely because of predation, and (3) changes in beach mouse essential life behaviors may not be detectable in standardized monitoring surveys.

For projects that occur within beach mouse habitat it is anticipated that no more than 50 linear feet of beach mouse habitat could be affected per sand placement activity for beach access within a subspecies range statewide as a result of the sand placement activities.

The incidental take is expected to be in the form of: (1) harm or harassment to all beach mice occupying the created or expanded beach access points; (2) harassment of beach mice from disturbance of foraging opportunities within the access areas during the construction period; (3) harassment of beach mice from temporary loss of foraging and burrow habitat; and (4) harassment of beach mice from temporary restriction of movement across access areas.

EFFECT OF THE TAKE

Sea Turtles

In the SPBO, the Service determined that the level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Loggerhead critical habitat has been designated in the project area. Based on the Corps incorporation of the conservation measures into the project, the Service concurs that the project may affect but is not likely to adversely affect nor adversely modify NWAO loggerhead critical habitat in the terrestrial environment. The Corps will consult with the NMFS on any impacts to critical habitat in the marine environment.

Incidental take of loggerhead nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 18.9 miles of shoreline per year within the PFRU during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year. The increased sand placement of 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events.

Incidental take of green, leatherback, hawksbill and Kemp's ridley nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project or while placed sand remains on the beach. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 27.7 miles (8.8 miles within the northwest portion of Florida and 18.9 miles within the northeast, south and west portion of Florida) of shoreline per year during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of

Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year.

Beach Mouse

In the SPBO, the Service determined that this level of anticipated take is not likely to result in jeopardy to AIBM, SEBM, PKBM, CBM, and SABM or in adverse modification or destruction of designated critical habitat for the PKBM, CBM, or SABM. Critical habitat for the SEBM and AIBM has not been designated; therefore, the project will not result in destruction or adverse modification of critical habitat for these subspecies.

Incidental take of SEBM, AIBM, PKBM, CBM, and SABM is anticipated to occur at beach access locations for the sand placement activities. Take will occur during project construction where beach access points are expanded or created and where equipment is staged or stored within beach mouse habitat along approximately 50 feet of vegetated dunes for beach access.

REASONABLE AND PRUDENT MEASURES

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize take of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles; SEBM, AIBM, CBM, PKBM, and SABM in the action area for the following activities:

A. Sand placement from beach nourishment, sand bypass, and sand back pass activities;

B. Sand placement from navigation channel maintenance; and

C. Groin and jetty repair or replacement.

If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the term and condition is not reasonable and prudent for the specific project or activity and request exception under the SPBO or
2. Initiate consultation with the Service for the specific project or activity. The Service may respond by either of the following:
    a. Allowing an exception to the terms and conditions under the SPBO or
    b. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

Post construction requirements are listed in Reasonable and Prudent measures, A11, A12, A13, and A14. These post construction requirements may besubject to congressional authorization and the allocation of funds. Florida State statutes apply. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

REASONABLE AND PRUDENT MEASURES for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection (these projects are usually larger scaled) shall include the following measures:

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties, sand placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte counties, sand placement shall not occur from June 1 through September 30. This time frame does not include Venice Beach and which has low density nesting. In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties, Florida, sand placement may occur during the sea turtle nesting season.

A4. All derelict material or other debris shall be removed from the beach prior to any sand placement.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest.

A6. If a dune system is already part of the project design, the placement and design of the dune shall emulate the natural dune system to the maximum extent possible, including the dune configuration and shape.

A7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice.

A8. A meeting between representatives of the Applicant's or Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

A9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted by the FWC-authorized Marine Turtle Permit Holder. Surveys for early and late nesting sea turtles shall be conducted where appropriate.

A10. If nests are constructed in the area of proposed sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

A11. A post construction survey(s) of all artificial lighting visible from the project beach shall be completed by the Applicant or Corps.

A12. The Applicant or Corps shall ensure that daily nesting surveys are conducted by the FWC Marine Turtle Permit Holder for two nesting seasons following construction if the new sand still remains on the beach.

A13. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities.

A14. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles.

A15. Construction equipment and materials including pipes shall be stored off the beach in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

A16. Lighting associated with the project construction including on the dredge shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

A17. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC permit holder is present) between dusk and the time of completion the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

A18. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice.

A19. Beach mouse habitat shall be avoided to the maximum extent possible when selecting sites for access corridors, storage and staging of equipment.

A20. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

A21. Existing vegetated habitat at beach access points and travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access corridor.

A22. Expanded or newly created beach access points shall be restored following construction.

A23. A report describing the actions taken shall be submitted to the Service following completion of the proposed work.

A24. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

All conservation measures described in the Corps' Programmatic Biological Assessment are hereby incorporated by reference as Terms and Conditions within this document pursuant to 50 CFR §402.14(I) with the addition of the following Terms and Conditions. In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures, described above and outline reporting/monitoring requirements.

These Terms and Conditions are nondiscretionary.

Post construction requirements are listed in Terms and Conditions A11, A12, A13, and A14. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

TERMS AND CONDITIONS for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection shall include the following conditions:

All beaches

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach-compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). If a variance is requested from FDEP, the Service must be contacted to discuss whether the project falls outside of the SPBO. A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes may be placed and/or stored on the beach.

b. Sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in A3.c below).

c. For higher density nesting beaches in Gulf and Franklin counties sand placement shall not occur during the main part of the nesting season (June 1 through September 30). On Manasota Key located in Sarasota and Charlotte counties (excluding Venice Beach), sand placement shall not occur during the main part of the nesting season (May 1 through October 31). These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, and St. George Island in Franklin County.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) may proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require an individual emergency consultation.

Land managers on publicly owned conservation lands must be involved in the project coordination.

A4. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach to the maximum extent possible prior to any sand placement in accordance with the dates in A3. If debris removal activities take place during shorebird breeding or peak sea turtle nesting season (**Tables 17 and 18**), the work shall be conducted during daylight hours only and shall not commence until completion of daily seabird, shorebird or marine turtle surveys each day.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events. The meeting will be used to discuss modifications to the beach profile based on the post-construction monitoring data.

Beach profile may vary depending on location, shoreline dynamics, nature of the fill material, and other factors. If a native beach berm elevation is not possible, due to the beach width, impacts to nearshore hardbottom, or other considerations, as discussed during the meeting, the alternative template shall include features to minimize impacts to sea turtle nesting success and the potential for ponding and escarpment formation for that beach. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Dunes and other construction features must be within the scope of the Congressionally-authorized project, if it is a civil works project, and constructible without impacting other resources. If a recommended dune is not possible, the Corps will contact the Service to see if consultation needs to be reinitiated or discuss features incorporated with the profile that will enhance the existing dune. Dune features included in the profile design (or project) shall have a slope of 1.5:1 followed by a gradual slope of 4:1 for approximately 20 feet seaward on a high erosion beach (**Figure 13)** or a 4:1 slope (**Figure 14**) on a low erosion beach. The Corps must explore options to include a dune system in the project design for existing authorized projects and new non-Federal projects. If another slope is proposed for use, the Corps shall consult the Service. The seaward toe of the dune should be at least 20 feet from the waterline.

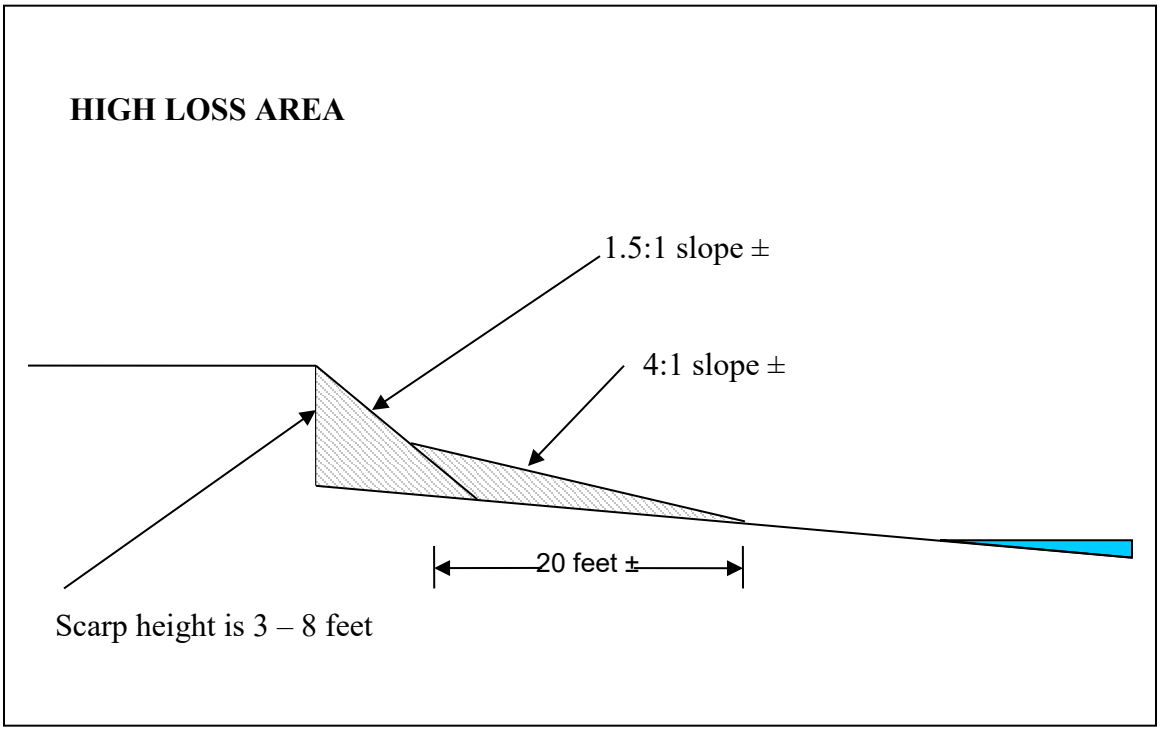

Figure 13. Recommended slope on a high erosion beach for sand placement projects that include the creation of a dune.

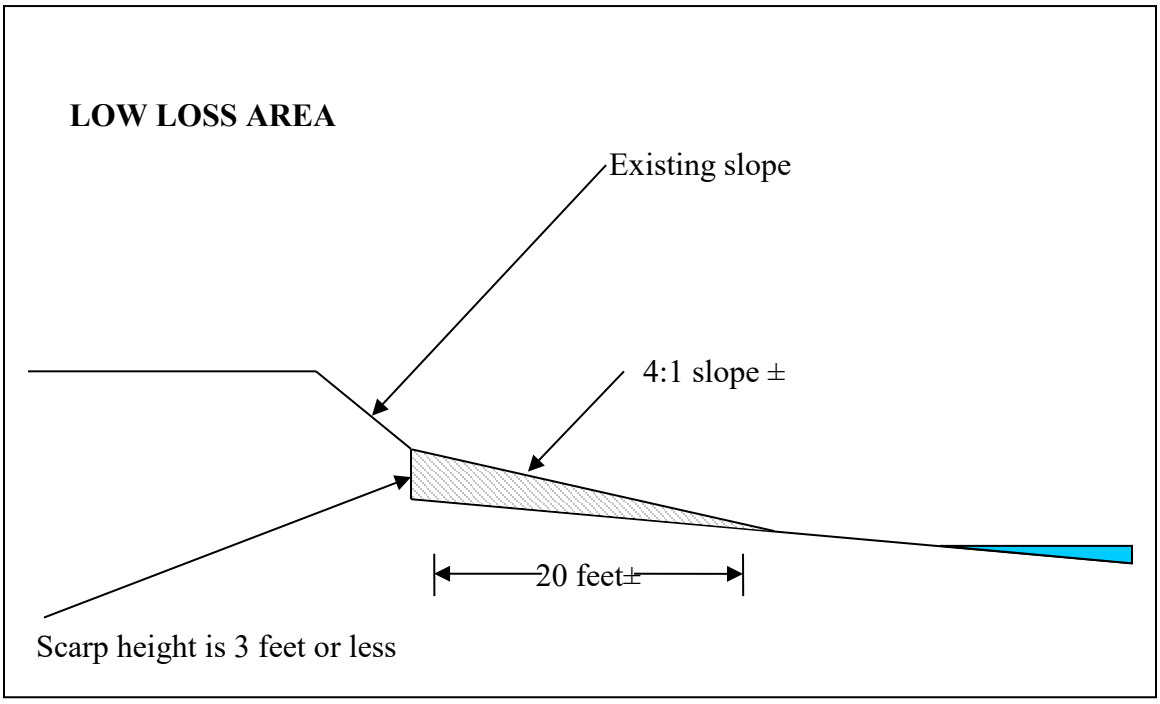

Figure 14. Recommended slope on a low erosion beach for sand placement projects that include the creation of a dune.

A6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. The Corps shall brief workers on the importance of not littering and keeping the project area trash and debris free.

A7. A meeting between representatives of the Corps (including the Corps project manager and/or the managing contractor), the Service, the FWC, the FWC Marine Turtle Permit Holder, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, and will include the following

a. Staging locations, storing equipment including fuel stations
b. Coordination with the Marine Turtle Permit Holder on nesting surveys and any nighttime work
c. Pipeline placement (between 5 to 10 feet from dune)
d. Minimizing driving
e. Egg relocation- permit holder and location (must be approved by FWC)
f. Free-roaming cat observation (for projects in or near beach mouse habitat)
g. Follow up lighting surveys - dates and inspector
h. Follow up coordination during construction and post construction
i. Coordination on construction lighting including dredge lighting and travel within and adjacent to the work area
j. Direction of the project including progression of sand placement along the beach
k. Late season nests present in project area (if any)
l. Plans for compaction monitoring or tilling
m. Plans for escarpment surveys

At the preconstruction meeting, the Corps shall also provide the Service with specific anticipated shoreline lengths and anticipated duration using the form on the following web link: http://www.fws.gov/northflorida/SeaTurtles/Docs/Corp%20of%20Engineers%20Sea%20Turtle%20Permit%20Information.pdf. Only the following information should be filled out: Corps Permit Number, FWS Log Number, Project Location, Construction Activity, Duration of Protect, and Actual Take (linear feet of beach). This form shall be emailed to the Service at seaturtle@fws.gov. This form is in addition to the annual report listed below.

Sea Turtle Protection

A8. Daily early morning surveys for sea turtle nests shall be required and continue throughout the season as outlined in **Tables 16 and 17 (Nesting Season Monitoring)** if construction

occurs during the nesting and hatching season. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

Table 16. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/relocation)	Beach Placement Window	Early Season Relocation*	Late Season Relocation**	Nesting Season Monitoring (monitoring throughout season)
Brevard, Indian River, St. Lucie, and Broward Counties	25 Feb - 11 Nov	15 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Brevard, Indian River, St. Lucie, & Broward counties nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to Jan 15 (11 Nov) (or 65 days prior to start of construction **)	1 Mar - 11 Nov ***
Martin and Palm Beach Counties	12 Feb – 17 Nov	21 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Martin and Palm Beach Counties, nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to 21 Jan (17 Nov) (or 65 days prior to start of construction**)	1 Mar - 17 Nov***

** Relocation can only begin after FWC authorizes nest relocation in accordance with Florida Statute 379.2431 (1).

*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

Table 17. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Outside of Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/ relocation)	Beach Placement Window	Nesting Season Monitoring and Relocation (monitoring throughout season)
Nassau, Duval, Flagler, St. Johns, and Volusia Counties	2 Apr. – 24 Oct	28 Dec	All Year	15 Apr – 24 Oct ***
Miami-Dade County	11 Feb – 25 Sep	29 Nov	All Year	1 Mar – 25 Sep***
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) & Franklin County (St. George Isl)	1 May - 4 Sep	13 Nov	1 Oct - 31 May	1 May – 4 Sep***
All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	2 May – 16 Sep	24 Nov	All Year	1 May - 16 Sep***
Sarasota and Charlotte Counties (Manasota Key)	24 Apr – 7 Sep	11 Nov	1 Nov - 30 Apr (except Venice beach)	15 Apr – 7 Sep***
All other beaches in Sarasota and Charlotte Counties	24 Apr – 12 Sep	16 Nov	All Year	15 Apr – 12 Sep***
Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	20 Apr – 19 Sep	23 Nov	All Year	15 Apr – 19 Sep***

*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

A9. If nests are constructed in the area of anticipated sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation as outlined in a through f. If nests are laid on the dune outside of the immediate sand placement area, the Corps must contact the Service to discuss whether relocation or mark and avoidance is required. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during the earlier part of the nesting season (see Table 14) through April 30, daily early morning surveys shall begin March 1 and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements (i through iii below). For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through November 11, and eggs shall be relocated per the requirements listed in (a)i through (a)iii. The Corps must contact the Service if there are any nests still incubating after November 30.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Relocation cannot begin until the Corps has a copy of the FWC permit authorizing relocation for construction purposes at that particular sand placement project. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or be subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

Daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the period of sea turtle nest laying (**see Table 17**), daily early morning (before 9 a.m.) surveys and egg relocation shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in A10.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or by nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17) with relocation only through the end of fill placement. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in A10.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, sand placement activities shall occur only during the Beach Placement Window indicated in Table 17 (except on Venice Beach), outside the period of peak sea turtle egg laying and egg hatching for this area. If nests are laid

in the early part of the nesting season monitoring during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17 whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17), with egg relocation continuing only through the end of fill placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in A10.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nesting season monitoring and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to sand placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of nesting season monitoring indicated in Table 17 and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

A10. Two surveys shall be conducted of all lighting visible from the beach placement area by the Applicant or Corps, using standard techniques for such a survey (**Appendix C**), in the year following construction. The first survey shall be conducted between May 1 and May 15 and a fill out FWS Sea Turtle Lighting Survey Form (**Appendix D**) and send electronically to seaturtle@fws.gov. The second survey shall be conducted between July 15 and August 1. A summary report of the surveys, including any actions taken, shall be submitted to the Service by December 31 of the year in which surveys are conducted. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area. If the project is completed during the nesting season and prior to May 1, the Corps may conduct the lighting surveys during the year of construction.

A11. Daily nesting surveys shall be conducted for two nesting seasons following construction in accordance with **Table 18** and reported in accordance with **Table 20** by the Corps or the Applicant if placed material still remains on the beach. Post construction year-one surveys shall record the number of nests, nesting success, reproductive success, disorientations, and lost nests due to erosion and/or inundation. Post construction year-two surveys shall only need to record nest numbers, nesting success, and disorientations (**Table 20**). This information will be used to periodically assess the cumulative effects of these projects on sea turtle nesting and hatchling production and monitor suitability of post construction beaches for nesting.

Table 18. Post-Construction Sea Turtle Monitoring.

Region	Nest Laying Season	Years 1 and 2 Post-Construction Monitoring
Brevard, Indian River, St. Lucie, and Broward Counties Martin and Palm Beach Counties	25 Feb – 11 Nov 12 Feb – 17 Nov	Daily surveys: 1 Mar - 31 Oct (for late season: 15 days without a nests, can stop monitoring-email FWS and FWC to stop
Nassau, Duval, and St. Johns, Counties	2 Apr. – 24 Oct.	Daily surveys: 1 May – 30 Sep
Flagler and Volusia Counties	2 Apr. – 24 Oct.	Daily surveys: 15 Apr- 15 Oct
Miami-Dade County	11 Feb – 25 Sep	Daily surveys: 1 Apr – 30 Sep
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) and Franklin County (St. George Island) All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	1 May – 4 Sep 2 May – 16 Sep	Daily surveys: 1 May – 31 Aug
Sarasota and Charlotte Counties (Manasota Key) All other beaches in Sarasota and Charlotte Counties Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	24 Apr – 7 Sep 24 Apr – 12 Sep 20 Apr – 19 Sep	Daily surveys: 15 Apr –15 Sep

A12. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years.

Table 19. Dates for Compaction Monitoring and Escarpment Surveys by County.

County where project occurs	Date
Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, and Monroe	Work must be completed by Mar 1
Miami-Dade, Monroe	Work must be completed by April 1
Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin, Volusia, Flagler, St. Johns, Duval, Nassau, Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier	Work must be completed by Apr 15

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted electronically to seaturtle@fws.gov prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.

(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act. See Appendix E for shorebird conditions recommended by FWC.

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each

depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

A13. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the sand placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed in **Table 19**. Any escarpment removal shall be reported by location in the annual report. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. If during weekly escarpment surveys, it is found that subsequent reformation of escarpments interferes with sea turtle nesting or that they exceed 18 inches in height for a distance of 100 feet during the nesting and hatching season, the Service shall be contacted immediately to determine the appropriate action to be taken. If it is determined by the Service or FWC that that escarpment leveling is required during the nesting or hatching season the Service, in coordination with the FWC, will provide a brief written authorization within 5 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be sent electronically to seaturtle@fws.gov. A summary is required even when no action has been taken (**Table 3**).

A14. Staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see table 14) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as

possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

A15. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. A light management plan for the dredge and the work site shall be submitted for approval by the Service and FWC prior to the pre-construction meeting. In accordance with this plan, lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing on dredge and land-based lights and be large enough to block light from all lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

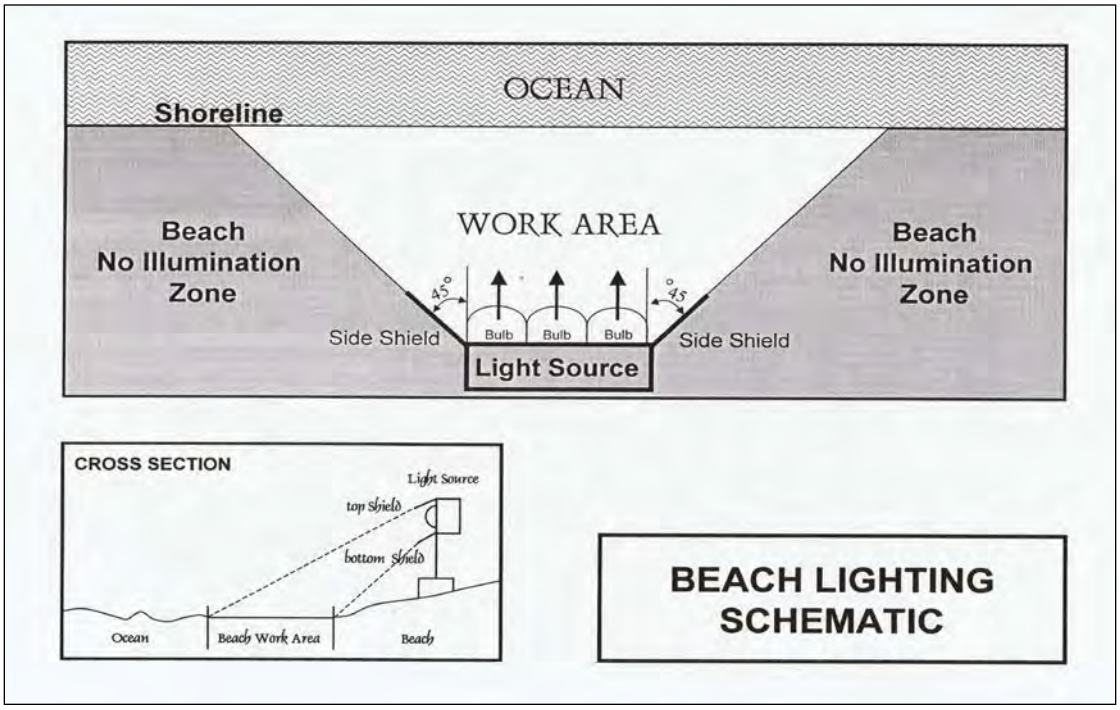

Figure 15. Beach lighting schematic.

A16. During the early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

Dune Planting

A17. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice. Dune vegetation planting may occur during the sea turtle nesting season under the following conditions.

a. Daily early morning sea turtle nesting surveys (before 9 a.m.) shall be conducted during the Nest Laying period for all counties in Florida where sea turtle nesting occurs (see Tables 16 and 17). Nesting surveys shall only be conducted by personnel with prior experience and training in nesting surveys. Surveyors shall have a valid FWC permit. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (all times). No dune planting activity shall occur until after the daily turtle survey and nest conservation and protection efforts have been completed. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys;

b. Any nests deposited in the dune planting area not requiring relocation for conservation purposes shall be left in place. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 3-foot radius around the nest. No planting or other activity shall occur within this area nor will any activities be allowed that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the planting activity;

c. If a nest is disturbed or uncovered during planting activity, the Corps, or the Applicant shall cease all work and immediately contact the project turtle permit holder. If a nest(s) cannot be safely avoided during planting, all activity within 10 feet of a nest shall be delayed until hatching and emerging success monitoring of the nest is completed;

d. All dune planting activities shall be conducted by hand and only during daylight hours;

e. All dune vegetation shall consist of coastal dune species native to the local area; (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material for the plant size;

f. No use of heavy equipment shall occur on the dunes or seaward for planting purposes. A lightweight (all-terrain type) vehicle, with tire pressures of 10 psi or less may be used for this purpose; and

g. Irrigation equipment, if needed, shall be authorized under a FDEP permit.

<u>Beach Mouse Protection</u>

A18. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging to the maximum extent possible. Suitable beach mouse habitat

constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

A19. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune as required during sea turtle nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO.

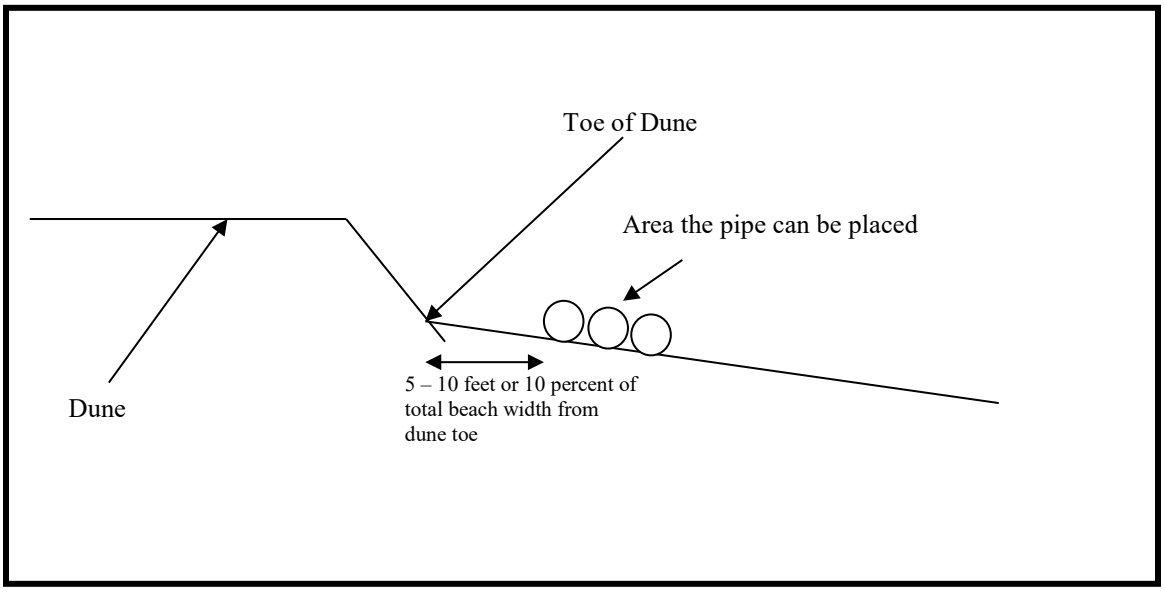

Figure 16. Equipment placement for projects occurring in beach mouse occupied habitat.

A20. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be fully restored to the preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

A21. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be spaced no closer than every four miles. The distribution of access areas will result in the least

number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least one inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

A22. A report with the following shall be submitted to the Service electronically (seaturtle@fws.gov) by December 31 after completion of construction.

i. A summary of the information listed in Table 20 for construction

ii. A summary of the information listed in Table 21 for post-construction

Table 20. Information to include in the report following the project completion.

All projects	**Project location (include Florida DEP R-monuments and latitude and longitude coordinates)**
	Project description (include linear feet of beach, actual fill template, access points, and borrow areas)
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nests surveys for nourished and non-nourished areas)
	Descriptions and locations of sites where nests were relocated
Beach mice	**Acreage of new or widened access areas affected in beach mouse habitat**
	Vegetation completed for new or widened access areas
	Success rate of vegetation of restoration

Table 21. Sea turtle monitoring following sand placement activity.

Date	Duration	Variable	Criterion
Nesting Success	Year of in season construction, two years post construction if placed sand remains on beach and variable does not meet criterion based on previous year	Number of nests and non-nesting events	40 percent or greater
Hatching success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to emerge from nest onto beach	80 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Disorientations	Year of in season construction and two years post construction if placed sand remains on the beach	Number of nests and individuals that misorient or disorient	http://myfwc.com/media/418153/Seaturtle_Guidelines_A_LDIR_Directions.pdf
Lighting Surveys	Two surveys the year following construction, one survey between May 1 and May 15 and second survey between July 15 and August 1	Number, location and photographs of lights visible from nourished berm, corrective actions and notifications made	Lighting survey and meeting resulting with plan for reduction in lights visible from nourished berm within one to two month period
Compaction	Three seasons following construction. Not required if the beach is tilled prior to nesting season each year placed sand remains on beach	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for three years each year placed sand remains on the beach	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

If nesting and reproductive (hatching and emergence) success is less than the criteria in the table above, the Corps and the Service must discuss during the annual meeting to review additional conditions prior to the next sand placement on this beach.

A23. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement (not including near shore placement for shore protection) shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Reasonable and Prudent Measures B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

B3. For dredged material placement on the beach, sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties, dredged material placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County dredged material placement shall not occur from June 1 through September 30. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall

not occur from May 1 through October 31 (except Venice Beach). In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape Sand Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, sand placement may occur during the sea turtle nesting season (**Table 16 and Table 17**).

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting season, sand placement will be conducted at or below MLLW line.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible.

B6. The Corps shall continue to work with FDEP, FWC, and the Service to create a sea turtle friendly beach profile for placement of material during construction.

B7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**).

B8. A meeting between representatives of the Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

B9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. Surveys for early and late nesting sea turtles shall be conducted where appropriate. If nests are constructed in the proposed area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

B10. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities. Not required for dredged material placement in the swash and littoral zone.

B11. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles. Not required for dredged material placement in the swash and littoral zone.

B12. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

B13. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

B14. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC sea turtle permit holder is present) between dusk and the time of completion of the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

B15. Beach mouse habitat shall be avoided when selecting sites for storage and staging of equipment to the maximum extent possible.

B16. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

B17. Existing vegetated habitat at beach access points and along shoreline travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access and travel corridors.

B18. Expanded or newly created beach access points shall be restored.

B19. A report describing the actions taken shall be submitted to the Service work for each year when the activity has occurred.

B20. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement of Corps civil works project shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Terms and Conditions B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

All beaches

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

B3. Dredged material placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Dredged material placement in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties shall occur only during the beach placement window indicated in Table 16. construction equipment or pipes may be placed and/or stored on the beach only during the beach placement window indicated in Table 16.

b. Dredged material placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in B3.c. below).

c. For higher density nesting beaches in Gulf and Franklin counties dredged material placement shall not occur during the main part of the nesting season June 1 through September 31. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur during the main part of the nesting season (May 1 through October 31). This timeframe does not include Venice Beach due to the low density nesting. These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties. See Table 17 for the Beach Placement Windows.

d. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone during the sea turtle nesting season (**Tables 16and 17**), the Corps shall contact the Service for coordination.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte Counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require that an individual emergency consultation be conducted.

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting and hatching season, sand placement will be conducted at or below the MLLW line. The swash zone is that region between the upper limit of wave run-up (approximately one-foot above MHW) and the lower limit of wave run-out (approximately one-foot below MLW). Material will not be placed so that it is exposed above the water during low tide during the nesting and hatching season. The Corps must consult with NMFS on impacts to hatchlings that emerge from those nests adjacent to the inwater construction area. The Service will discuss with the Corps and NMFS additional measures that could include caging nests close to the emergence date.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible. If debris removal activities take place during the peak sea turtle nesting season (**Tables 16 and 17**), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle nesting survey each day.

B6. The Corps shall continue to work with FDEP, FWC and the Service in conducting the second phase of testing on the sea turtle friendly profile during project construction. This includes exploring options to include a dune system in the project design for existing authorized projects and new non-federal projects and how the existing sand placement template may be modified.

B7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. All workers shall be briefed on the importance of not littering and keeping the project area trash and debris free.

B8. A meeting between representatives of the Corps, the Service, the FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, free-roaming cat observation, and reporting within the work area, as well as follow up meetings during construction (**Table 3**).

Sea Turtle Protection

B9. Daily early morning surveys for sea turtle nests shall be required as outlined in a through f. If nests are constructed in the area of sand proposed placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation (**Tables 614 and 17**).

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during earlier part of the nest laying season through April 30, daily early morning surveys shall be conducted for sea turtle nests shall begin with the start of the nesting season monitoring (see Table 16) and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through the end of the nest laying season indicated in Table 16, and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to

experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished area prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

During the period from March 1 through April 30, daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the nest laying period (**Table 17**), daily early morning (before 9 a.m.) surveys shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in B9.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or at the beginning of nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of the nest laying season (see Table 17). Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in B9.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County sand placement activities shall occur only during the Beach Placement Window indicated in Table 17. For Manasota Key in Sarasota and Charlotte Counties (except Venice Beach), sand placement activities shall during the Beach Placement Window indicted in Table 15, the period of peak sea turtle egg laying and egg hatching for this area. If nests laid in the early part of the nest laying season during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii below.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15, whichever is later. Nesting surveys shall continue through September 15. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in B9.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nest laying season or the end of sand placement whichever comes first. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of nest laying season (**Table 17**) whichever is later. Nesting surveys shall continue through the nesting season monitoring period (**Table 15).** If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

B10. Sand compaction shall be monitored in the area of dredged material placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years. Not required for dredged material placement in the swash and littoral zone.

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted seaturtle@fws.gov prior to any tilling actions being taken. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction

levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act (http://myfwc.com/docs/Conservation/FBCI_BNB_SeaTurtleMonitors.pdf)

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

B11. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the dredged material placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach. Not required for dredged material placement in the swash and littoral zone.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal shall be

reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined by the Service, in coordination with the FWC, that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronic to seaturtle@fws.gov.

B12. If available, staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes that are placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents take that was not considered in the SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

B13. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. Lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to

block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

B14. During the period during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if FWC sea turtle permit holder is present) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

Beach Mouse Protection

B15. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging, and beach travel corridors to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

B16. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune.

B17. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The topography at the access points shall be fully restored to preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

B18. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be no closer

than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least 1 inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

B19. An excel sheet with the information listed in **Table 20** shall be submitted to the Service electronically seaturtle@fws.gov by December 31 of the year following construction. A report with the information from Terms and Conditions B10 and B11 shall be submitted to the Service by December 31 of the year for 3 years following construction.

B20. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following measures:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall not occur during the period of peak sea turtle egg laying and egg hatching (May 1 through October 31), to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

C2. Maintenance of groin or jetty projects conducted during the early (February 1 through April 30) and late sea turtle nesting season (November 1 through November 30) shall adhere to the following conditions:

a. Install a barrier around the perimeter of the groin or jetty repair or replacement work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

b. For projects conducted during the early and late sea turtle nesting season, construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles to the maximum extent possible.

c. For projects conducted during the early and late sea turtle nesting season, no work may occur at night.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For maintenance of groin or jetty projects, conducted during the sea turtle nesting season.

a. Daily surveys shall be conducted by sea turtle permit holders. Nests laid adjacent to the work area shall be marked by flag and rope for avoidance.

b. A barrier shall be installed around the perimeter of the groin or jetty maintenance work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

c. Construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles and beach mice to the maximum extent possible.

d. No work shall occur at night.

In All Counties:

C4. If any safety lighting associated with the project is required, the Corps must coordinate with the Service. All safety lighting must be minimized to reduce the possibility of disrupting and disorienting nesting or hatchling sea turtles and nocturnal activities of beach mice. All lights shall be downward directed, full cut-off and fully shielded, and shall utilize long wavelength (greater than 590 nm) light sources.

C5. If entrapment of sea turtle hatchlings occurs in the groin or jetty system, the Corps shall meet with the Service to discuss a possible solution prior to the next nesting season.

C6. A report describing the projects conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service.

TERMS AND CONDITIONS for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following conditions:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall be started after October 31 and be completed before May 1.

C2. For groin or jetty repair or replacement projects conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16):

a. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at mean high water (MHW), as close to the groin or jetty as feasible, particularly during the period from sunset to sunrise. The Corps must contact the Service if there are any existing nests within the 100-foot buffer area.

b. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL shall be delineated. If the project is conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16), daily morning surveys shall be conducted within the travel corridor. If nests are laid within the travel corridor, the travel corridor must be re-routed to avoid the nest. If re-routing is not possible, these nests shall be relocated per the requirements listed in A9 (a)i through (a)iii.

c. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No construction shall be conducted at night.

e. Daily early morning surveys for sea turtle nests shall be required as outlined in e(i) and e (ii). All nests laid in the vicinity of the project area shall be marked for avoidance per the requirements specified below:

i. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

ii. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For groin or jetty repair or replacement projects conducted during the sea turtle nesting season (see Table 17):

a. Daily early morning surveys shall be conducted within the travel corridor.

b. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at MHW, as close to the groin or jetty as feasible during the period from sunset to sunrise.

c. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL will be delineated. Nests laid within the travel corridor that would impede traffic will be relocated per the requirements listed in A9(a)i through (a)iii.. Nests laid in adjacent areas will be marked and avoided per the requirements listed in C(2)(e) i through iii. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No nighttime construction may occur during the nesting season.

e. Material stockpiled on the beach shall only occur within the 200-foot barrier (100-foot area on either side). Construction activities shall not occur in any location prior to completion of the necessary sea turtle protection measures outlined below. If any nesting turtles are sighted on the beach, construction activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has marked the nest. All activities shall avoid the marked nest areas.

C4. All nests laid adjacent to the project area shall be marked for avoidance per the following requirements:

a. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

i. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at

a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In All Counties:

C5. To the maximum extent possible within the travel corridor, all ruts shall be filled or leveled to the natural beach profile prior to completion of daily construction.

C6. Exterior lighting shall not be permanently installed in association with the project. Temporary lighting of the construction area during the sea turtle nesting season shall be reduced to the minimum standard required by OSHA for general construction areas. Lighting on all equipment including offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for general construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

C7. If entrapment of sea turtle hatchlings occurs in the groin or jetty system during construction, the Corps shall contact the Service immediately.

C8. A report describing the work conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service electronically to seaturtle@fws.gov by December 31 of each year when the activity has occurred. This report will include the following information:

Table 22. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-monuments and latitude and longitude coordinates)
	Project description
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and mark and avoid activities
	Nesting survey, mark and avoid activities, and nest relocation results

The Service believes that incidental take will be limited to the 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of sand on the of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and

threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties, construction activities should be planned to take place outside the main part of the sea turtle nesting and hatching season (May 1 through October 31).
2. Work cooperatively with the Service, FWC, County or Municipality, to reduce sea turtle disorientations in the sand placement areas. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area.
3. Work cooperatively with the Service to mimic the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events.
4. If public driving is allowed on the project beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require the local sponsor or Applicant to have authorization from the Service for incidental take of sea turtles, their nests, and hatchlings and beach mice, as appropriate, due to such driving or provide written documentation from the Service that no incidental take authorization is required. If required, the incidental take authorization for driving on the beach should be obtained prior to any subsequent sand placement events.
5. Beach nourishment should not occur on publicly owned conservation lands during the sea turtle nesting season.
6. All created dunes should be planted with at least three species of appropriate native salt-resistant dune vegetation. Examples along the Atlantic coast include: bitter panicgrass, sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Northwest Florida coast includes: bitter panicgrass, little bluestem (Schizachyrium scoparium), sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Southwest Florida coast include: sea oats (grown from local genetic stock), bitter panicgrass, beach morning-glory, and railroad vine.
7. If the project area is within a local municipality that has not adopted a lighting ordinance, and lighting is shown to be an issue on a nourished beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require an ordinance be adopted prior to any subsequent sand placement event.

8. To increase public awareness about sea turtles and beach mice, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and beach mice.
9. If the Corps has the authority, we recommend it exercise its discretionary authority to require predator control programs (including education of pet owners and cat colony supporters) should be implemented that target free-roaming cats.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. Reinitiation of formal consultation is also required ten years after the issuance of this SPBO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

The above findings and recommendations constitute the report of the Service. If you have any questions about this SPBO, please contact Ann Marie Lauritsen of this office at (904) 525-0661, Richard Zane of the Panama City Field Office at (850) 769-0552, or Jeffrey Howe of the South Florida Field Office at (772) 562-3909.

Sincerely,

for Larry Williams
State Supervisor

cc:
FWC, Lake City, Florida (Melissa Tucker)
FWC, Lake City, Florida (Nancy Douglass)
FWC, Lake City, Florida (Terry Doonan)
FWC, Panama City, Florida (John Himes)
FWC, Tallahassee, Florida, (Robbin Trindell)
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Service, Atlanta RO digital version in Word
Service, Panama City, Florida, (Patricia Kelly, Lisa Lehnhoff)
Service, St. Peteresburg, Florida (Ann Marie Lauritsen)
Service, Vero Beach, Florida (Jeffrey Howe)

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Appendix A

PREVIOUS FORMAL CONSULTATIONS/BIOLOGICAL OPINIONS WITHIN FLORIDA THAT HAVE BEEN ISSUED FOR ALL PROJECTS THAT HAD ADVERSE IMPACTS TO THE SEA TURTLES ON THE NESTING BEACH

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
STATEWIDE	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Monroe, Miami-Dade, Collier, Lee, Charlotte, Sarasota, Manatee, Pinellas, Pasco, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia	FEMA Emergency Beach Berm Repair	2007-F-0430		Repair of 5-year beach berms post-disaster	75 miles
JAX FIELD OFFICE						
1991	Brevard	Lighting at Cape Canaveral Air Force and Patrick Air Force Station	4-1-91-028	Lighting at both installations	Sea turtle lighting	75 disoriented loggerhead nests; 2 green turtles nests at CCAFS and 2 loggerhead nests at PAFB
1993	Brevard	Beach nourishment on Cape Canaveral	4-1-93-073C		Beach nourishment	2 miles
1995	Brevard	Inlet Bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14	Inlet bypass	
1996	Brevard	Canaveral Port Authority Dredge and Beach Disposal		R-34 to R-38	Dredge and beach restoration	
1998	Brevard	Inlet bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14		
2000	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	00-0545	Lighting at both installations	Sea turtle lighting	2 percent hatchling and nesting female disorientations at each installation.
2001	Brevard	Brevard County Shore Protection Project (North Reach)		R-5 to R-12 and R-13 to R-54.5	Beach nourishment	9.4 miles
2001	Brevard	Patrick Air Force Base Beach Restoration		R-53 to R-70	Beach nourishment	

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2002	Brevard	Brevard County Shore Protection Project (South Reach)		R-123.5 to R-139	Beach nourishment	3.02 miles
2002	Brevard	Brevard County Shore Protection Project (North Reach)		R-4 to R-20	Beach nourishment	
2002	Brevard	Permanent Sand Tightening of North Jetty at Canaveral Harbor	02-1090	North jetty at Canaveral Inlet	Sand tightening and extension of existing jetty	500 feet
2003	Brevard	Brevard County Shore Protection Project (South Reach)		R-118.3 to R-123.5		0.94 mile
2004	Brevard	Canaveral Harbor Federal Sand Bypass and Beach Placement	04-0077	R-14 to R-20	Inlet bypass and beach nourishment	18,600 linear feet
2005	Brevard	Brevard County Shore Protection Project (North and South Reach)	05-0443	R-5 to R-20 and R-21 to R-54.5 and R-118 to R-139	Beach nourishment	13.2 miles
2005	Brevard	Brevard County FEMA Berm and Dune Restoration	05-1054	R-75 to R-118	Dune repair	12 miles
2005	Brevard	Patrick Air Force Base Beach Restoration	05-0258	R-54.5 to R-75.3	Beach nourishment	
2005	Brevard	Sloped Geotexile Revetment Armoring Structures	05-0454	5 tubes along north and south Melbourne beach	Protec tube installation	4,600 linear feet
2006	Brevard	Brevard County FEMA Berm and Dune Restoration	41910-2006-F-0189	R-75 to R-118	Dune repair	12 miles
2006	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	41910-2006-F-0841		Sea turtle lighting	3 percent hatchling and nesting female disorientations at each installation
15 Feb 2008	Brevard	Patrick Air Force Base Dune Restoration	41910-2008-F-0150	R-65 to R-70	Dune restoration	6,000 linear feet
25 Jan 2008	Brevard	Brevard County's Dune Restoration	41910-2008-F-0189	R-75 to R-118 and R-138 to R-202	Dune restoration	140,000 cy along 3,000 linear feet
2009	Brevard	Brevard County's Dune Restoration	41910-2009-F-0125	R 75.4 to R 118.3 and R-139 to R-213	Dune restoration	22 miles
2009	Brevard	Mid Reach		R-75 to R119	Beach berm repair (permanent)	40,748 linear feet
2009	Brevard	South Beach		R-139 to R-215	Beach berm repair (permanent)	70,385 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2009	Brevard	Patrick Air Force Base Dune Restoration and Beach Nourishment	41910-2009-F-0336	R-36 to R-75, R-53 to R-65	Sand placement	8,500 linear feet for dune restoration and 11,235 linear feet for beach nourishment.
2009	Brevard	Brevard Dune Restoration	41910-2009-F-0125	R-75.4 to R-118.3, R-139 to R-213	Dune restoration	Periodically on no more than 22 miles.
2009	Brevard	Mid Reach Shore Protection	41910-2008-F-0547	R-119 to R-75.4	Sand placement	7.7 linear miles
2009	Brevard	Canaveral Harbor Sand Bypass	41910-2008-F-0547	Canaveral Harbor	Sand bypass	18,600 linear no more than every 2 years
2009	Brevard	Kennedy Space Center Lighting	41910-2009-F-0306			3% of all hatchling disorientation events
2009	Brevard	South Beach Renourishment	41910-2009-F-0327			7.8 miles
1991	Duval	Duval County Beach Erosion Control		R-44 to R-52.5	Beach nourishment	9,000 linear feet
1996	Duval	Duval County Beach Erosion Control		R-47 to R-80	Beach nourishment	5 miles
2003	Duval	Duval County Beach Erosion Control		R-72 to R-80	Beach nourishment	
2005	Duval	Duval County Beach Erosion Control	05-1544	R-43 to R-53 and R-57 to R-80	Beach nourishment	5.7 miles
2010	Duval	Duval County Hurricane and Storm Damage Reduction	2010-CPA-0045	V-501 to R-80	Beach nourishment	52,800 linear feet
2005	Flagler	Road Stabilization from SR A1A	41910-2006-IE-0173		Seawall	140 linear feet
2009	Flager	State Road (SR) A1A Shoreline Stabilization	41910-2007-F-0495	200 feet south of South 28th Street to 980 feet south of Osprey Point Drive	Sand placement, revetments, and seawalls	5.2 miles = length of take; 3,000 linear feet of anticipated incidental take
2005	Hillsborough	Egmont Key Nourishment	05-1845	R-2 to R-10	Beach nourishment	8,000 linear feet
1993	Manatee	Anna Maria Island Beach Restoration		R-2 to R-36	Beach nourishment	4.7 miles
1997	Manatee	Dredge Material Disposal and Longboat Key Beach Restoration		R-48 to R-51	Dredge and beach nourishment	
2002	Manatee	Anna Maria Island Beach Restoration		R-7 to R-10 and R-12 to R-36	Beach nourishment	5.2 miles
2005	Manatee	Anna Maria Island Shore Protection Project	41910-2006-F-0079	R-7 to R-10	Beach nourishment	3,000 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2005	Manatee	Anna Maria Island Emergency Beach Restoration	05-1227	R-2 to R-41	Beach nourishment	4.2 miles
2005	Manatee	Town of Longboat Key Beach Renourishment	4-1-04-TR-4529	R-44.5 to R-46	Beach nourishment	0.34 mile
2007	Manatee	Longboat Key Groin Installation	41910-2007-F-0521		Groin installation	2,210 linear feet
2009	Manatee	Anna Maria Island Beach Nourishment	41910-2008-F-456	R-7 to R-10, R-35 +790 feet and R-41 +365 feet	Sand placement	8,000 linear feet
2010	Manatee	Longboat Key North End Nourishment	41910-2010-F-0301			4,015 linear feet of beach
1994	Nassau	South Amelia Island Beach Restoration		R-60 to R-78	Beach nourishment	
1997	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal		R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
2002	Nassau	South Amelia Island Beach Restoration		R-50 to R-80	Beach nourishment	3.4 miles
2002	Nassau	Fernandina Harbor Dredge and Beach Disposal		R-1 to R-9	Dredge and beach nourishment	8,000 linear feet
2004	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-9 to R-33	Beach nourishment	3.6 miles
2005	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-11 to R-34	Beach nourishment	4.3 miles
2005	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal	41910-2006-F-0254	R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
1988	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1990	Pinellas	Sand Key/Indian Rocks Beach Restoration		R-72 to R-85	Beach nourishment	
1991	Pinellas	Long Key Beach Restoration		R-144 to R-147	Beach nourishment	0.45 mile
1991	Pinellas	Johns Pass Dredge Material Disposal		R-127 to R-130	Dredge disposal and sand placement	
1992	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1992	Pinellas	Sand Key/Indian Shore Beach Restoration		R-85 to R-99	Beach nourishment	
1996	Pinellas	Treasure Island Beach Restoration		R-138 to R-142	Beach nourishment	2,500 linear feet
1996	Pinellas	Long Key Beach Restoration		R-144 to R-146	Beach nourishment	0.45 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
1998	Pinellas	Sand Key/Belleair Beach Restoration		R-56 to R-66	Beach nourishment	
1999	Pinellas	Sand Key Beach Restoration		R-71 to R-107	Beach nourishment	
2000	Pinellas	Treasure Island Beach Restoration		R-136 to R-141	Beach nourishment	2.0 miles
2000	Pinellas	Terminal Groin at North End of Treasure Island			Groin construction	
2000	Pinellas	Long Key Beach Restoration		R-144 to R-145.6	Beach nourishment	2,800 linear feet
2000	Pinellas	Dredge Material Disposal and Honeymoon Island Beach Restoration		R-10 to R-12	Dredge disposal and sand placement	
2004	Pinellas	Treasure Island Beach Restoration	04-1247	R-136 to R-141	Beach nourishment	5,000 feet
2004	Pinellas	Long Key Beach Restoration	04-1247	R-144 to R-148	Beach nourishment	4,000 linear feet
2005	Pinellas	Sand Key Emergency Renourishment	05-0627	R-56 to R-66 and R-72 to R-106	Beach nourishment	8.6 miles
2006	Pinellas	Treasure Island, Sunset, Long Key, Pass a Grill Emergency Renourishment	41910-2006-F-0480	R-126 to R-146	Beach nourishment	9.5 miles
2006	Pinellas	Dredge Material Disposal and Mullet Key and Fort DeSoto Beach Restoration	41910-2006-F-0692	R-177 to R-179.5 and R-181 to R-183	Dredge disposal and sand placement	4,500 linear feet
2009	Pinellas	Treasure Island Beach Nourishment	41910-2009-F-0250	R-136 to R-141, R-144 to R-148	Sand placement	11,375 linear feet
1997	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209		
2001	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D			
2002	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-137 to R-152	Beach nourishment	2.5 miles
2003	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-132 to R-152	Beach nourishment	3.8 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2003	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209	Beach nourishment	
2005	St. Johns	St. Johns County Shore Protection Project at St. Augustine	05-0446	R-137 to R-150	Beach nourishment	2.5 miles
2006	St. Johns		TE091980-0		Beach driving	41.1 linear miles
2007	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	41910-2007-F-0305	R-200 to R-208	Beach nourishment	4,000 linear feet
2009	St. Johns	Beach berm repair		R-201 to R-203, R-207 to R-208	Beach berm repair	7,000 linear feet
2009	St. Johns	Matanzas Inlet Maintenance Dredge and Summer Haven Sand Placement	41910-2009-F-0462	R-200 to R-208	Sand placement	8,000 linear feet
2009	St. Johns	St. Augustine Shore Protection Project	41910-2009-F-0444	600 feet north of R-137 and 600 feet south of R-151	Sand placement	15,280 linear feet
2010	St. Johns	St. Augustine Inlet Dredge and Sand Placement	41910-2010-F-0105			20,000 linear feet
2004	Volusia	Volusia County FEMA Berm	05-1074	R-40 to R-145 and R-161 to R-208	Beach nourishment	
2005	Volusia	Ponce de Leon Dredge and Beach Placement	05-0884	R-143 to R-145	Dredge and sand placement	3,000 linear feet
2005	Volusia		TE811813-11		Beach driving	50 miles
2006	Volusia	New Smyrna/Silver Sands Dune Restoration	05-1007	R-161 to R-175	Beach restoration	5.4 miles
2006	Volusia	Volusia County FEMA Berm	41910-2006-F-0831		Repair of right of way and beach placement	230 linear feet
2007	Volusia	Ponce de Leon Dredge and Beach Placement	41910-2007-F-0109	R-158 to R-175	Dredge and sand placement	3.2 miles
2009	Volusia	Ponce de Leon Inlet Maintenance Dredging and Sand Placement	41910-2009-F-0362	R-143 to R-145	Sand placement	8,000 linear feet
PANAMA CITY FIELD OFFICE						
8 April 1998	Bay	Panama City Beach Beach Nourishment	4-P-97-108	R-4.4 and R-93.2	Beach nourishment new project	16 miles
24 June 1998	Bay	Tyndall AFB Driving on the Beach	4-P-98-020	V-9 (virtual) to R-122	Driving on the beach for military missions	18 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 July 1998	Bay	Lake Powell Emergency Opening	4-P-97-089	R- 0.5	Emergency outlet opening	1,500 feet
16 April 1999	Bay	Panama City Beach Beach Nourishment Amendment 1	4-P-97-108	R-0.5 to R-9	Beach nourishment completion	16 miles (no additional take provided from original)
9 March 2000	Bay	Panama City Beach Beach Nourishment Amendment 2	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
10 April 2000	Bay	Panama City Beach Beach Nourishment Amendment 3	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
18 December 2000	Bay	Panama City Beach Beach Nourishment Amendment 4	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement and compaction testing sample numbers beach nourishment	16 miles (no additional take provided from original)
4 January 2001	Bay	East Pass Re-Opening	4-P-00-211	No R-monuments	Dredging of a closed inlet and dredged material placement on beach	2 miles
29 March 2001	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement beach nourishment	16 miles (no additional take provided from original)
7 Sept 2001	Bay	City of Mexico Beach Sand Bypass System	4-P-01-178	Mexico Beach canal	Dredging and spoil disposal	3,700 feet 2.0 acres
14 January 2005	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-4.4 and R-93.2	Post hurricane restoration	16 miles (no additional take provided from original)
2006	Bay	Tyndall Air Force Base INRMP	4-P-05-240	V-9 (virtual) to R-122	Integrated Natural Resources Management Plan	18 miles
26 March 2006	Bay	Mexico Beach Canal Sand By Pass Amendment 1	4-P-05-281 2007-F-0205	R-127 to R-129	By pass system improvements	5,000 feet
24 May 2007	Bay	Panama City Beach Beach Nourishment Amendment 6	4-P-97-108 2007-TA-0127	R-4.5 to R-30 and R-76 to R-88	New work and post hurricane restoration	31,500 feet of 16 miles total no additional take provided
25 October 2007	Bay	Panama City Beach Nourishment Amendment 8	2008-F-0004	2008 project: R-74 to R-91; Entire project: R-0.5 to R-91	Beach nourishment	17.9 miles
29 Feb 2008	Bay	Panama City Harbor (revised BO)	2008-F-0168	R-97	Navigation channel maintenance dredging and beach placement of dredged material.	500 ft of beachfront at St. Andrew State Park

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
8 June 2009	Bay	Panama City Harbor Navigation Channel Amendment 1	2009-F-0175	R-92 to R-97	Maintenance navigation channel dredging and dredged material placement	0.85 mile
2009	Bay	City of Mexico Beach		R-128.5 to R-138.2	Beach berm repair (emergency)	9,393 linear feet
06 Jan 2010	Bay	Lake Powell Outlet Emergency Opening	2009-F-0226	R-0-A and R-1	Emergency opening of the outlet to the Gulf of Mexico	2,400 feet
7 August 2000	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin	Destin Dome OCS Offshore Oil and Gas Drilling	4-P-00-003	Gulf of Mexico federal waters	Oil and gas offshore exploration	Formal consultation with no take
3 June 2002	Escambia	Pensacola Beach Beach Nourishment	4-P-02-056	R-108 to R-143	Beach nourishment	8.3 miles Loggerhead 14 nests Green 1 nest Leatherback < 1 nest Kemp's ridley <1 nest
9 June 2009	Escambia	Perdido Key Beach Nourishment	2008-F-0059	R-1 to R-34	New beach nourishment	6.5 miles
9 Sept 2010	Escambia	Pensacola Navigation Channel	2009-F-0205; using statewide programmatic 41910-2010-F-0547	R-32 to R-64	Navigation channel maintenance and dredge material disposal	6.3 miles
11 Jan 2010	Escambia	FEMA Perdido Key Upland Berm	Using statewide programmatic 41910-2010-F-0547	R-21.5 to R-31.5	Post Tropical Storm Gustav berm	2.0 miles
8 April 2005	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf	FEMA Beach Berms Post Hurricane Ivan Emergency Coordination (consultation incomplete)		UK	Emergency beach berms	Walton 20 miles Okaloosa 4.2 miles Mexico Bch 1 mile Panama City Bch UK St Joseph peninsula UK Perdido Key UK Navarre UK
10 May 2004	Franklin	Alligator Point Beach Nourishment	4-P-02-163	R-207 to R-210	Beach nourishment	2,500 feet Loggerhead,: 2 nests, green 1 nest; leatherback 1 nest
17 May 2007	Gulf	St. Joseph Peninsula Beach Nourishment	4-P-07-056 2007-F-0220	R-67 to R-105.5	Beach nourishment	7.5 miles
31 Jan 2008	Gulf	St. Joseph Peninsula Beach Nourishment; Amendment 2	2008-F-0161	R-67 to R-105.5	Beach nourishment – change from work in 2 to 1 season.	7.5 miles; no increase in IT.
2009	Gulf	St. Joseph Peninsula Beach		R-95.3 to R-105.5	Beach berm repair (emergency)	10,300 linear feet

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25 April 2001	Okaloosa	Eglin AFB Porous Groin within Season	4-P-00-207	Eglin AFB Test Sites 1 and 3	Experimental porous groin system	
18 June 2002	Okaloosa	Eglin 737 Sensor Test Site 13-A SRI	4-P-02-088	V-507	Military testing	0.01 acre 0.12 mile
2009	Okaloosa	City of Destin		R-17.37 to R-19	Beach berm repair (emergency)	1,260 linear feet
23 Dec 2009	Okaloosa	East Pass at Destin Navigation Channel	2009-F-0096	R-17 to R-25.5	Navigational channel maintenance	1.7 miles
21 March 2003	Okaloosa Santa Rosa	Eglin Marine Expeditionary Unit Training	4-P-03-052	V-621 to V-501	Military marine training	
9 October 2003	Okaloosa Santa Rosa	Eglin AFB U.S. Army Ranger Los Banos	4-P-03-289	V-502 to V-533	Military army training	7 miles
25 February 2004	Okaloosa, Santa Rosa	Eglin AFB Advance Skills Training	4-P-03-264	R-502 to R-534	Military training	7 miles 70 acres
4 June 2004	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	4-P-04-225	V-501 to V-514	Military naval testing	0.5 mile 15.2 acres
1 December 2005	Okaloosa Santa Rosa	Eglin Air Force Base Military Mission & Training Santa Rosa Island Programmatic	4-P-05-242	V-621 to V-501	Military missions	17 miles
6 December 2007	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	2008-F-0056	V-501 to V-514 Test Site A-15	Military naval testing	0.7 acre
3 June 2008	Okaloosa Santa Rosa	Eglin AFB Beach and Dune Restoration	2008-F-0139	V-551 to V-609 excluding non-AF lands and V-512 to V-518	Beach nourishment including dune restoration (new)	5.0 miles
28 August 2008	Okaloosa, Santa Rosa	Eglin Air Force Base Armoring Santa Rosa Island Test Sites A-3, A-6, A-13B	2008-F-061	Test Sites A-3, A-6, A-13B	Storm protection at air force facilities, Santa Rosa island	0.57 miles
21 April 2009	Okaloosa, Santa Rosa	East Pass Destin Navigation Channel	2009-F-0295	V-619.5 to V-621 and R-17	Maintenance navigation channel dredging and dredged material placement	1.6 miles
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base protection of Test Sites A-3, A-13, and A-13b	2008-F-061 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet

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28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base	2008-F-039 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet
26 March 2002	Santa Rosa, Okaloosa, Gulf	Eglin AFB INRMP		V-621 to V-501	Integrated natural resources management program	17 miles
19 July 2005	Santa Rosa	Navarre Beach Nourishment Emergency Coordination (consultation incomplete)	4-P-04-244	R-192.5 to R-213.5	Emergency beach nourishment	4.1 miles
24 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
30 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
29 Nov 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
28 August 2008	Santa Rosa	Eglin AFB SRI Armoring at Test Sites	2008-F-0061	V-608, V-551, and V-512	Bulkheads around test sites A-3, A-6, and A-13B	0.57 mile
7 Dec 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
9 October 2009	Santa Rosa	Navarre Beach Restoration Amendment 7	2010-F-0036	R-192 to R-194	Emergency beach restoration	1,800 feet
30 April 2004	Walton, Okaloosa	Walton County-Destin Beach Nourishment	4-P-01-149	R-39 (Okaloosa Co.) to R-21.93 (Walton Co.)	New beach nourishment	6.7 miles Loggerhead: 11 nests; green 1 nests; leatherback & Kemp's ridley: < 1 nests
8 May 2006	Walton	Western Lake Emergency Opening	4-P-01-105	R-72 to R-73	Emergency outlet opening	0.5 miles 3.0 acres
26 October 2007	Walton	Eastern Lake Emergency Opening	2007-F-0627	R-94 to R-95	Emergency opening of coastal dune lake to GOM	0.5 mile

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9 November 2007	Walton	Alligator Lake Emergency Opening	2007-F-0031	R-68 to R-70	Emergency opening of coastal dune lake to GOM	0.5 mile
2 October 2008	Walton	Walton County Beach Nourishment Phase 2	2008-F-060	R-41 to R-67, R-78 to R-98, R-105.5 to R-127	Beach nourishment (new)	13.5 miles
SOUTH FLORIDA FIELD OFFICE						3,390 feet
11 March 2003	Broward	Broward County Shore Protection Project	4-1-99-F-506		Port Everglades dredging and beach nourishment	
4 Dec 2003	Broward	Diplomat Beach Nourishment	4-1-00-F-743		Nourishment and 200 feet of riprap	
25 Aug 2004	Broward	Fishermen's Pier	4-1-04-F-8366		Pier repair	14,910 square feet
18 June 2007	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	315 feet of the Inlet and 500 feet of shoreline at R-25.	Inlet dredging and sand nourishment	500 feet
10 Dec 2007	Broward	Town of Hillsboro Beach Pressure Equalizing Modules (PEMs) Pilot Project	41420-2007-F-0859	300 feet north of R-7 to 100 feet south of R-12 1 mile of shoreline	Pilot project to investigate the effectiveness of the PEMs	1 mile
7 Mar 2008	Broward	Broward County Glass Cullet Pilot Project	41420-2007-FA-0599	Centered at R-103	Pilot project to examine the effectiveness of glass cullet as potential beach fill supplement material for shoreline stabilization.	333 feet
28 April 2008	Broward	Town of Hillsboro Truck Haul Beach Nourishment Project	41420-2008-FA-0187	330 feet north and 100 feet south of R-7	Temporary beach nourishment	0.08 mile (430 feet)
3 Sept 2008	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	500 feet south of R-25	Inlet dredging and sand placement. This is an amended BO in regard to the original BO completed on 18 June 2007.	500 feet
28 May 2010	Broward	Port Everglades Jetty Repair	41420-2010-CPA-0144	South Jetty	Repair of the south jetty.	0.15 mile

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18 June 2010	Broward	Hillsboro Beach Sand Placement	41420-2008-FA-0187	R-5 +300 to R-12 +450 feet	Beach nourishment	1.35 miles
23 March 2005	Charlotte	Manasota Key Groin Construction	4-1-04-F-8338	R-19 to R-20	Stump Pass dredging (material placed on beach); and groin construction	1,000 feet
29 March 2006	Charlotte	Stump Pass Dredging and Beach Nourishment	4-1-04-F-8338	R-16.5 to R-18	Stump Pass dredging and beach nourishment	1,500 feet
26 April 2010	Charlotte	Stump Pass Dredging and Sand Placement	41420-2008-FA-0425	R-14.4 to R-20 R-22 to R-23 R-29 to R-39	Stump Pass dredging and sand placement	3.5 miles
3 April 2003	Collier	Keewaydin Island Limited Partnership T-Groin Project	4-02-F-1099	R-90 to R-91	Gordon Pass – maintenance dredge; nourish the section of beach where groins are to be constructed; construct three t-groins	1,000 feet
14 March 2005	Collier	Hideaway Beach	4-1-04-F-6342	H-1 to H-5 and H-9 to H-12	Beach nourishment and t-groin construction	1.4 miles
20 Sept 2005	Collier	Collier County Beach Re-Nourishment Project	4-1-04-TR-8709	Segments within R-22 and R-79	Beach nourishment	13.4 miles
14 Nov 2005	Collier	South Marco Island Beach Re-Nourishment	4-1-04-TR-11752	R-144 to G-2	Beach nourishment	0.83 mile
28 August 2008	Collier	Doctor's Pass North Jetty Repair	41420-2008-FA-0432	R-57 plus 500 feet south	Removing the existing 240 feet of existing jetty and constructing a new jetty within generally the same footprint.	0.25 mile
27 October 2009	Collier	Hideaway Beach Erosion Control	41420-2008-FA-0935	H-4 to H-9	Sand placement and construction of six T-head groins.	0.47 mile
18 August 2010	Collier	Gordon Pass Erosion Control Project – Phase 2 (T-head groins)	41420-2008-FA-0765	R-91 to R-92	Construction of two T-head groins.	0.19 mile
28 Oct 2010	Collier	Collier County Truck Haul Sand Placement (Park Shore & Naples Beach)	41420-2010-F-0225	R-45 +600 feet to R-46 +400 feet; R-58A -500 feet to R-58	A truck haul sand placement project	0.37 mile

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12 Oct 2004	Indian River	Issuance of Permits to Homeowners for Emergency Coastal Armoring	10(a)(1)(B) permit			3,196 feet
28 Feb 2005	Indian River	Indian River County Beach Nourishment - Sectors 3 and 5	4-1-05-F-10922	Gaps between R-21 and R-107	Dune restoration and beach nourishment	5.90 miles dunes 0.8 mile beach
22 Nov 2005	Indian River	Indian River County Beach Nourishment – Sector 7	4-1-05-TR-9179	R-97 to R-108	Beach nourishment	2.2 miles
31 Oct 2006	Indian River	Indian River County Beach Nourishment – Sectors 1 and 2	41420-2006-FA-1491	R-3.5 to R-12	Dune enhancement and beach nourishment	1.62 miles
10 Sept 2007	Indian River	Sebastian Inlet Channel and Sand Trap Dredging, Sectors 1 and 2 Beach Nourishment	41420-2007-F-0864	R-3 to R-12	Sand trap dredging and beach nourishment	1.61 miles
10 October 2008	Indian River	Baytree and Marbrisa Condominium Dune Restoration	41420-2008-FA-0007	200 feet south of R-46 to 200 feet south of R-48	Dune restoration/enhancement	0.38 mile
16 October 2009	Indian River	City of Vero Beach, Outfall Pipe Installation	41420-2009-FA-0255	220 feet north and 930 feet south of R-83	Outfall pipe installation	0.22 mile
2 December 2009	Indian River	Indian River County Beach Nourishment Sector 3	41420-2007-F-0839	Phase 1 = R-32 to R-55 Phase 2 = R-20 to R-32	Beach and dune nourishment	Phase 1 = ~4.4 miles Phase 2 = ~2.3 miles
24 July 2002	Lee	Gasparilla Island Beach Nourishment	4-01-F-765	R-10 to R-26.5 R-25, R-25.5, R-26	Beach nourishment; breakwater construction; and two t-head groins	3.2 miles
19 June 2003	Lee	Bonita Beach Re-nourishment	4-1-02-F-1736		Beach nourishment	3,922 feet
4 March 2005	Lee	Sanibel and Captiva Island Beach Nourishment	4-1-04-F-9180	R-83 to R-109 and R-110 to R-118	Beach nourishment	6.0 miles
14 March 2007	Lee	Gasparilla Island Beach Nourishment (BO amendment)	41420-2007-FA-0509	South of R-26A	Beach nourishment	
27 August 2007	Lee	North Captiva Island Beach Nourishment	41420-2007-FA-1023	R-81 and 208 feet south of R-81A	Beach nourishment	0.23 mile
5 August 2009	Lee	Matanzas Pass Reopening	41420-2009-FA-0132	North end of Estero Island	Channel dredging	0.14 mile

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21 March 2008	Lee	Blind Pass Reopening	41420-2006-FA-1549	R-109 to R-114	Reopening Blind Pass and then nourishing the shoreline between R-112 and R-114.	0.95 mile
7 Dec 2009	Lee	Sanibel Island Sand Placement	41420-2009-FA-0066	R-174A to Bay 1A	Beach nourishment	0.25 mile
15 Sept 2010	Lee	Big Hickory Island Sand Placement and Groin Construction	41420-2010-CPA-0100	R-222.3 to R-223.8	Beach nourishment and groin construction	0.47 mile
31 Jan 2002	Martin	Jupiter Island	4-1-05-TR-13281	R-75 to R-117	Beach nourishment	6.5 miles
5 Jan 2005	Martin	Martin County Shore Protection Project	4-1-05-F-10476	R-1 to R-25.6	Beach nourishment	4.1 miles
2 Dec 2005	Martin	Jupiter Island Modification	4-1-05-TR-13281	R-76 to R-84 and R-87 to R-11	Beach nourishment	5 miles
2 Feb 2007	Martin	Sailfish Point Marina Channel Dredging and Beach Nourishment	41420-2007-FA-0196	R-36 to R-39	Channel dredging and beach nourishment	0.66 mile
6 October 2009	Martin	Bathtub Beach Park Sand Placement	41420-2009-FA-0110	R-34.5 to R-36	Beach nourishment	0.24 mile
8 June 2010	Martin	Martin County Beach Erosion Control Project	41420-2009-FA-0190	R-1 to R-25	Beach nourishment	~ 4 miles
23 Sept 2005	Miami-Dade	Bal-Harbour T-Groin Reconstruction	4-1-05-12842	R-27 to R-31.5	Groin removal and reconstruction	0.85 mile
11 Oct 2005	Miami-Dade	Bakers Haulover AIW Maintenance Dredging	4-1-04-TR-8700	R-28 to R-32	Dredging and beach nourishment	0.85 mile
7 June 2006	Miami-Dade	Miami-Dade Beach Nourishment	41420-2006-FA-0028	3 segments within R-48.7 and R-61	Beach nourishment	3,716 feet
25 July 2007	Miami-Dade	Miami Beach Nourishment	41420-2006-F-0028	R-67 to R-70	BO modification to June 7, 2006 BO	3,000 feet
5 Nov 2008	Miami-Dade	Baker's Haulover Dredging and Sand Placement	41420-2008-FA-0729	R-28 to R-32	BO modification to the October 11, 2005 BO. Dredging and sand placement events will be biannual.	4,000 feet
12 Nov 2008	Miami-Dade	DERM Truck Haul Sand Placement	41420-2008-FA-0776	R-27 to R-29 R-7 to R-12 R-43 to R-44+500 feet	Beach nourishment	1.78 miles
25 Nov 2009	Miami-Dade	DERM 27th Street Sand Placement	41420-2009-FA-0045	R-60 to R-61	Beach nourishment	0.19 mile
17 Dec 2009	Miami-Dade	32nd and 63rd Streets Sand Placement	41420-2009-FA-0415	R-37.75 to R-46.25 R-53.7 to R-55.5 R-60 to R-61	Sand placement	2.14 miles

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31 March 2010	Miami-Dade	55th Street Sand Placement	41420-2009-FA-0046	R-48.7 to R-50.7	Sand placement	0.38 mile
30 April 2010	Miami-Dade	44th Street Sand Placement	41420-2009-FA-0047	R-53.7 to R-55.5	Sand placement	0.34 mile
25 June 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0593	R-29 to R-32	Sand Placement – truck haul	0.60 mile
28 June 2010	Miami-Dade	Sunny Isles BeachSand Placement	41420-2009-FA-0594	R-12 to R-15)	Sand Placement – truck haul	0.58 mile
30 July 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0595	R-45 to R-48 +700 feet	Sand Placement – truck haul	0.78 mile
13 Sept 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0527	R-43 to R-44 + 500 feet	Sand Placement – truck haul	0.26 mile
8 October 2010	Miami-Dade	Sunny Isles Beach Sand Placement	41420-2009-FA-0526	R-7 to R-12	Sand Placement – truck haul	0.95 mile
8 October 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0525	R-27 to R-29	Sand Placement – truck haul	0.38 mile
2009	Monroe	Reclaimed sand placement and sand cleaning (seaweed removal)	41420-2010-F-0006	No R-monuments	Sand placement and cleaning	1,462 linear feet
2009	Monroe	City of Key West (South Beach)	41420-2010-F-0013	No R-monuments	Beach repair (emergency)	235 linear feet
2009	Monroe	City of Key West (Rest Beach)	41420-2010-F-0014	No R-monuments	Beach repair (emergency)	640 linear feet
2009	Monroe	City of Marathon, Sombrero Beach	41420-2010-F-0001	No R-monuments	Beach repair (emergency)	1,380 linear feet
5 March 2010	Monroe	City of Key West – Simonton Beach	41420-2010-FC-0412	Approximately 350 feet ENE of V-416 (latitude 24.562, longitude -81.8054	Emergency beach repair	95 linear feet
5 March 2010	Monroe	City of Key West – Dog Beach	41420-2010-FC-0413	Between V-414 and V-413 (latitude 24.5473, longitude -81.7929	Emergency beach repair	35 linear feet
13 May 2010	Monroe	City of Key West, Smathers Beach	41420-2008-FA-0185	No R-monuments	Sand placement	0.57 mile
27 March 2003	Palm Beach	Palm Beach Harbor M & O	4-1-03-F-139	200 feet south of the south jetty	Jetty sand tightening	200 feet
16 March 2004	Palm Beach	Boca Raton Inlet Sand Bypassing	4-1-04-F-4688	200 feet south of R-223	Inlet sand bypassing and beach nourishment	500 feet
11 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Delray Segment	4-1-05-F-10767	R-175 to R-188	Beach restoration	2.7 miles

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24 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Ocean Ridge Section	4-1-05-F-10787	R-153 to R-159	Beach nourishment	1.12 miles
11 April 2005	Palm Beach	South Lake Worth Inlet Sand Transfer Plant Reconstruction and Bypassing	4-1-04-F-8640	135 feet south of R-151, to 275 feet south of R-152	STP reconstruction and bypassing	900 feet
5 Dec 2005	Palm Beach	Mid-Town Beach Nourishment Project (Reach 3 & 4)	4-1-00-F-742	R-90.4 to R-101.4	Beach nourishment	2.4 miles
23 Dec 2005	Palm Beach	Palm Beach Harbor M & O	4-1-05-TR-13258	R-76 to R-79	Dredging and beach nourishment	3,450 feet
23 Feb 2006	Palm Beach	Boca Raton Central Beach Nourishment Project	4-1-01-F-1795	R-216 to R-222	Dredge shoal fronting Boca Raton Inlet and beach nourishment	1.3 miles
23 Feb 2006	Palm Beach	Boca Raton South Beach Nourishment Project	41420-2008-FA-0777 Old database number 41-01-F-652	R-223.3 to R-227.9	Dredge shoal fronting Boca Raton Inlet and beach nourishment	Approx. 1 mile
28 April 2006	Palm Beach	Palm Beach Nourishment Project – Reach 8	41420-2006-F-0018	R-125 to R-134	Beach nourishment	2.17 miles
31 July 2006	Palm Beach	Sea Dunes Condominium Seawall	41420-2006-FA-1108		Seawall construction	0.03 acre
15 Dec 2006	Palm Beach	North Ocean Boulevard Rock Revetment	41420-2006-FA-1490	290 feet north of R-84; 1,150 feet south of R-85	Rock revetment construction	0.34 mile
5 Feb 2007	Palm Beach	Palm Beach Sand Transfer Plant Reconstruction	41420-2006-FA-1447	R-76 to R-79	Sand transfer plant reconstruction and discharge pipe extension	0.57 mile
28 March 2007	Palm Beach	Lake Worth Inlet Jetty Repair	41420-2007-FA-0221	200 feet north of R-75 and 200 feet south of R-76	Jetty repair	400 feet
25 May 2007	Palm Beach	Singer Island and South Palm Beach Emergency Dune Restoration	41420-2007-FA-1001	385’ south of R-137 to 500’ north of R-136; 500’south of R-60 to 850’ south of R-65	Dune Restoration	6,135 feet
25 May 2007	Palm Beach	Jupiter Island ICWW Maintenance Dredging and Beach Nourishment	41420-2006-FA-1582	16,000 feet (130,000 cy) of the ICWW dredged; material placed between R-13 and R-19.	Channel dredging and beach nourishment	1.04 miles
20 July 2007	Palm Beach	North Boca Raton Beach Nourishment	41420-2007-FA-0477	T-205 to 181 feet south of R-212	Beach nourishment	1.45 miles

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9 Nov 2007	Palm Beach	Jupiter Inlet and channel dredging	41420-2006-FA-1582	R-13 to R-17	Dune restoration	~ 4,000 linear feet
14 Nov 2007	Palm Beach	Jupiter Inlet Sand Trap Dredging and Sand Placement	41420-2007-FA-0600	Maintenance dredging of the inlet; beach compatible placed R-13 to R-19	Inlet dredging and beach nourishment	1.02 miles
28 Nov 2007	Palm Beach	Modification to a Sheet Pile and Rubble-Mound T-Head Groin System	41420-2007-FA-0574	500 feet north of R-94 south to R-95	T-groin repair, extension, construction	0.4 mile
5 Feb 2008	Palm Beach	Reach 8 Dune Restoration	41420-2006-F-0018	R-125 to 350 feet south of R-134	Dune restoration	2.17 miles
9 Sept 2008	Palm Beach	Juno Beach Sand Placement	41420-2008-FA-0081	R-26 to R-38	Sand placement	2.45 miles
4 Nov 2008	Palm Beach	Palm Beach Harbor M&O and Sand Placement	41420-2008-FA-0524	R-76 to R-79	Biannual Inlet dredging and sand placement events.	3,450 feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0008	R-60 to R-68	Beach berm repair (permanent work)	6,880 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0009	R-135 to R-138	Beach berm repair (permanent work)	3,590 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F0010	R-137 to R-138	Beach berm repair (emergency)	125 linear feet
21 June 2010	Palm Beach	Mid-Town Reaches 3 & 4 Sand Placement	41420-2006-F-0011-R001	R-95 to R-100	Beach nourishment	0.95 mile
2 July 2010	Palm Beach	Phipps Ocean Park Reaches 7&8	41420-2010-CPA-0110	R-116 to R-125	Sand Placement	3.4 miles
3 Sept 2010	Palm Beach	Singer Island Breakwater	41420-2008-FA-0019	R-60.5 to R-66	Segmented, submerged breakwater	1.1 miles
19 June 2003	St. Lucie	Fort Pierce Shoreline Protection	4-1-03-F-1867 41420-2006-FA-1575	R-33.8 to R-41	Beach nourishment; berm expansion; and six t-head groins	1.3 miles
9 March 2006	St. Lucie	Blind Creek Restoration and South St. Lucie Emergency Berm Remediation Project	41420-2006-FA-0075	R-98 to R-115 R-88 to R-90	Wetland restoration and beach nourishment	3.6 miles
27 June 2008	St. Lucie	Fort Pierce Shoreline Protection Project	41420-2006-FA-1575	R-34 to R-41	Beach nourishment, berm expansion, and six t-head groins	1.3 miles
25 Aug 2004	Sarasota and Manatee	Longboat Key Beach Nourishment	4-1-04-F-4529	R-46A to R-29.5	Beach nourishment	9.45 miles
4 Oct 2005	Sarasota and Manatee	Longboat Key Beach Nourishment Project – BO Amendment	4-1-04-TR-4529	R-44 to R-44.5 and R-46A to R-44.5	Beach nourishment	0.47 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
20 Oct 2005	Sarasota	South Siesta Key	4-1-05-TR-12691	R-67 to R-77 plus 200 feet	Beach nourishment	2.1 miles
7 Dec 2007 (original BO) 28 July 08 (BO mod)	Sarasota	Lido Key Beach Fill Placement Project	41420-2007-F-0841	R-35.5 to R-44.2 2.27 miles	Beach nourishment with 425,000 cy of fill material.	2.27 miles
13 August 2008	Sarasota	Longboat Key Permeable Adjustable Groins	41420-2007-FA-0205	R-13 to R-13.5	Construction of two permeable adjustable groins.	0.09 mile project area 0.43 mile action area
2009	Sarasota		41420-2010-F-0003	R-77 to midpoint between R-77 and R-76	Beach restoration	700 linear feet
2009	Sarasota	Longboat Key Beach	41420-2010-F-0007	R-13 to R-14 Sarasota County; R-44 to R-5, and R-48.5 to R-49.5 Manatee County	Beach berm repair	951, 1,197, and 1,142 linear feet, respectively

Appendix B

NMFS Consultations

CONSULTATION ACTIVITY	TYPE OF ACTION	DATE SIGNED	ACTION AREA	INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE)									
				Loggerhead (NWAO & NP DPS)		Green Turtle		Leatherback		Hawksbill		Kemp's Ridley Olive Ridley	
				Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Non-Fishery Consultations													
North Carolina DENR Inshore Gillnet-Incidental Take Permit	Section 10(a)(1)(B)	9/6/13	North Carolina Inshore Waters	1-yr Estimate									
						330	165					98	49
				1-yr Observed									
				24		18		8		8		12	
Removal of Offshore Structures in the Gulf of Mexico Outer Continental Shelf	Oil & Gas	8/28/2006	Gulf of Mexico	6-yr Estimate									
				15*	0	3*	0	3*	0	3*	0	3*	0
Sinking Exercises (SINKEX) in the Western North Atlantic Ocean	Military	9/22/2006	Western North Atlantic Ocean	1-yr Estimate									
				ITS - We do not have information to determine an amount of take. Survey data for the SINKEX location is extremely limited and the densities or abundance of sea turtles within the area is not known. Therefore, we anticipate the extent of take would be within the water column that would be affected by the shock and pressure waves above levels of 12 psi and 182 dB re 1 µ Pa2-sec in the greatest 1/3 octave band. For the largest underwater detonations, the extent includes the volume within 2 nmi of the detonation. Thus, the extent of take includes the "exclusion zone" of the SINKEX.									
Issuance of multiple permits to conduct scientific research on Atlantic sturgeon pursuant to section 10 (a)(1) of the Endangered Species Act of 1973	Section 10(a)(1)(A) for Sturgeon Research	4/2/2012	U.S. Atlantic Coast (from ME to FL)	Anticipated take for the entire research permit (5 years)									
				4*	0	4*	0	4*	0	4*	0	4*	0
National Science Foundation - Marine Seismic Survey in the Central Pacific Ocean	Seismic	11/23/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				ITS - We do not have information to determine an amount of take. Harassment of these sea turtles is expected to occur at received levels of seismic sounds above 166 dB re 1 µPa. Because density estimates of sea turtles in the survey area are unknown, we estimate take as the number of turtles exposed to seismic operations above 166 dB re 1 µPa during the proposed activities. These turtles could be of all ages and life stages in the survey area.									
Navy - Conduct of training in the Virginia Capes, Cherry Point and Jacksonville Range Complexes June 2011 to June 2012	Navy Activities	6/1/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				485	9	311*	3*	20	1	311*	3*	557	5

Appendix C

ASSESSMENTS: DISCERNING PROBLEMS CAUSED BY ARTIFICIAL LIGHTING

LIGHTING INSPECTIONS

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This "urban skyglow" is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach. Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are partially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION

Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS

An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections. Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaries need what remedy.

NIGHTTIME INSPECTIONS

A nighttime survey shall be conducted of all lighting visible from the beach placement area by the FWC permit holder, using standard techniques for such a survey. During the nighttime lighting surveys, the surveyor shall walk the length of the beach placement area looking for light from artificial sources. During the nighttime lighting surveys, a complete census shall be made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. Because problem lighting will be most visible on the darkest nights, lighting inspections are to be conducted when there is no moon visible. Descriptions of light sources identified during the survey should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east, etc.). A summary report of the survey shall be submitted to the Corps, FWC, and the Service.

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. **Direct lighting**. A luminaire is considered to be direct lighting if some glowing element of the luminaire (e.g., the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; style

of fixture), mounting (pole, porch, *etc.*), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to 14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represent a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be give the information they need to make proper alterations to light sources. This information should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

Appendix D
Sea Turtle Lighting Survey Form

Lighting Survey Form

The lighting survey must be conducted to include a landward view from the seaward most extent of the beach profile. The survey must occur after 9 p.m. The survey must follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation.

Date: _____

Contact information of person conducting the lighting survey: _____

_____

Location (name of beach): _____

Lighting ordinance (applicable County or Municipality): _____

Compliance Officer name and contact information: _____

Survey start time: _____

Survey end time: _____

Survey start location (include address or GPS location):_____

_____

_____

Survey end location (include address or GPS location): _____

_____

Date summarizing report sent to the following: marineturtle@myfwc.com, JCPCompliance@dep.state.fl.us, and seaturtle@fws.gov:_____

County or Municipality contact information for follow up meeting with the FWS and FWC:

_____

For each light visible from the nesting beach provide the following information:

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommend ations sent? (YES/NO)

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommend ations sent? (YES/NO)

Appendix E

Nesting Seabird and Shorebird Protection Conditions

a. Selection of Bird Monitors. The Permittee or designated representative ("Permittee") shall hire one or more Bird Monitors, depending on the size of the area to be affected, who shall monitor shorebird and seabird (shorebird) activity before, during, and after construction. Bird Monitors shall have proven seabird and shorebird identification skills and avian survey experience. Before hiring any Bird Monitors, the Representative shall provide a list of candidate Bird Monitors with (1) their contact information and (2) a summary of their qualifications, including bird identification skills and avian survey experience, to the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) and copied to JCPCompliance@dep.state.fl.us for FWC approval before the Permittee hires the Bird Monitor(s).

b. The Bird Monitor(s) shall review and become familiar with the general information on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org). They shall use the data-collection protocol and implement data-entry procedures as outlined in that website. An outline of data to be collected, including downloadable field data sheets, is available on the website.

c. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this project: February 15 – September 1.

   Surveys during the breeding season shall begin on the first day of the breeding season or 10 days before any site work begins, whichever is later. Surveys shall be conducted through August 31 or until all breeding activity has concluded, whichever is later.

d. During the breeding season, the Bird Monitor(s) shall survey all potential beach-nesting bird habitats that may be affected by construction or pre-construction activities. The Bird Monitor(s) shall establish one or more shorebird survey routes in the FSD website to cover these areas.

e. During the pre-construction and construction phases of the project, the Bird Monitor(s) shall complete surveys on a daily basis to detect breeding activity and the presence of flightless chicks before (1) equipment is moved to the area, (2) vehicles are operated in the area, or (3) any other activities occur that have the potential to disrupt breeding behavior or cause harm to the birds or their eggs or young. Once construction is completed and all personnel and equipment have been removed from the beach, surveys may be conducted at weekly intervals.

f. The Bird Monitor(s) shall survey the project area by walking and looking for evidence of (1) shorebirds exhibiting breeding behavior, (2) shorebird chicks, or (3) shorebird juveniles, as outlined in the FSD's Breeding Bird Protocol for Shorebirds and Seabirds. The Bird Monitor(s) shall use binoculars for these surveys.

g. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed under 6 mph and only on beaches at or below the high-tide line. The Bird Monitor(s) shall stop at no greater than 200-meter intervals to look for breeding activity.

h. Once the Bird Monitor(s) confirms that birds are breeding, as evidenced by the presence of a scrape, eggs, or young, the Bird Monitor(s) shall notify the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) within 24 hours. The Bird Monitor(s) shall report all breeding activity to the FSD website within one week of data collection.

Seabird and Shorebird Buffer Zones and Travel Corridors

The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where shorebirds have been engaged in breeding behavior, including territory defense. The FWC considers a 300-foot-wide buffer to be adequate based on published studies; however, a smaller, site-specific buffer may be established if approved by the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit). All sources of human disturbance (including pedestrians, pets, and vehicles) shall be prohibited in the buffer zone.

a. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall widen of the buffer zone immediately to a sufficient size to protect breeding birds.

b. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

c. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked with posts, twine, and signs stating "Do Not Enter, Important Nesting Area" or similar language. The signs shall include the name and a phone number of the entity responsible for posting. Posts shall not be higher than 3 feet once installed. "Symbolic fencing" (i.e., twine, string, or rope) shall be placed between all posts and be clearly visible to pedestrians. In areas where marine turtles nest, the ropes shall be at least 2.5 feet above the ground. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these shall be clearly marked. The Bird Monitor(s) shall ensure that the posting is maintained in good repair until breeding is completed or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

d. The Bird Monitor(s) shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

e. The Bird Monitor(s) shall designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may go past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

f. When flightless chicks are present on the beach, the Bird Monitor(s) shall accompany any moving vehicles or equipment to ensure that no chicks are in the path of the moving vehicle and no tracks are left that could trap flightless chicks.

g. The FWC recommends that the Bird Monitor(s) ensure that some activity in the travel corridor is maintained on a daily basis in order to discourage birds from nesting within the travel corridor. These activities shall not be allowed to disturb shorebirds nesting on site or interfere with marine turtle nesting, especially if the corridors are established before construction has started.

h. *Notification.* If the Bird Monitor(s) find that shorebirds are breeding within the project area, he or she shall ensure that an informational bulletin board is placed and maintained in the construction staging area. This bulletin board shall display the location map of the construction site, depict the location(s) of the bird breeding areas, and include a clearly visible warning stating: "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE AND FEDERAL MIGRATORY BIRD ACTS".

Post-construction Conditions, Monitoring and Reporting

i. Shorebird: If beach cleaning will occur on the nourished beach, a minimum of 30 percent of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

Appendix F

EXAMPLES OF PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle must be secured or heavy enough so it is not easily turned over.

Attachment XX: SARBO Pre-Construction Required Reporting Information		
File Number:		
Project Name:		
For ALL projects	Who is in charge of the project?	
	Protectect Species Observer(s) (PSO):	
	PSO Contact Information (Address, phone, email)	
	Other Federal Agencies Associated?	
	Biological Opinion used:	**SERO-2019-03111**
	What is the project start date?	
	What is the estimated end date?	
	Latitude and Longitude of Dredge Area (decimal degrees)	
	Latitude and Longitude of Disposal Area (decimal degrees)	
	Is the project in the range of ESA-listed species?	
	Is the project within designated critical habitat?	
	Total area that occurs within critical habitat.	
	Project Type	Select
	Pre-project proposed dredge & placement volume (cy)	
	Post-Project actual dredge & placement volume (cy)	
	Does project exceed the previously approved dredge template, including previously considered overdepth and/or advance maintenance?	Yes/No
	If yes to above, please provide explination.	
	Vessels and Equipment used on project	Select
		Select
		Select
For Hopper Dredging Projects	Used UXO/MEC screening	Yes/No
	Screening Size used for the project	
	If inflow screening is removed, please report start and end date of dredging that occurred without inflow screening and the number of loads.	
For Geophysical Surveys	Describe the equipment type, frequency the equipment was operated, maximum source/power level, locatin used, and total time used.	
For Relocation Trawling	Total number of tows for the project	
	Total number of days	
	Relocation trawling start date	
	Relocation trawling end date.	
	Describe bycatch captured	

Attachment XX: SARBO Post-Construction Required Reporting Information		
File Number:		
Project Name:		
For ALL projects	Who is in charge of the project?	
	Protectect Species Observer(s) (PSO):	
	PSO Contact Information (Address, phone, email)	
	Other Federal Agencies Associated?	
	Biological Opinion used:	**SERO-2019-03111**
	What is the project start date?	
	What is the estimated end date?	
	Latitude and Longitude of Dredge Area (decimal degrees)	
	Latitude and Longitude of Disposal Area (decimal degrees)	
	Is the project in the range of ESA-listed species?	
	Is the project within designated critical habitat?	
	Total area that occurs within critical habitat.	
	Project Type	Select
	Pre-project proposed dredge & placement volume (cy)	
	Post-Project actual dredge & placement volume (cy)	
	Does project exceed the previously approved dredge template, including previously considered overdepth and/or advance maintenance?	Yes/No
	If yes to above, please provide explination.	
	Vessels and Equipment used on project	Select
		Select
		Select
For Hopper Dredging Projects	Used UXO/MEC screening	Yes/No
	Screening Size used for the project	
	If inflow screening is removed, please report start and end date of dredging that occurred without inflow screening and the number of loads.	
For Geophysical Surveys	Describe the equipment type, frequency the equipment was operated, maximum source/power level, locatin used, and total time used.	
For Relocation Trawling	Total number of tows for the project	
	Total number of days	
	Relocation trawling start date	
	Relocation trawling end date.	
	Describe bycatch captured	

Attachment ##: SARBO Take Reporting Form		
Required Reporting Information:		**Provide as much datail as possible in the below fields:**
	Location of take (latitude and longitude)	
	Tow Number when take occurred during relocation trawling or dredge load # if during hopper dredging.	
	PSO (Name/Company and Contact Info)	
	Total # of take	
	Previous animal ID/Tracking Tag, if any	
	Passive Intragated Transponder (PIT) Tag (See attachment 1)	
	Genetic Sample collected, if applicable (See Attachment 1)	
	Age class of species (e.g., juvenile, adult)	
	Specimen condition (e.g., alive, fresh dead, decomposed) (See Attachment 1)	
	Final disposition (e.g., released at site, relocated, rehabilitation & outcome, necropsy, disposal)	
	Species Gender	
	Species size/length (See Attachment 1)	
	Beaufort state at time of take	
	Water temp. at time of take (recorded at surface in marine environments and at the bottomg in estuarine/riverine environments)	
	Notes about species condition	
If take occurred during hopper dredging:		
	Location where take was identified (e.g., draghead, inflow box, overlfow box)	
	Screening at the time of take?	
	Size of screening used (both inflow and overflow)	
	Were UXO/MEC installed at time of take?	

AS-BUILT CERTIFICATION BY PROFESSIONAL ENGINEER

Submit this form and one set of as-built engineering drawings to the U.S. Army Corps of Engineers, Enforcement Section, 701 San Marco Boulevard, Jacksonville, Florida, 32207. If you have questions regarding this requirement, please contact the Enforcement Branch at 904-232-3131.

1. Department of the Army Permit Number: SAJ-2001-03870(PRJ)

2. Permittee Information:

Name: _____

Address: _____

_____

3. Project Site Identification (physical location/address):

_____

_____

_____

4. As-Built Certification: I hereby certify that the authorized work, including any mitigation required by Special Conditions to the permit, has been accomplished in accordance with the Department of the Army permit with any deviations noted below. This determination is based upon on-site observation, scheduled, and conducted by me or by a project representative under my direct supervision. I have enclosed one set of as-built engineering drawings.

_____ _____

Signature of Engineer Name (*Please type*)

_____ _____

(FL, PR, or VI) Reg. Number Company Name

_____ _____ _____

City State ZIP

(Affix Seal)

_____ _____

Date Telephone Number

Identify any deviations from the approved permit drawings and/or special conditions (attach additional pages if necessary):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

COMMENCEMENT NOTIFICATION

Within ten (10) days of initiating the authorized work, submit this form via electronic mail to saj-rd-enforcement@usace.army.mil (preferred, not to exceed 15 MB) ***or*** *by standard mail to U.S. Army Corps of Engineers, Enforcement Section, P.O. Box 4970, Jacksonville, FL 32232-0019.*

1. **Department of the Army Permit Number**: SAJ-2001-03870(SP-PRJ)

2. **Permittee Information**:

   Name: _____

   Email: _____

   Address: _____

   _____

   Phone: _____

3. **Construction Start Date**: _____

4. **Contact to Schedule Inspection**:

   Name: _____

   Email: _____

   Phone: _____

_____
Signature of Permittee

_____
Printed Name of Permittee

_____
Date

Prepared by:
Permittee: _____
Address: _____
_____
Phone:_____

NOTICE OF DEPARTMENT OF THE ARMY PERMIT

TAKE NOTICE the U.S. Army Corps of Engineers (Corps) has issued Department of the Army Permit SAJ-2001-03870 to SAISSA, FDEP, and Nassau County (Permittee) on , 200 , authorizing impacts to waters of the United States (including wetlands) in accordance with Section 404 of the Clean Water Act on a parcel of land known as Folio/Parcel ID: _____ encompassing _____ acres located within a portion of Section _____, Township _____ south, Range _____ east, _____, _____ County, Florida.

Within 30 days of any transfer of interest or control of that portion of the premises containing the area authorized to be filled (or any portion thereof), the Permittee must notify the Corps in writing of the property transfer by submitting the completed permit transfer page of the permit. Notification of the transfer does not by itself constitute a permit transfer. Therefore, purchasers of that portion of the premises containing the area authorized to be filled (or any portion thereof) are notified that it is unlawful for any person to construct, alter, operate, maintain, remove or abandon any works, including dredging or filling, without first having obtained a permit from the Corps in the purchaser's name.

The subject Permit concerns only that portion of the property determined to fall within the jurisdiction of the Corps and this notice is applicable only to those portions of the subject property containing areas authorized to be filled and wetland mitigation/conservation areas subject to the Permit.

Conditions of the Permit: The Permit is subject to General Conditions and Special Conditions which may affect the use of the subject property. Accordingly, interested parties should closely examine the entire Permit, all associated applications, and any subsequent modifications.

To obtain a copy of the permit in its entirety submit a written request to:
U.S. Army Corps of Engineers
Regulatory Division - Special Projects & Enforcement Branch
Post Office Box 4970
Jacksonville, Florida 32232-0019

Questions regarding compliance with these conditions should be directed to:
U.S. Army Corps of Engineers
Enforcement Section
Post Office Box 4970

Jacksonville, Florida 32232-0019

Conflict Between Notice and Permit
This Notice of Permit is not a complete summary of the Permit. Provisions in this Notice of Permit shall not be used in interpreting the Permit provisions. In the event of conflict between this Notice of Permit and the Permit, the Permit shall control.

This Notice is Not an Encumbrance
This Notice is for informational purposes only. It is not intended to be a lien, encumbrance, or cloud on the title of the premises.

Release
This Notice may not be released or removed from the public records without the prior written consent of the Corps.

This Notice of Permit is executed on this _____ day of _____, 20____. This document is being submitted for recordation in the Public Records of _____ County, Florida as part of the requirement imposed by Department of the Army Permit No SAJ-2001-03870 issued by the Corps.

Permittee:
_____
Address:
_____
_____
____
Phone:_____
___

STATE OF FLORIDA
COUNTY OF _____

The foregoing instrument was acknowledged before me this _____day of _____, 20____, by _____, who is personally known to me or has produced _____ as identification.

_____
Notary Public

(seal)

_____
Print

My Commission Expires_____

APPENDIX B – Construction Plans
BID NO. NC21-008
South Amelia Island Dredging & Beach Nourishment Project

Construction Plans – 16 Sheets, Issue Date 19 January 2021

APPENDIX B: CONSTRUCTION PLANS
NC 21-008

SOUTH AMELIA ISLAND
DREDGING & BEACH NOURISHMENT PROJECT

NASSAU COUNTY, FL

INDEX OF SHEETS

PROJECT ENGINEER:

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
904.387.6114
904.384.7368
COA 00003491

BID SET

NOT RELEASED FOR CONSTRUCTION

SEALED SET ON FILE
WITH OWNER

ALBERT E. BROWDER, FL PE #57403

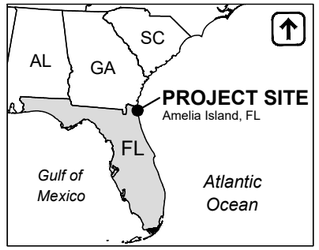
PROJECT OWNER:

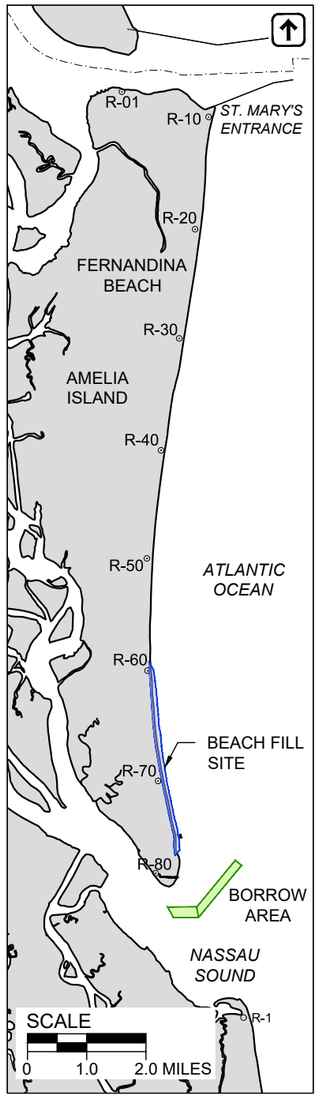
NASSAU COUNTY
BOARD OF COUNTY COMMISSIONERS
96135 Nassau Place
Yulee, FL 32097

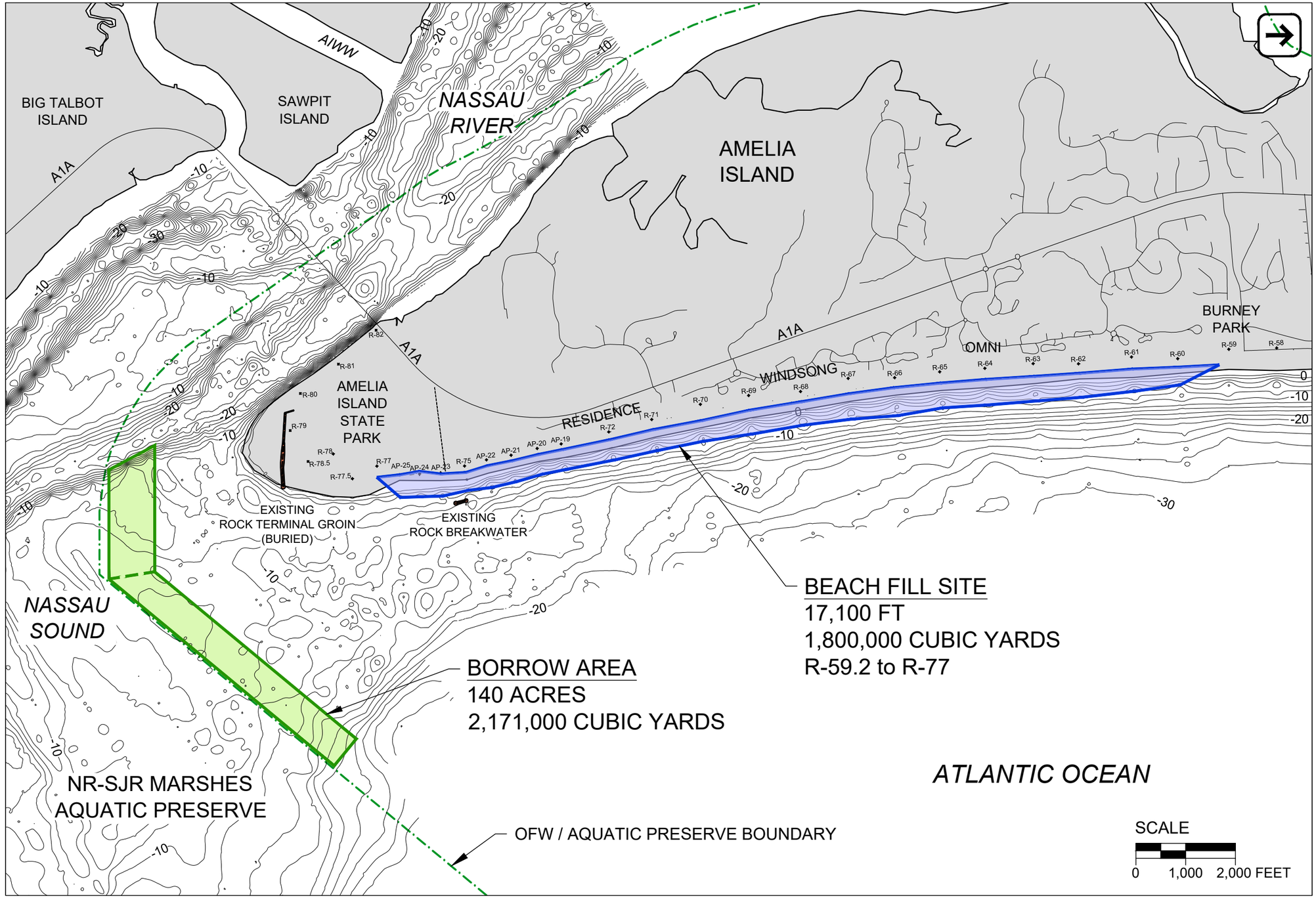
NOT RELEASED FOR CONSTRUCTION

DATE ISSUED: **01/19/2021**

DATE REVISED:







NOTES:
1) DATUMS: HORIZ. NAD83 SPC FL EAST; VERT. NAVD88, FT
2) SURVEY DATE: MAY 2020

BID SET

NOT RELEASED FOR CONSTRUCTION

SEALED SET ON FILE WITH OWNER

REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPRVD

olsen associates, inc.
coastal engineering
2618 Herschel Street
Jacksonville, FL 32204
Tel. (904) 387-6114
COA 00003491

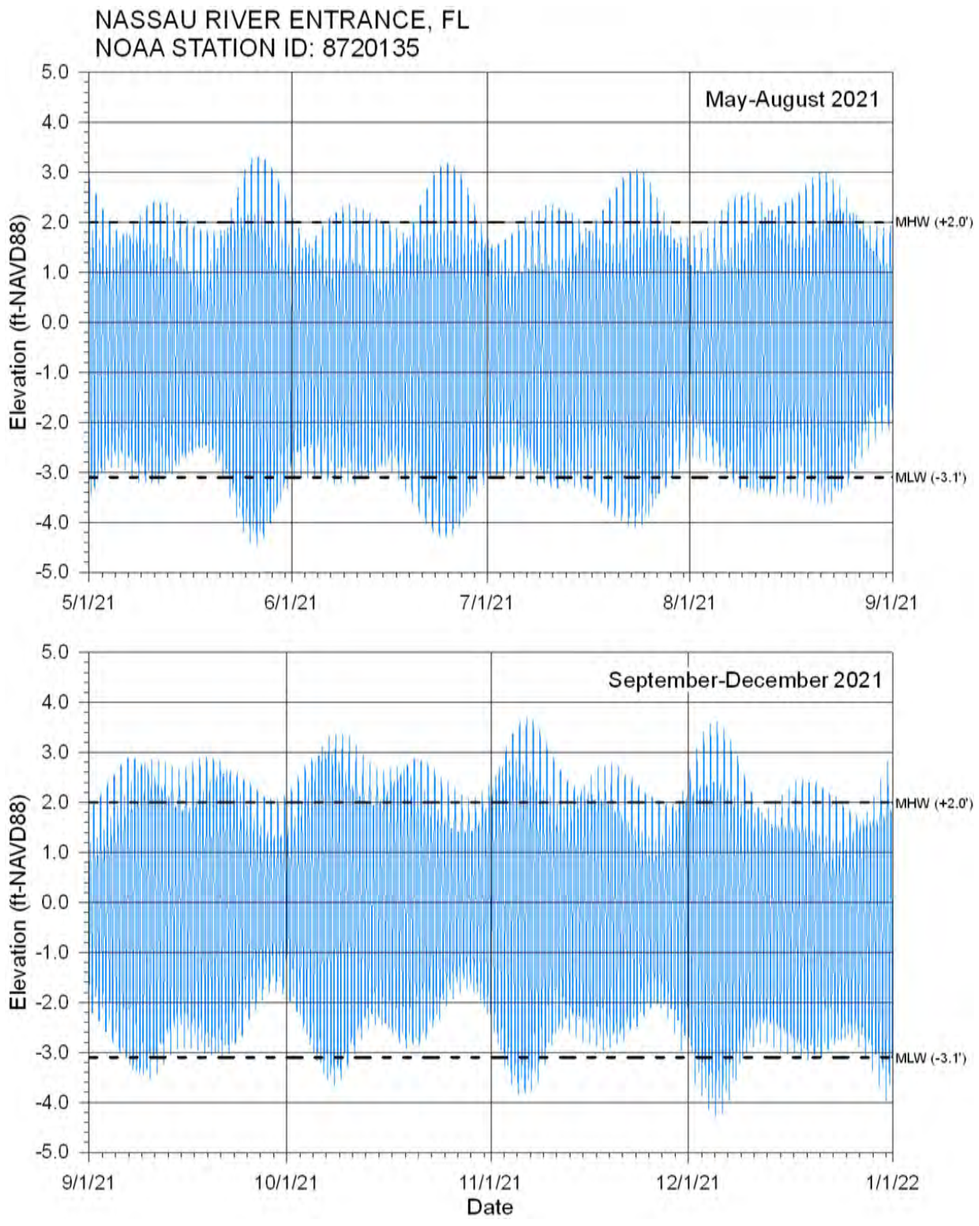
SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

PROJECT LOCATION

DRAWN BY:	WAH	DATE: 01/19/2021
CHECKED BY:	AEB	DATE: 01/19/2021
REVISED BY:		DATE:

SHEET 1 of 15

PREDICTED TIDES

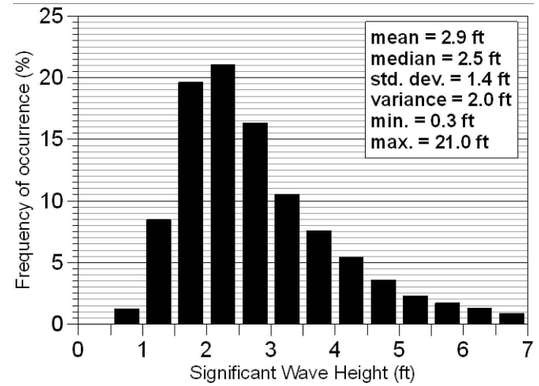


TIDAL DATUMS

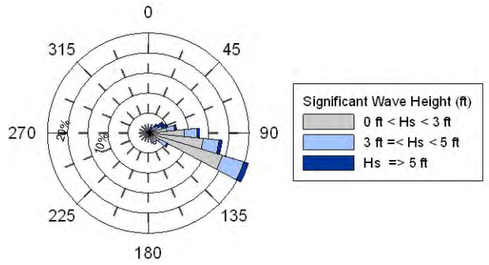
Nassau River Entrance, FL NOAA Station ID: 8720135	
Vertical Datum	**Elevation (ft-NAVD88)**
Mean Higher High Water (MHHW)	2.4
Mean High Water (MHW)	2.0
NAVD 1988	0.0
Mean Tide Level (MTL)	-0.5
NGVD 1929	-1.2
Mean Low Water (MLW)	-3.1
Mean Lower Low Water (MLLW)	-3.3

WAVE DATA

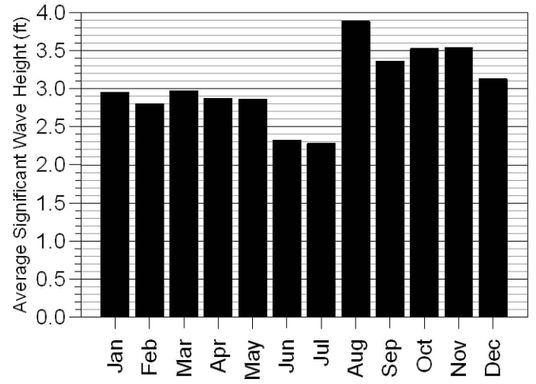
Data Source:
NDBC Buoy 41112
Years 2008-2020
Offshore Fernandina Beach, FL
30.709 N 81.292 W
Water Depth: 51.0 ft



AVERAGE WAVE HEIGHTS



WAVE DIRECTION



WAVE HEIGHT FREQUENCY

NOTES:
1) ALL ELEVATIONS ARE RELATIVE TO FEET-NAVD 88, UNLESS OTHERWISE NOTED
2) WAVE CONDITIONS AT SITE MAY VARY FROM REPORTED BUOY CONDITIONS. WAVE CLIMATE DATA PRESENTED FOR GENERAL INFORMATION PURPOSES ONLY.

BID SET

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REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPRVD

olsen associates, inc.
coastal engineering
2618 Herschel Street
Jacksonville, FL 32204
Tel. (904) 387-6114
COA 00003491

SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

HYDROGRAPHIC CONDITIONS

DRAWN BY:	WAH	DATE: 01/19/2021
CHECKED BY:	AEB	DATE: 01/19/2021
REVISED BY:		DATE:

Baseline Coordinates

Baseline Station	Easting (ft, NAD83)	Northing (ft, NAD83)
00+00	518,810.2	2,248,064.0
35+00	518,810.2	2,251,564.0
75+61	517,904.5	2,255,523.0
115+89	517,147.0	2,259,478.5
192+00	516,585.6	2,267,069.1

Beach Fill Schedule

Acceptance Section	Southern Limit (Station)	Northern Limit (Station)	Section Length (feet)	Anticipated Fill Quantity (Cubic Yards)
5	143+00	190+00	4,700	462,000
4	115+00	143+00	2,800	434,000
3	85+00	115+00	3,000	406,000
2	57+00	85+00	2,800	286,000
1b	33+00	57+00	2,400	149,000
1a	19+00	33+00	1,400	63,000
Total	**19+00**	**190+00**	**17,100**	**1,800,000**

Base Bid Beach Fill Layout

Monument Location			Monument Transect/Baseline Intersection					Landward Limit of Fill (El. Varies)				Mid-Berm Break in Slope (+10.0')			Seaward Edge of Berm (+6.5')		
Monument	Easting (ft, NAD83)	Northing (ft, NAD83)	Transect Azimuth (deg, grid)	Distance from Baseline (ft)	Baseline Station	Easting (ft, NAD83)	Northing (ft, NAD83)	Distance from Baseline (ft)	Elevation (ft-NAVD)	Easting (ft, NAD83)	Northing (ft, NAD83)	Distance from Baseline (ft)	Easting (ft, NAD83)	Northing (ft, NAD83)	Distance from Baseline (ft)	Easting (ft, NAD83)	Northing (ft, NAD83)
R-59	516,345.4	2,267,069.1	90	240	192+00	516,586	2,267,069	NO FILL									
NA	NA	NA	85	NA	190+00	516,600	2,266,870	59	10.0	516,659	2,266,875	NORTHERN LIMIT OF FILL					
R-60	516,534.1	2,266,042.6	85	127	181+82	516,661	2,266,054	45	10.0	516,705	2,266,058	NA	NA	NA	200	516,860	2,266,071
R-61	516,500.8	2,265,113.7	85	229	172+59	516,729	2,265,134	14	10.0	516,743	2,265,135	45	516,774	2,265,138	238	516,966	2,265,154
R-62	516,637.2	2,264,046.9	85	172	161+85	516,808	2,264,062	20	10.0	516,828	2,264,064	118	516,925	2,264,072	310	517,117	2,264,089
R-63	516,634.0	2,263,136.7	85	242	152+78	516,875	2,263,158	16	10.0	516,890	2,263,159	131	517,005	2,263,169	323	517,197	2,263,186
R-64	516,728.4	2,262,165.8	85	219	143+03	516,947	2,262,185	5	10.0	516,952	2,262,185	124	517,071	2,262,196	317	517,262	2,262,213
R-65	516,799.2	2,261,258.0	85	216	133+92	517,014	2,261,277	11	10.0	517,025	2,261,278	134	517,147	2,261,288	326	517,339	2,261,305
R-66	516,916.3	2,260,353.3	85	166	124+80	517,081	2,260,368	49	10.0	517,118	2,260,336	177	517,253	2,260,324	368	517,444	2,260,307
R-67	516,930.5	2,259,418.6	85	225	115+48	517,155	2,259,438	83	10.0	517,238	2,259,445	190	517,344	2,259,455	383	517,536	2,259,472
R-68	517,195.3	2,258,461.5	85	145	105+66	517,339	2,258,474	61	10.0	517,400	2,258,479	141	517,480	2,258,486	333	517,671	2,258,503
R-69	517,274.6	2,257,418.1	85	264	95+14	517,537	2,257,441	32	10.0	517,569	2,257,444	104	517,641	2,257,450	297	517,833	2,257,467
R-70	517,452.6	2,256,448.2	85	271	85+27	517,723	2,256,472	56	10.0	517,778	2,256,477	91	517,814	2,256,480	284	518,005	2,256,497
R-71	517,757.2	2,255,470.4	80	156	75+35	517,910	2,255,497	51	10.0	517,960	2,255,506	96	518,005	2,255,514	289	518,195	2,255,548
R-72	518,006.7	2,254,606.9	80	105	66+40	518,110	2,254,625	54	10.0	518,163	2,254,634	75	518,183	2,254,638	267	518,373	2,254,671
AP-19	518,247.8	2,253,650.5	80	83	61+52	518,330	2,253,665	34	10.0	518,363	2,253,671	36	518,365	2,253,671	228	518,555	2,253,705
AP-20	518,339.3	2,253,167.9	78	101	51+67	518,438	2,253,189	22	10.0	518,460	2,253,194	32	518,470	2,253,196	225	518,658	2,253,236
AP-21	518,475.4	2,252,643.2	80	86	46+22	518,560	2,252,658	29	10.0	518,588	2,252,663	53	518,612	2,252,667	245	518,801	2,252,701
AP-22	518,568.4	2,252,149.1	80	105	41+19	518,672	2,252,167	14	10.0	518,686	2,252,170	36	518,707	2,252,174	228	518,897	2,252,207
R-75	518,692.1	2,251,709.0	80	83	36+64	518,774	2,251,723	50	10.0	518,822	2,251,732	82	518,855	2,251,738	257	519,027	2,251,768
AP-23	518,831.3	2,251,228.5	85	-21	31+63	518,810	2,251,227	41	10.0	518,851	2,251,230	99	518,909	2,251,235	292	519,101	2,251,252
AP-24	518,850.8	2,250,805.0	87	-41	27+39	518,810	2,250,803	-10	10.0	518,800	2,250,802	128	518,938	2,250,810	320	519,130	2,250,820
AP-25	518,871.5	2,250,399.8	88	-61	23+34	518,810	2,250,398	60	6.5	518,870	2,250,400	NA	NA	NA	346	519,156	2,250,410
NA	NA	NA	90	NA	19+00	518,810	2,249,964	108	6.5	518,918	2,249,964	Southern Limit of Fill					
R-77	518,695.2	2,249,946.5	90	115	18+83	518,810	2,249,947	NO FILL									

NOTES:
1) DATUMS: HORIZ. NAD83 SPC FL EAST; VERT. NAVD88, FT
2) BEACH FILL LAYOUT BASED UPON CONDITIONS AS OF MAY 2020 BEACH PROFILE SURVEY.
3) BEACH FILL LAYOUT TO BE ADJUSTED BY ENGINEER PRIOR TO CONSTRUCTION START AND DURING CONSTRUCTION AS NEEDED TO COMPLY WITH DESIGN AND PROJECT BUDGETS.
4) TABULAR DATA TO BE PROVIDED TO CONTRACTOR IN ELECTRONIC FORMAT
5) DISTANCES LISTED ARE RELATIVE TO MONUMENT AZIMUTHS WHICH VARY AS LISTED AND ARE NOT PERPENDICULAR TO THE PROJECT CONSTRUCTION BASELINE.
6) BASELINE ORIGIN IS THE ROCK TERMINAL GROIN (STA 0+00.0).

BID SET

NOT RELEASED FOR CONSTRUCTION

SEALED SET ON FILE WITH OWNER

REVISIONS

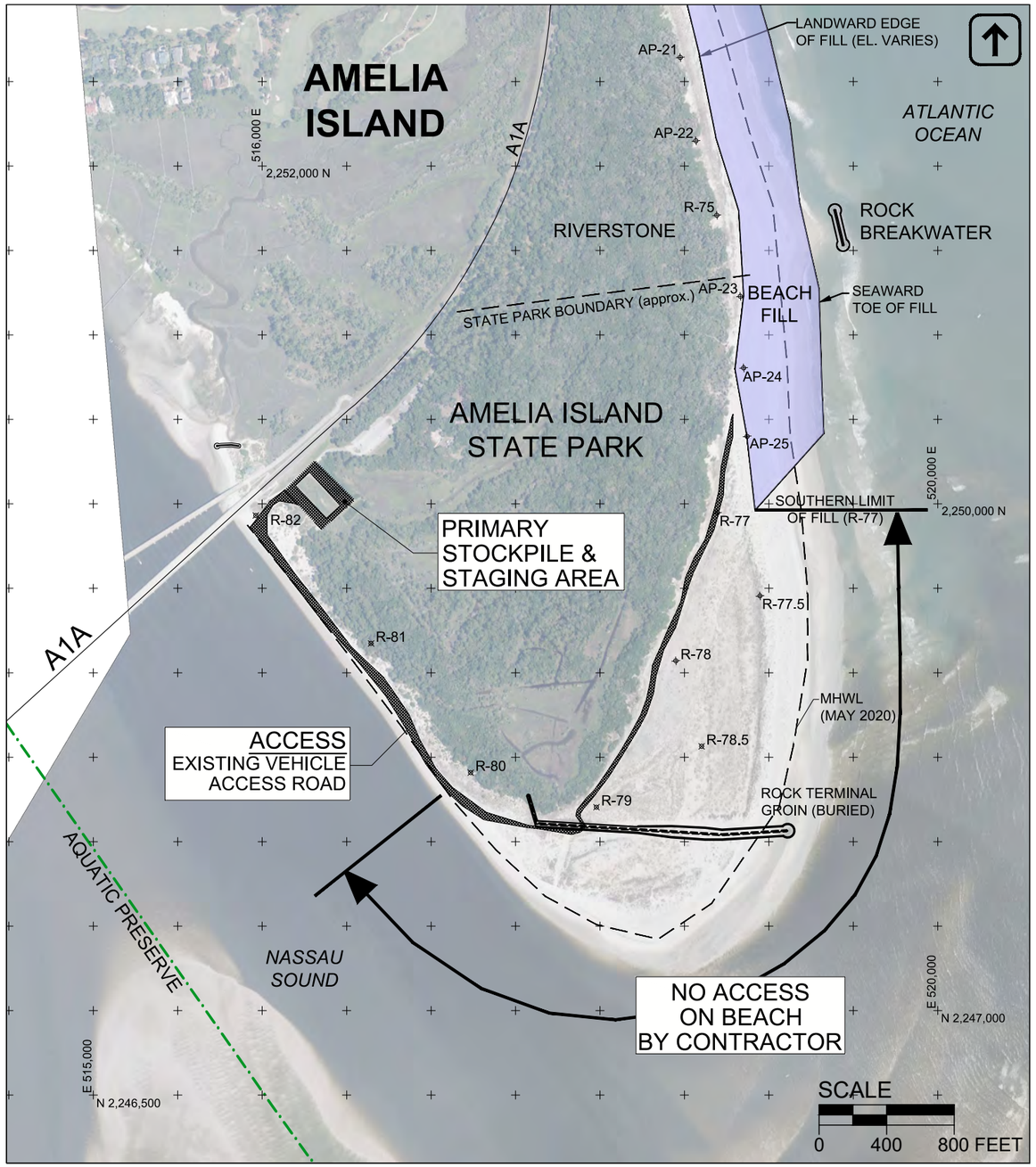
LTR	DESCRIPTION	BY	DATE	APPRVD

olsen associates, inc.
coastal engineering
2618 Herschel Street
Jacksonville, FL 32204
Tel. (904) 387-6114
COA 00003491

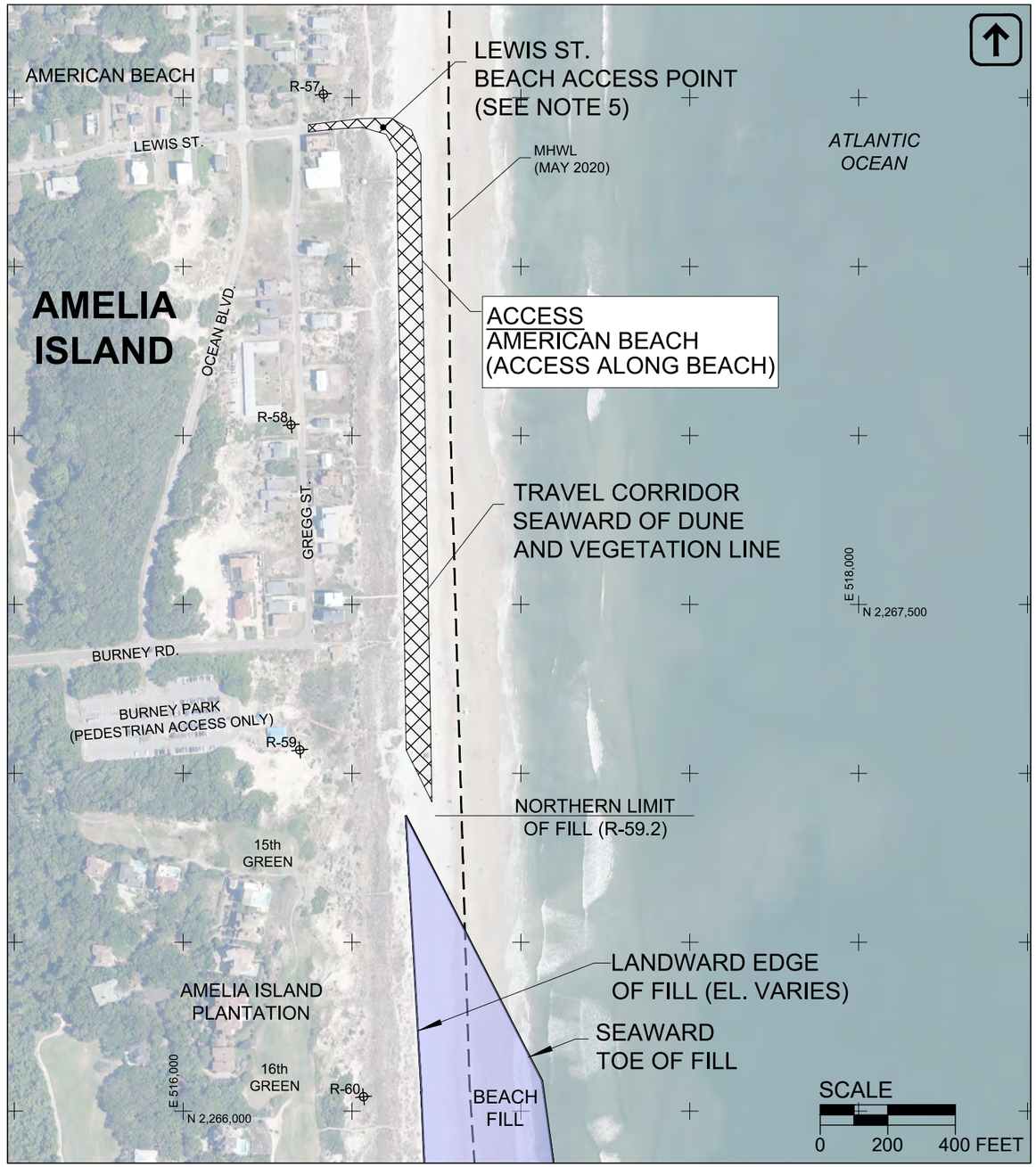
SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

SURVEY CONTROL

DRAWN BY:	WAH	DATE: 01/19/2021
CHECKED BY:	AEB	DATE: 01/19/2021
REVISED BY:		DATE:



SOUTH STAGING & ACCESS AREA



NORTH ACCESS AREA

NOTES:
1) AERIAL PHOTO DATE: MAY 2020
2) DATUMS: HORIZ. NAD83 SPC FL EAST; VERT. NAVD88, FT
3) STAGING AREA ON AISP PROPERTY TO BE COORDINATED WITH PARK PERSONNEL
4) ACTUAL ALIGNMENT OF ACCESS ROADS MAY VARY FROM THAT DEPICTED. ACCESS SHALL FOLLOW ROADS.
5) USE OF LEWIS STREET ACCESS SUBJECT TO COUNTY CONSENT. AMERICAN BEACH IS A RESIDENTIAL NEIGHBORHOODS. RIGHT-OF-WAY ARE MINIMAL. THE CONTRACTOR SHALL ARRANGE FOR ANY DESIRED STAGING SITE OR PARKING IN THE AREA - AT HIS EXPENSE.

BID SET

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REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPRVD

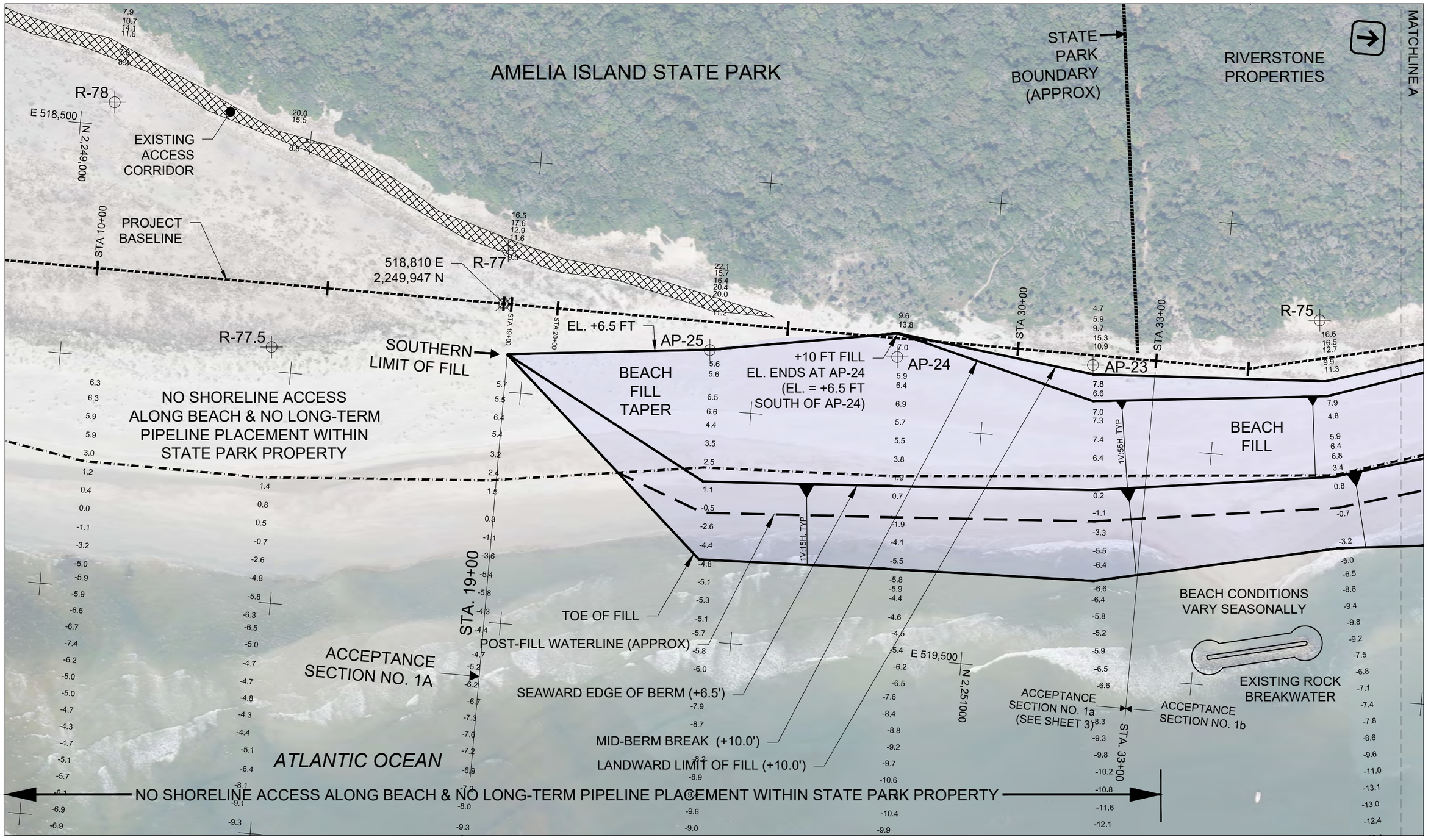
olsen associates, inc.
coastal engineering
2618 Herschel Street
Jacksonville, FL 32204
Tel. (904) 387-6114
COA 00003491

SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

STAGING & ACCESS

DRAWN BY:	WAH	DATE: 01/19/2021
CHECKED BY:	AEB	DATE: 01/19/2021
REVISED BY:		DATE:

SHEET 4 of 15



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5) LANDWARD LIMIT OF FILL AND BERM WIDTH VARY ALONG PROJECT LENGTH
6) LANDWARD LIMIT OF FILL TO BE ADJUSTED TO AVOID IMPACTS TO EXISTING SIGNIFICANT DUNE VEGETATION

SCALE

0 100 200 FEET

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2618 Herschel Street
Jacksonville, FL 32204
Tel. (904) 387-6114
COA 00003491

SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

BEACH FILL PLAN

DRAWN BY:	WAH	DATE: 01/19/2021
CHECKED BY:	AEB	DATE: 01/19/2021
REVISED BY:		DATE:

SHEET 5 of 15

MATCHLINE A

MATCHLINE B

A1A

E 518,000

N 2,252,000

RIVERSTONE

THE SANCTUARY

THE SANCTUARY

THE RESIDENCES

R-72

PROJECT BASELINE

AP-19

AP-20

AP-21

AP-22

STA 40+00

STA 50+00

STA 60+00

1V:55H TYP

1V:15H TYP

BEACH FILL

MHWL (MAY 2020)

MID-BERM BREAK (+10.0')

TOE OF FILL

POST-FILL WATERLINE (APPROX)

SEAWARD EDGE OF BERM (+6.5')

LANDWARD LIMIT OF FILL (+10.0')

ATLANTIC OCEAN

STA. 57+00

ACCEPTANCE SECTION NO. 1

ACCEPTANCE SECTION NO. 2

E 519,000

N 2,251,500

NOTES:

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BEACH FILL PLAN

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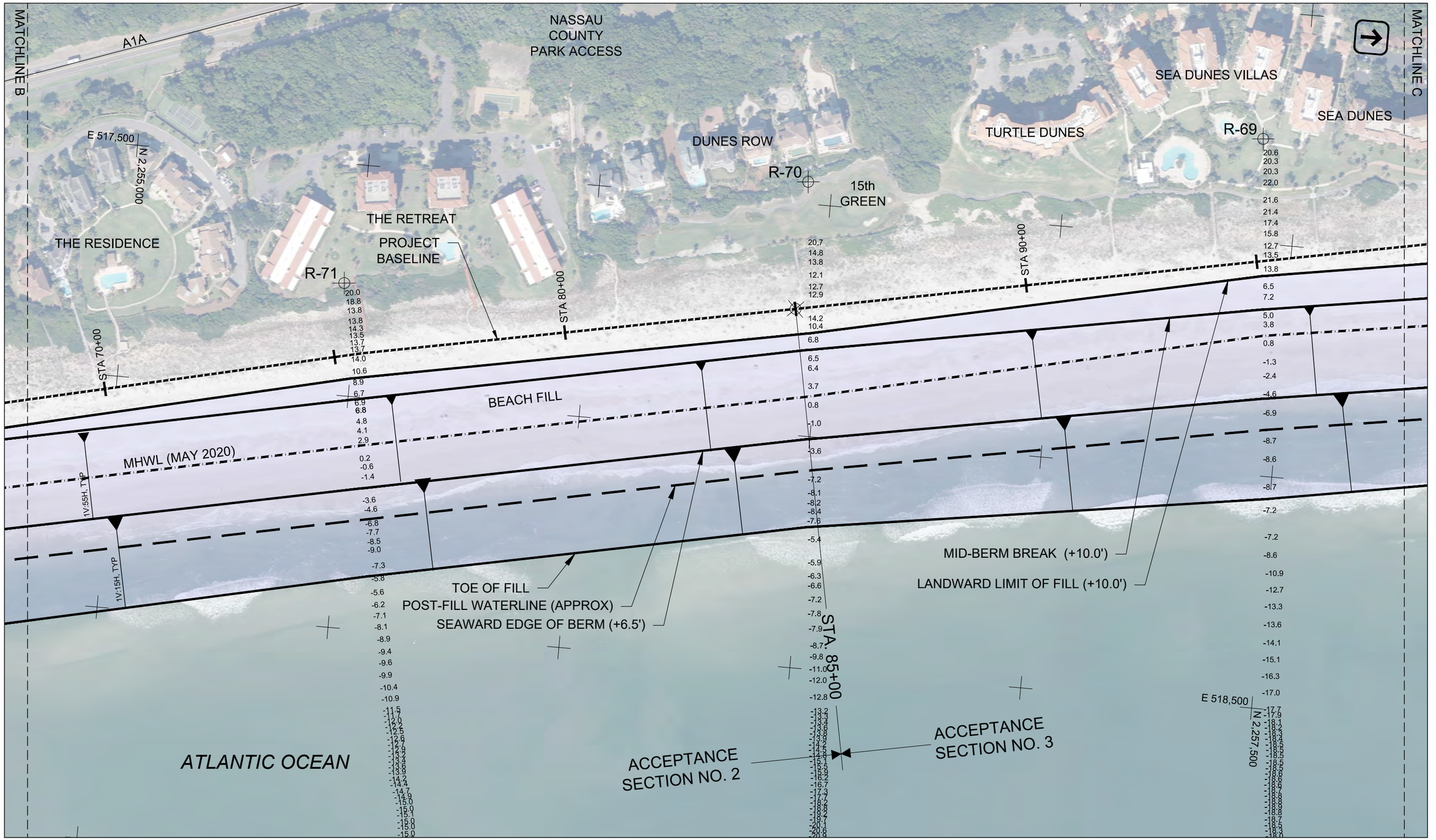
SHEET 6 of 15



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BEACH FILL PLAN

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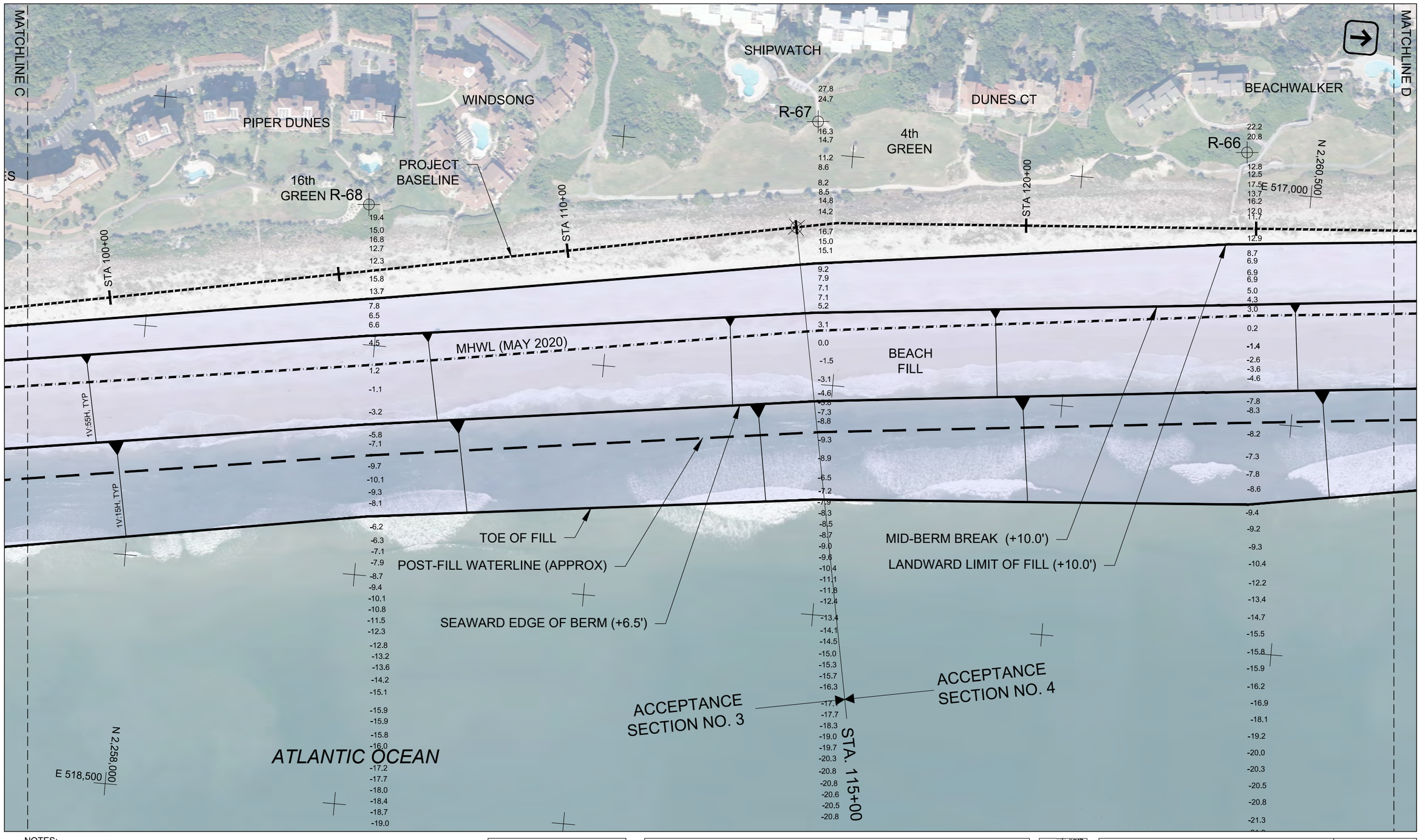
SHEET 7 of 15



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DREDGING & BEACH NOURISHMENT PROJECT

BEACH FILL PLAN

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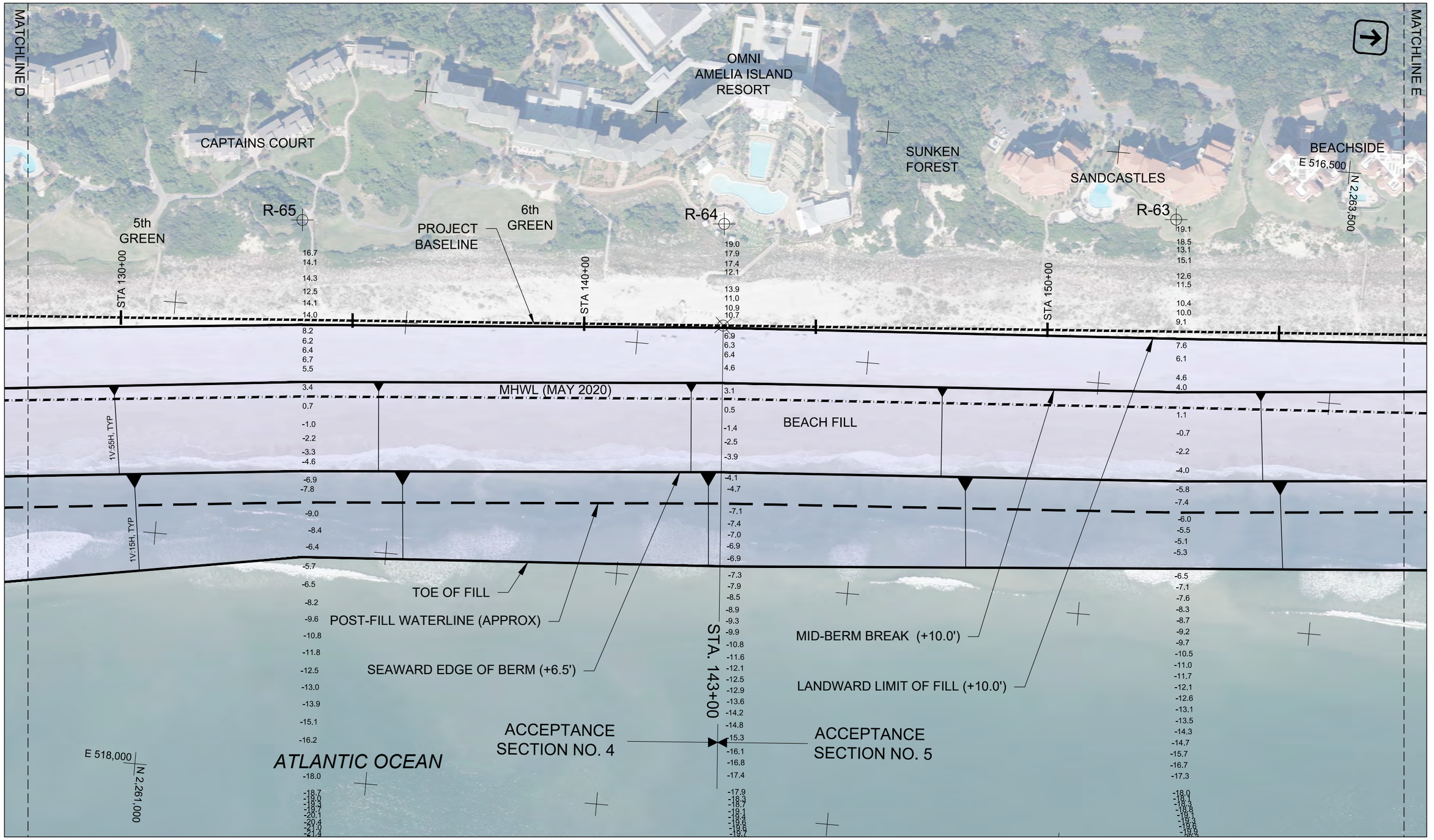
SHEET 8 of 15



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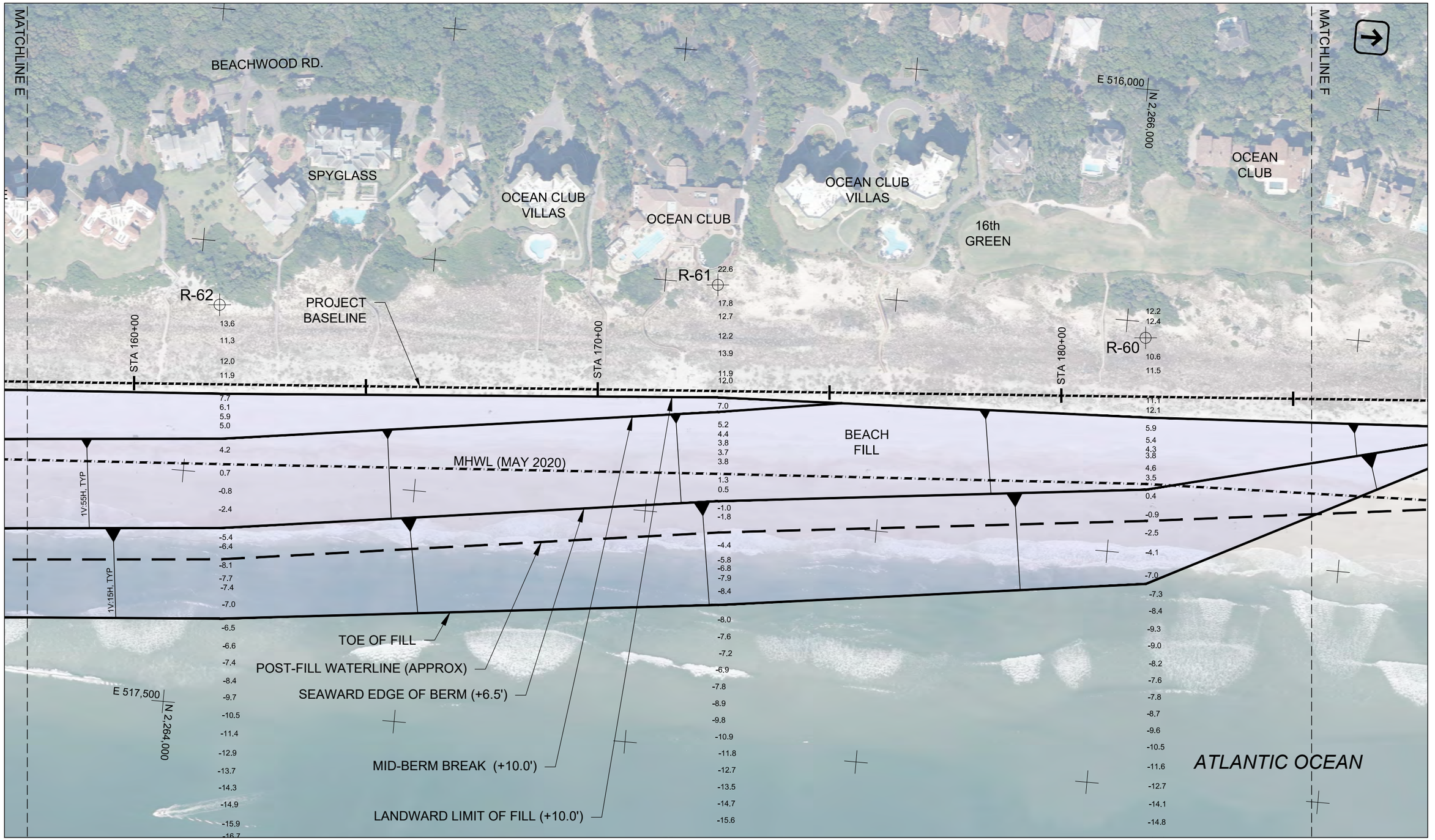
SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

BEACH FILL PLAN

DRAWN BY:	WAH	DATE: 01/19/2021
CHECKED BY:	AEB	DATE: 01/19/2021
REVISED BY:		DATE:

SHEET 9 of 15



NOTES:
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2) AERIAL PHOTO DATE: MAY 2020
3) SURVEY DATE: MAY 2020
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5) LANDWARD LIMIT OF FILL AND BERM WIDTH VARY ALONG PROJECT LENGTH
6) LANDWARD LIMIT OF FILL TO BE ADJUSTED TO AVOID IMPACTS TO EXISTING SIGNIFICANT DUNE VEGETATION

SCALE
0 100 200 FEET

BID SET

NOT RELEASED FOR CONSTRUCTION

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REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPRVD

olsen associates, inc.
coastal engineering
2618 Herschel Street
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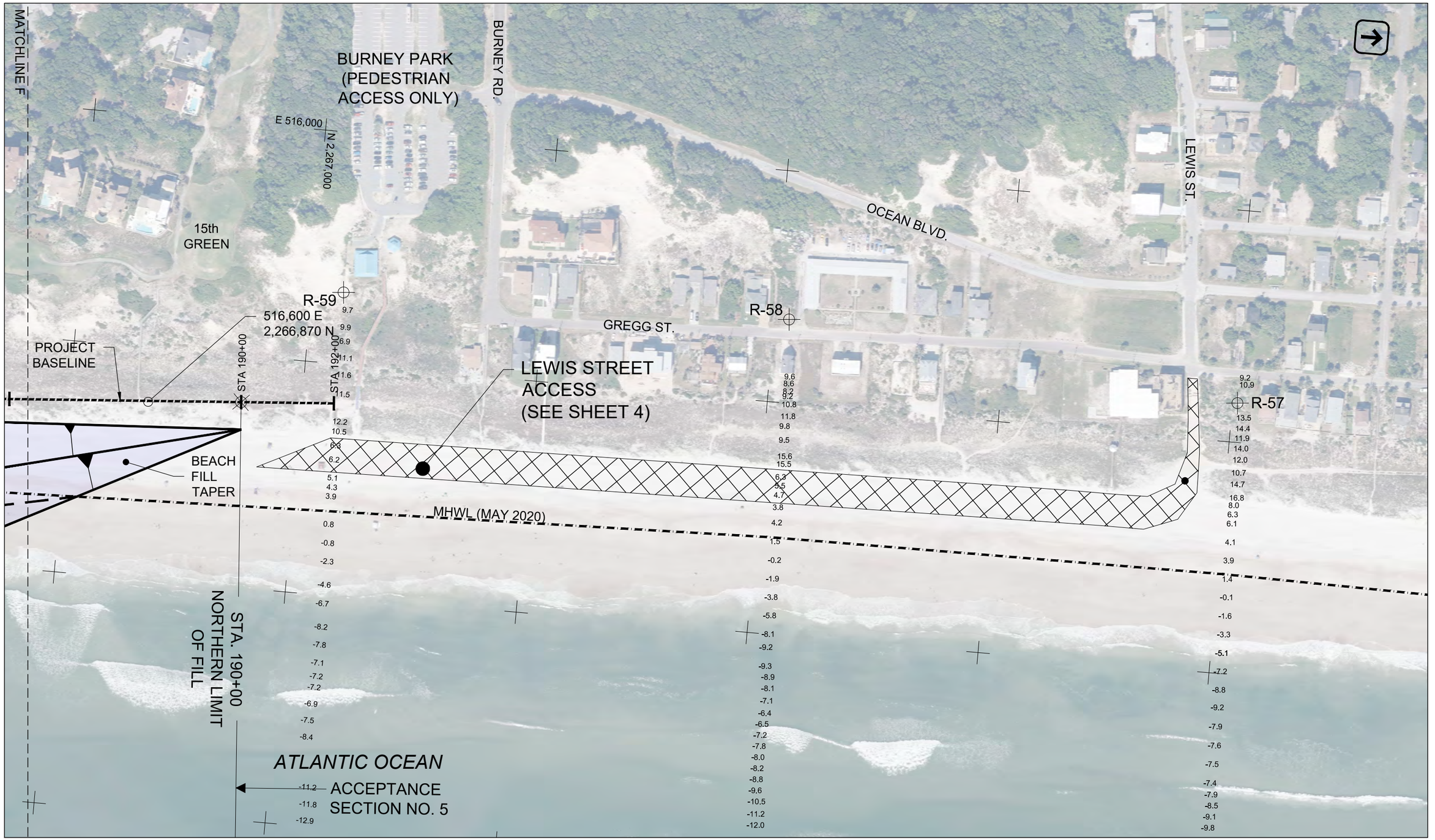
SHEET 10 of 15



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SCALE
0 100 200 FEET

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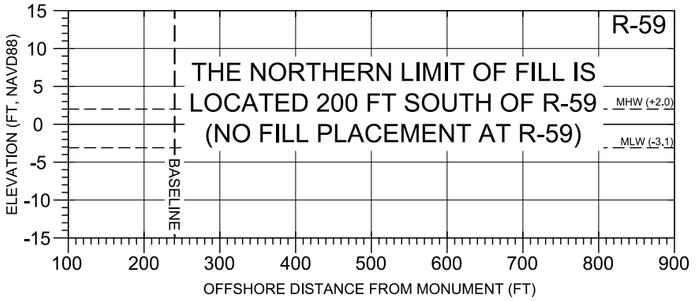
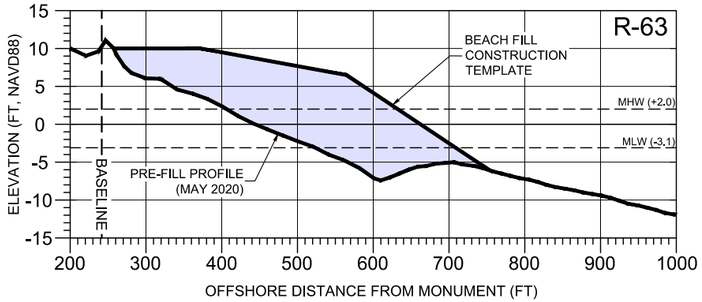
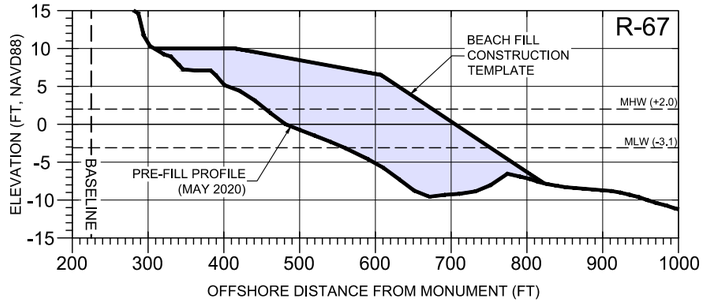
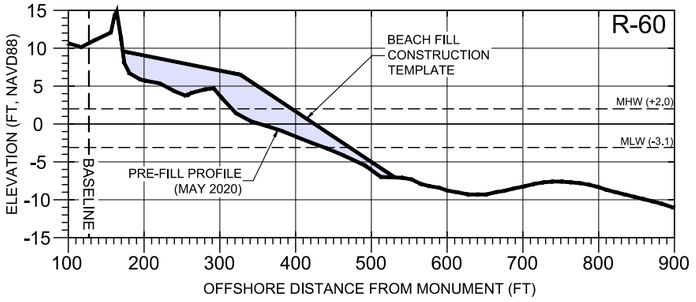
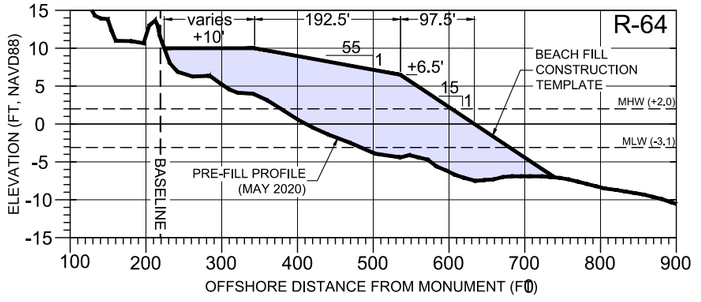
SHEET 11 of 15

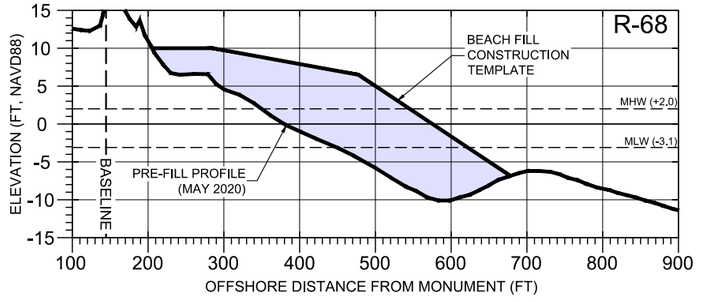


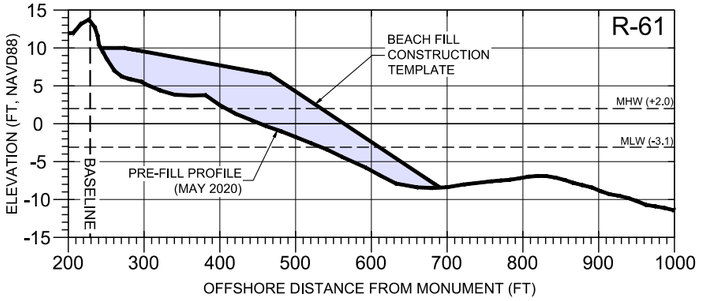


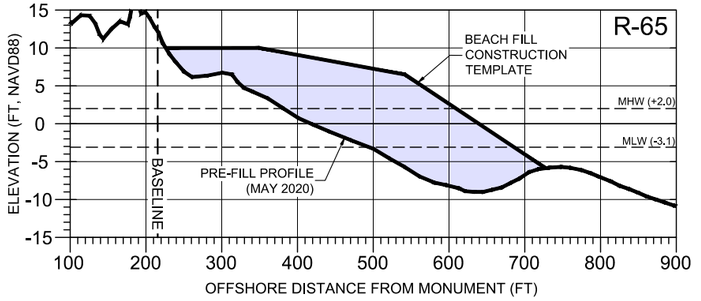


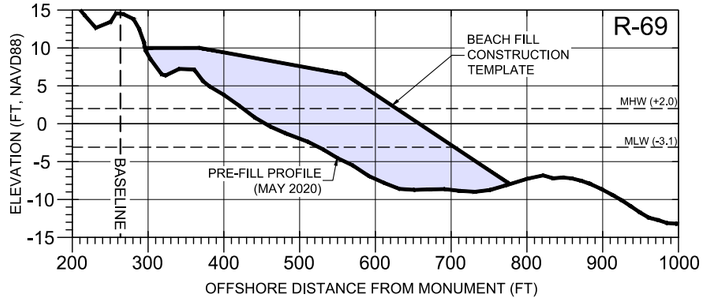


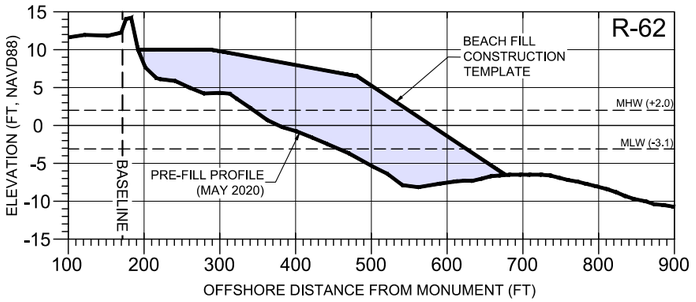


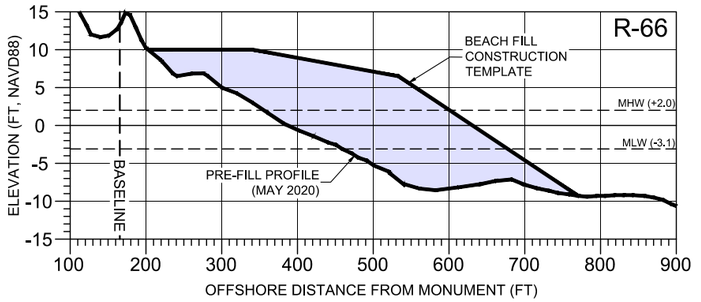


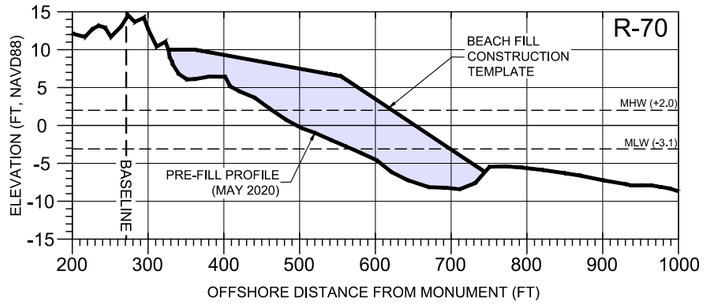












NOTES:
1) EXAGGERATED SCALE: 1V:10H
2) PROFILE SURVEY DATE: MAY 2020
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BID SET

NOT RELEASED FOR CONSTRUCTION

SEALED SET ON FILE WITH OWNER

REVISIONS

LTR	DESCRIPTION	BY	DATE	APPRVD

olsen associates, inc.
coastal engineering
2618 Herschel Street
Jacksonville, FL 32204
Tel. (904) 387-6114
COA 00003491

SOUTH AMELIA ISLAND, FL
DREDGING & BEACH NOURISHMENT PROJECT

BEACH FILL SECTIONS

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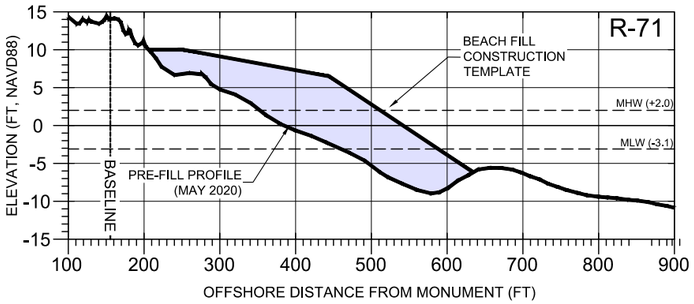

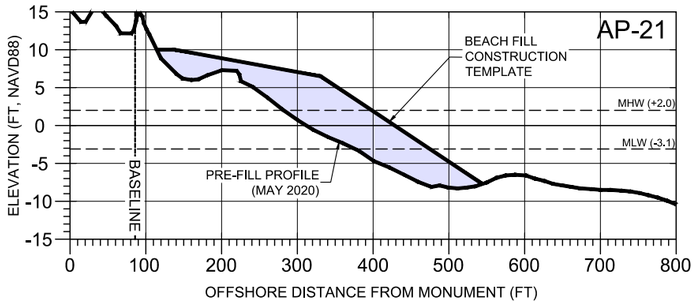

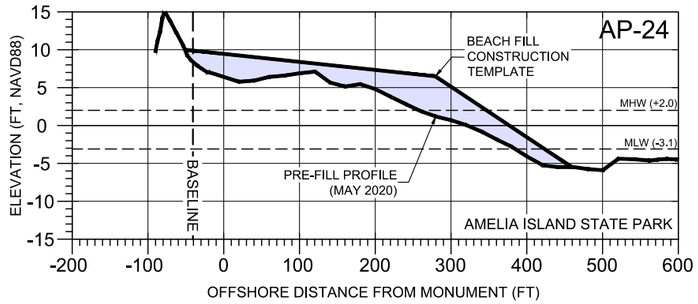

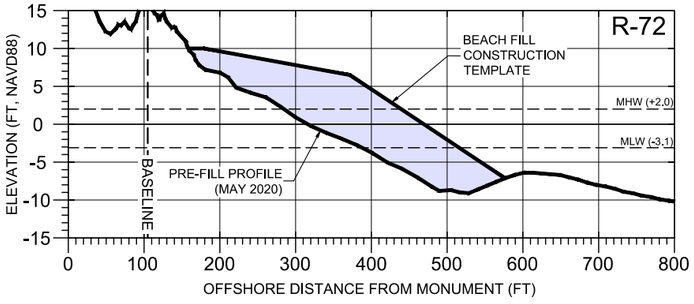

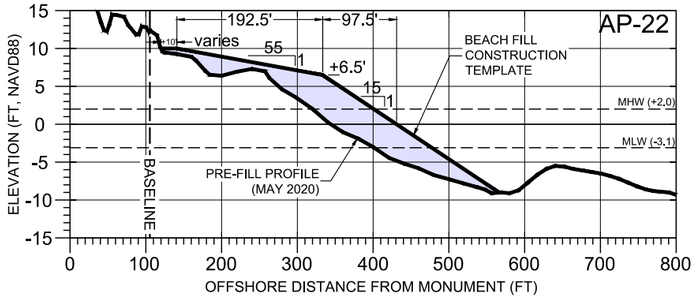

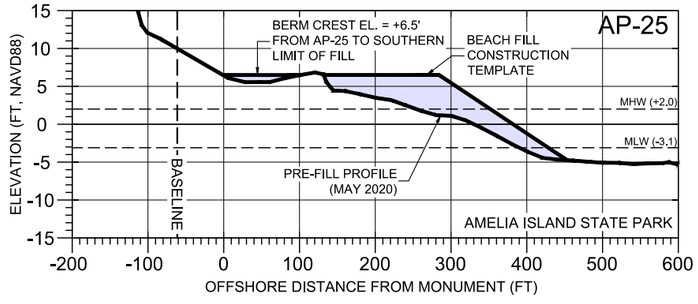

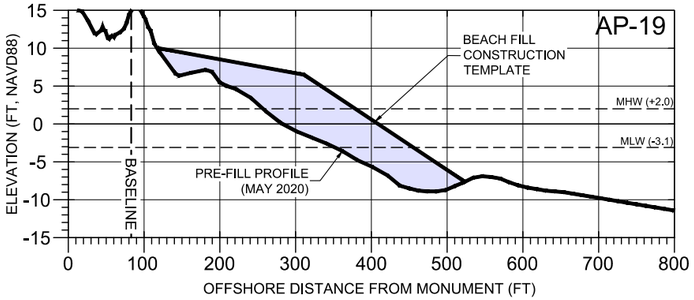

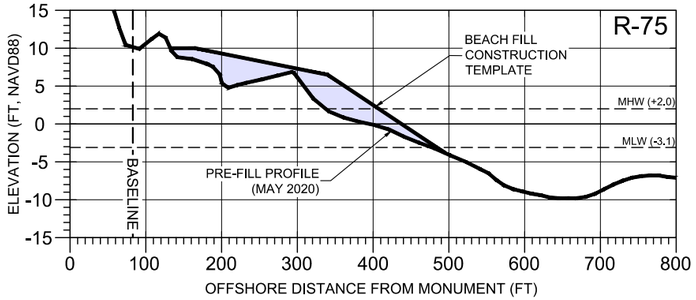

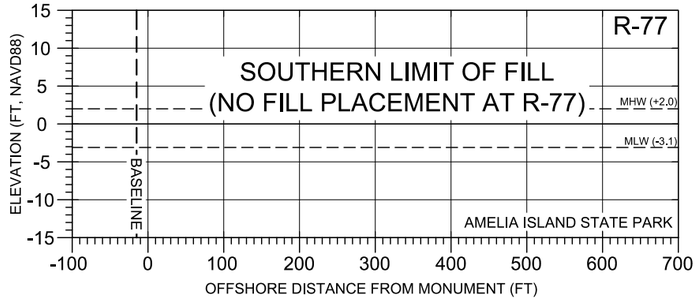

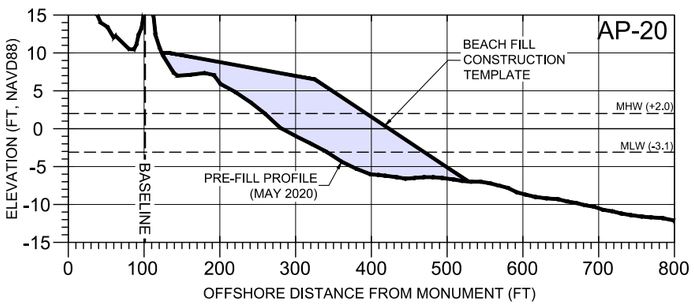

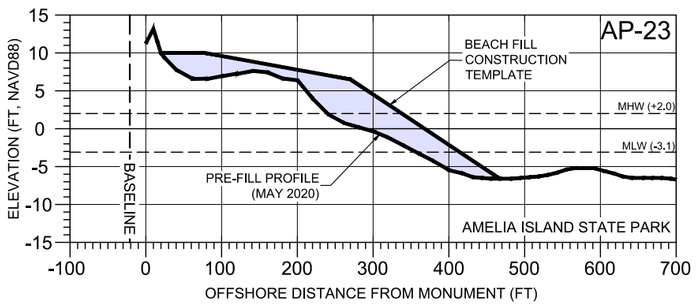

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SOUTH AMELIA ISLAND, FL
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BEACH FILL SECTIONS

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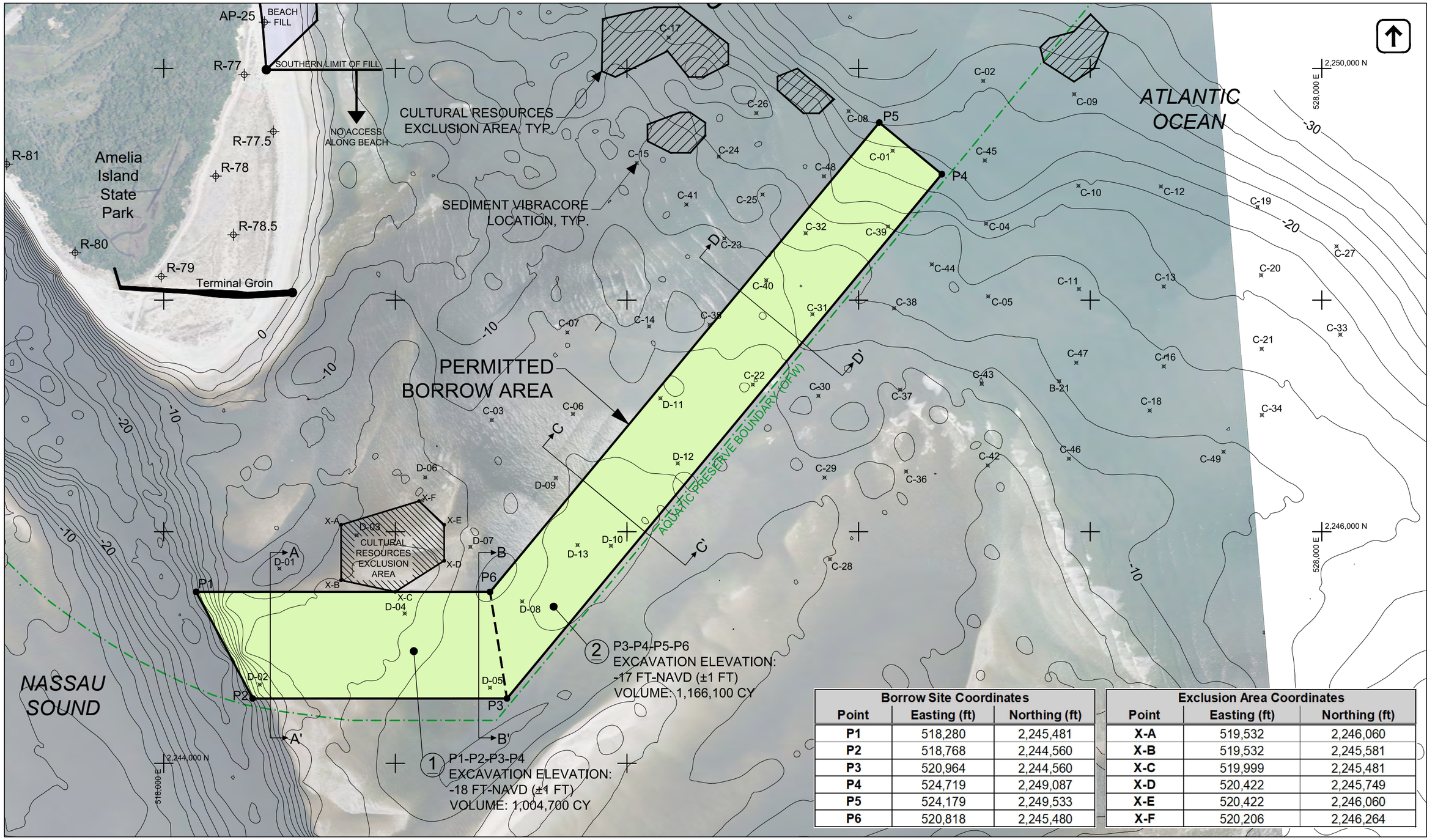
SHEET 13 of 15



2 P3-P4-P5-P6
EXCAVATION ELEVATION:
-17 FT-NAVD (±1 FT)
VOLUME: 1,166,100 CY

1 P1-P2-P3-P4
EXCAVATION ELEVATION:
-18 FT-NAVD (±1 FT)
VOLUME: 1,004,700 CY

Borrow Site Coordinates		
Point	Easting (ft)	Northing (ft)
P1	518,280	2,245,481
P2	518,768	2,244,560
P3	520,964	2,244,560
P4	524,719	2,249,087
P5	524,179	2,249,533
P6	520,818	2,245,480

Exclusion Area Coordinates		
Point	Easting (ft)	Northing (ft)
X-A	519,532	2,246,060
X-B	519,532	2,245,581
X-C	519,999	2,245,481
X-D	520,422	2,245,749
X-E	520,422	2,246,060
X-F	520,206	2,246,264

NOTES:
1) DATUMS: HORIZ. NAD83 SPC FL EAST; VERT. NAVD88, FT
2) SURVEY DATE: JUNE 2020
3) BORROW SITE TEMPLATE/COORDINATES TO BE PROVIDED IN ELECTRONIC FORMAT
4) VIBRACORE DATES VARY (2017 & 2018)
5) SEE SHEET 15 FOR BORROW SITE SECTIONS
6) ENGINEER RESERVES THE RIGHT TO NARROW THE EXCAVATION AREA AS NEEDED

SCALE
0 400 800 FEET

BID SET

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BORROW AREA PLAN

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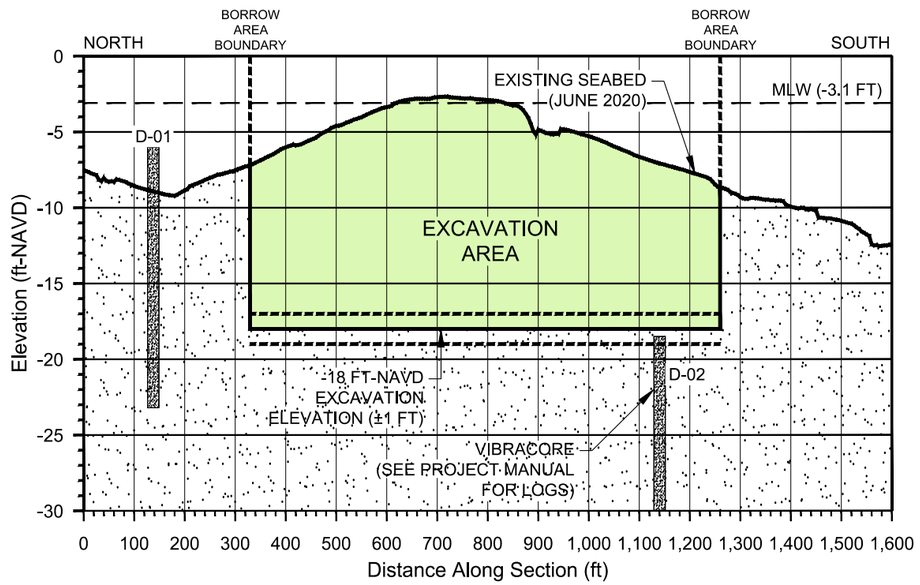
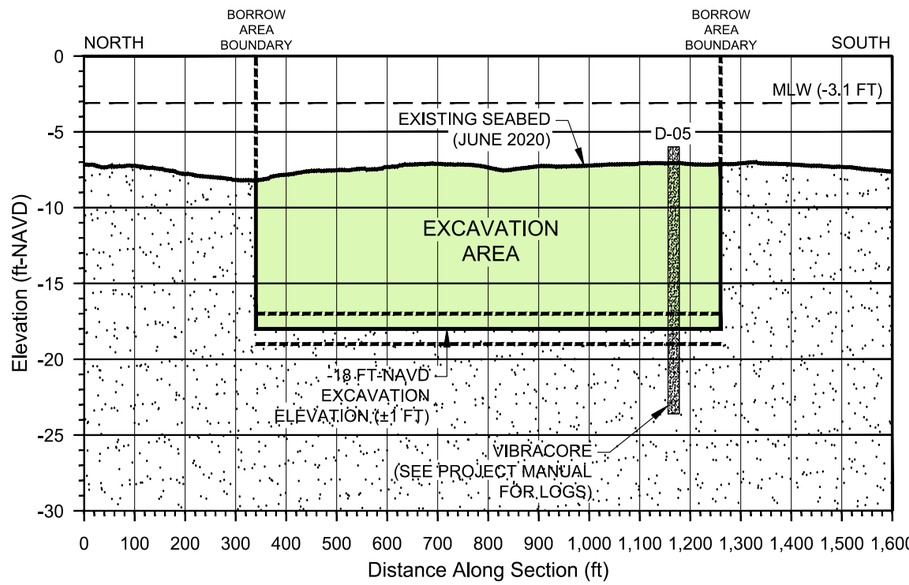


SECTION A-A'



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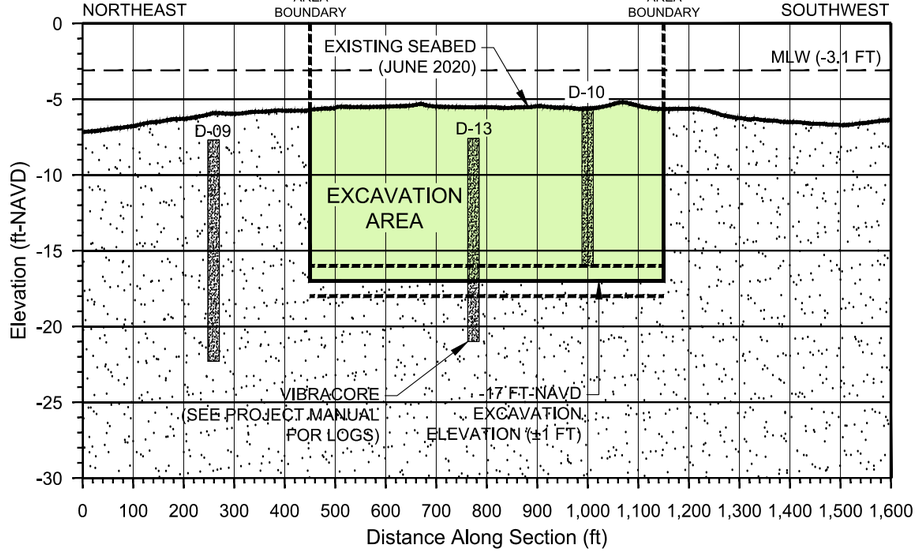
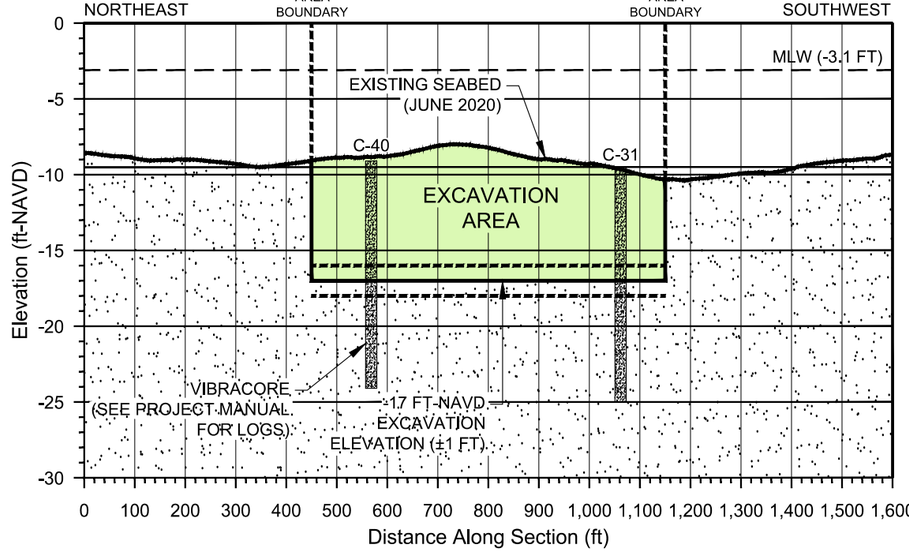


SECTION C-C'



SECTION D-D'

NOTES:
1) SEE SHEET 14 FOR SECTION LOCATIONS
2) BORROW SITE EXCAVATION AREA/COORDINATES TO BE PROVIDED IN ELECTRONIC FORMAT
3) POSITIONING OF VIBRACORES RELATIVE TO SEABED PROFILE IS APPROXIMATE. SEE VIBRACORE LOGS IN PROJECT MANUAL
4) EXCAVATION MAY OCCUR UP TO BORROW SITE LIMITS SHOWN
5) ENGINEER RESERVES THE RIGHT TO NARROW THE EXCAVATION AREA AS NEEDED

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BORROW AREA SECTIONS

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SHEET 15 of 15

APPENDIX C – Project Data
BID NO. NC21-008
South Amelia Island Dredging & Beach Nourishment Project

Geotechnical data:

Appendix C-1:
2018 Vibracores and geotechnical laboratory analyses (Athena Technologies, Inc.)

Appendix C-2:
2017 Vibracores and geotechnical laboratory analyses (Athena Technologies, Inc.)

Provided in electronic format (*.PDF)

APPENDIX C – Project Data
BID NO. NC21-008
South Amelia Island Dredging & Beach Nourishment Project

Geotechnical data:

Appendix C-1:
2018 Vibracores and geotechnical laboratory analyses (Athena Technologies, Inc.)

Appendix C-2:
2017 Vibracores and geotechnical laboratory analyses (Athena Technologies, Inc.)

GEOTECHNICAL VIBRACORE REPORT

2018 GEOTECHNICAL INVESTIGATION
NASSAU SOUND (SOUTH AMELIA ISLAND)
NASSAU COUNTY, FLORIDA

TABLE OF CONTENTS

TABLES

APPENDICES

1293 Graham Farm Road, PO Box 68
McClellanville, South Carolina 29458
(843) 887-3800
www.athenatechnologies.com

Section 1: Introduction

Athena Technologies, Inc. (Athena) was contracted by Olsen Associates, Inc. (OAI) of Jacksonville, Florida to collect geotechnical vibracore samples in Nassau Sound, which is located south of Amelia Island in northeast Florida. The purpose of the project was to evaluate geotechnical parameters of sediment lying within a proposed sand borrow area in Nassau Sound (**Figure 1**). The scope of services, which were conducted between August and November 2018, included the following:

1) Collection of 13 geotechnical vibracore samples to allow for geotechnical analysis.

2) Geological logging, core photography, sub-sample collection, contracting laboratory analyses, and geotechnical reporting.

Findings of the geotechnical investigation are presented below.

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McClellanville, South Carolina 29458
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Figure 1: Study Area Location Map, Nassau Sound, South Amelia Island, Nassau County, Florida

ATHENA TECHNOLOGIES, INC.

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McClellanville, South Carolina 29458
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Section 2: Methodology

Athena utilized our 35-foot research vessel, *Artemis* (**Figure 2**), to act as the sampling platform for this project. *Artemis* was equipped with all required United States Coast Guard (USCG) safety gear and was operated by a USCG-certified 100 Ton Master Captain. A Trimble Differential Global Positioning System (capable of sub-meter accuracy) interfaced with HYPACK was utilized for primary navigation. Horizontal coordinates were recorded in North American Datum of 1983 State Plane Coordinate System, Florida West (Zone 0902), U.S. Survey Feet. Real-time tide elevation data were obtained using a Champion TKO Global Navigation Satellite System (GNSS) receiver interfaced with the Florida Permanent Reference Network, which served as the base station.

Figure 2: Research Vessel* Artemis *offshore of Mobile Bay, Alabama.

During field operations, the research vessel was immobilized over the desired sample sites using a triple-point anchor system. Once on station, the coordinates at the vessel location were compared with the coordinates for the desired sample location to ensure accurate vessel positioning. Upon satisfactory positioning, a water depth was collected via lead line. Horizontal coordinates were recorded at each station and were referenced to North American Datum of 1983 State Plane Coordinate System, Florida East (Zone 0901), U.S. Survey Feet. Tide elevation data were also recorded in the field and were referenced to North American Vertical Datum of 1988. The tide elevation was then utilized to determine the sediment surface elevation at each sample location. Vibracore sample locations are depicted in **Figure 3**.

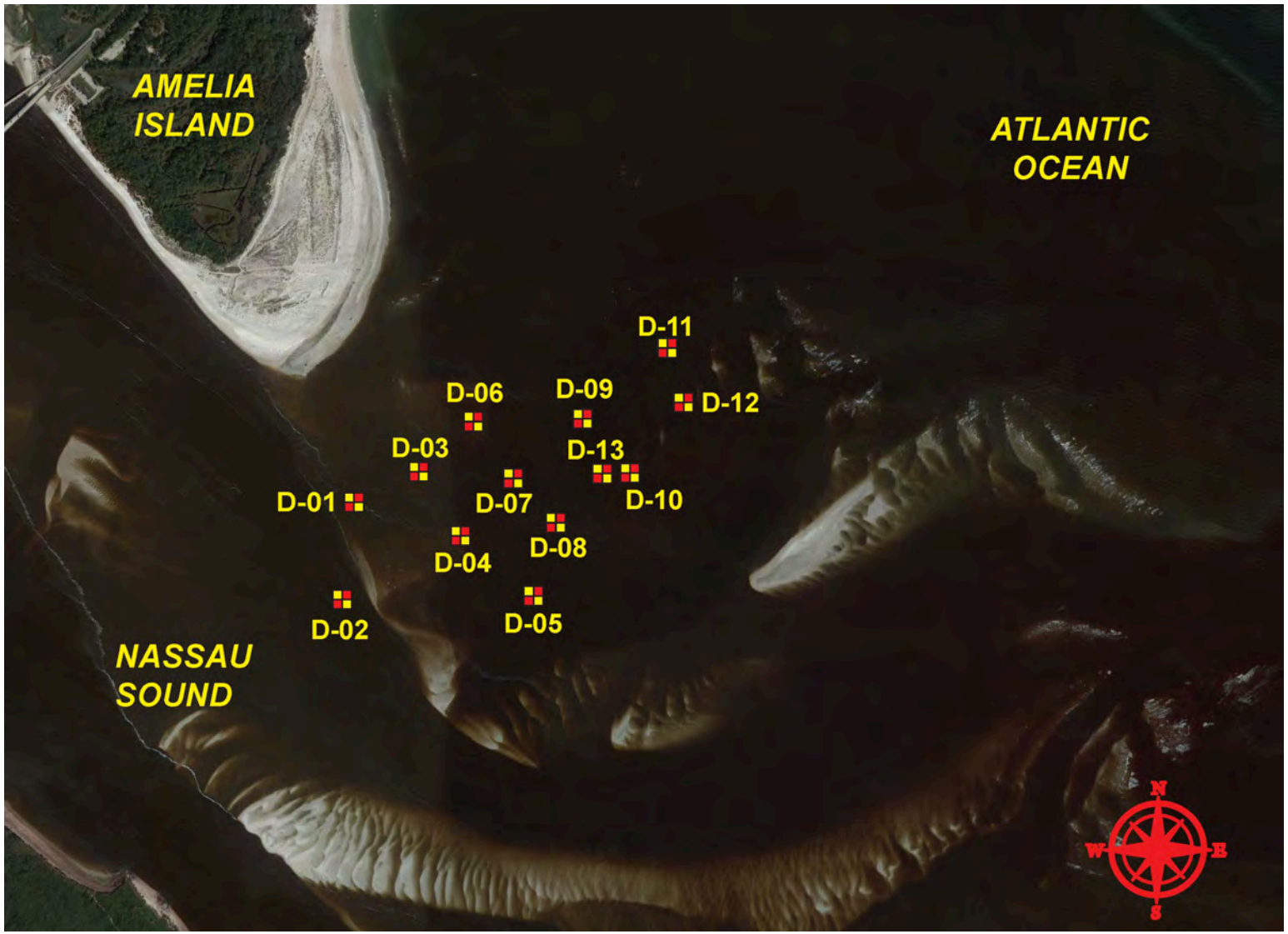

Figure 3: Vibracore Location Map, Nassau Sound, South Amelia Island, Nassau County, Florida

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A custom-designed and fabricated vibracore system was utilized to collect the geotechnical vibracores. The system consists of a generator with a mechanical vibrator attached via cable to a 3-inch diameter, galvanized sample barrel. The sample barrel was lowered until the bottom of the barrel was directly above the sediment surface. The vibracore machine was turned on and the sample barrel was allowed to penetrate until the bottom of the sample barrel reached project depth, or refusal. Once the sample barrel reached the termination depth, the machine was turned off and the sample barrel was retrieved using an electric winch. The recovered core length was measured following core retrieval, and percent recovery was verified. The cores were then capped, labeled, and cut into 5-foot sections (when necessary). A geotechnical vibracore summary has been included as **Table 1**.

The completed cores were opened longitudinally at Athena's core processing facility in McClellanville, South Carolina. The cores were photographed after opening and were logged by Athena's geologist in accordance with protocol outlined in ASTM D2487 and ASTM D2488. Draft core logs and photo-mosaic images of the cores were provided to OAI for sub-sample interval determination. Core photographs and logs have been included as **Appendix A**.

Upon receipt of sample selections from OAI, Athena extracted and shipped the sub-samples to Terracon Consultants, Inc. in Jacksonville, Florida, which is a USACE-certified geotechnical laboratory. The requested sampling program included the collection of 1 composite sample from each core (2 composite samples from D-01), and the collection of between 1 and 3 discrete grab samples from each core. The discrete and composite samples were analyzed in accordance with ASTM D6913 using the following sieve sizes: 3/4-inch, 5/8-inch, 7/16-inch, 5/16-inch, No. 3.5, No. 4, No. 5, No. 7, No. 10, No. 14, No. 18, No. 25, No. 35, No. 45, No. 60, No. 80, No. 120, No. 170, No. 200, and No. 230. Visual estimation of shell and rock fragment content was also conducted on material retained in each sieve using the Terry & Chilingar (1955) method and all samples were classified by the laboratory in accordance with protocol outlined in ASTM D2487. Composite samples were also analyzed for carbonate content using the Twenhofel and Tyler acid digestion method (1941). A laboratory data summary is presented in **Table 2**. Laboratory grain size data reports and distribution curves have been included as **Appendix B**.

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Table 1 – Geotechnical Vibracore Summary

Boring ID	Collection Date	Time	East (x)	North (y)	Water Depth (ft)	Tide Elevation (ft NAVD 88)	Sediment Surface Elevation (ft NAVD 88)	Bottom of Boring Elevation (ft NAVD 88)	Penetration (ft)	Recovery (ft)	Notes
D-01	8/20/2018	8:16	518999.3	2245682.2	3.8	-2.1	-6.0	-26.0	20.0	17.2	Core collected via 3-inch diameter sample barrel.
D-02	8/23/2018	10:01	518829.2	2244679.7	17.7	-0.8	-18.5	-32.0	13.5	11.5	Core collected via 3-inch diameter sample barrel.
D-03	9/19/2018	8:49	519667.4	2245969.8	4.8	-2.0	-6.8	-23.8	17.0	14.3	Core collected via 4-inch diameter sample barrel.
D-04	8/20/2018	14:41	520081.0	2245293.7	4.6	0.6	-4.0	-17.0	13.0	11.3	Core collected via 3-inch diameter sample barrel; only 1 coring attempt made at the location due to vessel surging; sediment stopped feeding into sample barrel at ~13' below sediment surface; core retained.
D-05	9/18/2018	7:59	520817.3	2244652.9	6.7	-1.9	-8.6	-27.1	18.5	15.0	Core collected via 4-inch diameter sample barrel.
D-06	8/22/2018	8:15	520257.4	2246469.3	5.3	-0.4	-5.7	-22.2	16.5	13.2	Core collected via 4-inch diameter sample barrel.
D-07	8/22/2018	11:27	520648.3	2245868.3	4.8	-3.0	-7.8	-24.3	16.5	13.5	Core collected via 4-inch diameter sample barrel; sediment stopped feeding into sample barrel at ~16.5' below sediment surface; core retained.
D-08	9/18/2018	10:40	521095.3	2245398.3	6.2	-2.6	-8.7	-25.0	16.3	13.2	Core collected via 4-inch diameter sample barrel.
D-09	9/19/2018	12:42	521385.9	2246463.8	5.7	-2.0	-7.7	-26.7	19.0	14.6	Core collected via 4-inch diameter sample barrel.
D-10	8/20/2018	13:48	521861.7	2245877.8	4.9	-0.5	-5.5	-16.0	10.5	8.7	Core collected via 3-inch diameter sample barrel; only 1 coring attempt made at the location due to vessel surging; sediment stopped feeding into sample barrel at ~10.5' below sediment surface; core retained.
D-11	8/20/2018	11:46	522289.1	2247152.7	5.8	-2.6	-8.4	-20.9	12.5	10.9	Core collected via 3-inch diameter sample barrel; only 1 coring attempt made at the location due to vessel surging; sediment stopped feeding into sample barrel at ~12.5' below sediment surface; core retained.
D-12	8/20/2018	12:44	522439.2	2246590.0	4.6	-1.4	-6.0	-15.5	9.5	8.2	Core collected via 3-inch diameter sample barrel; only 1 coring attempt made at the location due to vessel surging; sediment stopped feeding into sample barrel at ~9.5' below sediment surface; core retained.
D-13	9/19/2018	10:59	521573.8	2245884.8	4.7	-3.0	-7.6	-24.1	16.5	13.4	Core collected via 4-inch diameter sample barrel.

Notes	
	ft = feet
	NAVD 88 = North American Vertical Datum of 1988
	Coordinates were recorded in North American Datum of 1983, State Plane Coordinate System, Florida East (Zone 0901), US Survey Feet.
	Elevation data collected using a Champion TKO GNSS System interfaced with the Florida Permanent Reference Network.

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Table 2 – Laboratory Data Summary

Boring ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #230 Sieve	Percent Gravel-Sized Fraction[1]	Percent Shell Fragments[2]	Percent Carbonate[3]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
D-01	C-1	0.0	11.0	SP	1.07	1.93		23.4	1.45	0.37	1.81	0.29	1.29	-1.34	4.63
	C-2	0.0	16.0	SP	0.96	1.83		18.3	1.84	0.28	2.27	0.21	1.32	-1.58	5.25
	S-1	0.8	1.3	SP	0.00	4.22	51		0.54	0.69	0.82	0.57	1.41	-0.66	2.87
	S-2	5.8	6.3	SP	0.96	0.16	6		2.33	0.20	2.37	0.19	0.53	-2.61	22.34
D-02	C-1	0.0	3.5	SP-SM	6.11	1.82		10.3	2.01	0.25	2.32	0.20	1.12	-2.71	10.97
	S-1	0.8	1.3	SP	1.13	0.21	8		2.10	0.23	2.25	0.21	0.80	-2.30	10.55
	S-2	6.8	7.3	SP	1.01	4.07	46		0.74	0.60	1.13	0.46	1.51	-0.60	2.42
D-03	C-1	0.0	14.3	SP	1.84	5.62		33.8	1.01	0.50	1.53	0.35	1.70	-0.75	2.53
	S-1	0.8	1.3	SP	0.97	2.73	38		1.10	0.47	1.53	0.35	1.47	-0.91	3.15
	S-2	7.8	8.3	SP	4.15	7.15	57		0.29	0.82	0.44	0.74	1.67	-0.15	2.12
	S-3	12.8	13.3	SP	0.47	0.82	7		2.27	0.21	2.55	0.17	0.96	-2.88	12.84
D-04	C-1	0.0	11.3	SP	1.11	2.68		26.8	1.56	0.34	2.14	0.23	1.46	-1.39	4.02
	S-1	0.8	1.3	SP	0.26	0.00	5		2.34	0.20	2.49	0.18	0.66	-2.39	11.42
	S-2	4.8	5.3	SP	1.50	2.60	48		0.69	0.62	0.96	0.51	1.39	-0.46	2.40
D-05	C-1	0.0	13.4	SP	0.86	4.27		28.4	1.38	0.38	2.04	0.24	1.60	-1.17	3.36
	S-1	0.8	1.3	SP	0.38	0.55	14		2.07	0.24	2.34	0.20	0.99	-2.26	8.70
	S-2	5.8	6.3	SP	4.62	6.30	32		1.02	0.49	1.69	0.31	1.76	-1.00	3.08
	S-3	12.8	13.3	SP	0.98	8.08	62		0.21	0.86	0.35	0.78	1.61	-0.33	2.57
D-06	C-1	0.0	13.3	SP	0.49	7.67		40.8	0.50	0.71	0.83	0.56	1.59	-0.32	2.34
	S-1	0.8	1.3	SP	0.58	2.64	47		0.68	0.62	0.89	0.54	1.36	-0.45	2.54
	S-2	10.8	11.3	SP	0.74	1.18	8		2.23	0.21	2.35	0.20	0.83	-3.55	19.98
D-07	C-1	0.0	13.5	SP	1.95	5.71		27.2	1.34	0.40	2.05	0.24	1.71	-1.31	3.84
	S-1	0.8	1.3	SP	1.10	0.35	6		2.25	0.21	2.41	0.19	0.78	-2.70	13.41
	S-2	5.8	6.3	SP	1.72	5.78	46		0.72	0.61	1.17	0.44	1.54	-0.88	3.16
	S-3	10.8	11.3	SP	1.42	0.00	3		2.45	0.18	2.54	0.17	0.50	-1.19	6.88

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Table 2 – Laboratory Data Summary (continued)

Boring ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #230 Sieve	Percent Gravel-Sized Fraction [1]	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
D-08	C-1	0.0	10.0	SP	1.43	5.83		34.1	0.96	0.51	1.51	0.35	1.65	-0.80	2.61
	S-1	0.8	1.3	SP	1.22	0.02	7		2.18	0.22	2.30	0.20	0.69	-2.54	12.38
	S-2	5.8	6.3	SP	1.65	3.56	40		1.02	0.49	1.47	0.36	1.57	-0.69	2.51
	S-3	11.8	12.3	SP	2.43	12.22	58		0.19	0.88	0.53	0.69	1.67	0.20	2.20
D-09	C-1	0.0	14.6	SP	1.68	4.81		31.6	1.31	0.40	1.95	0.26	1.64	-1.10	3.23
	S-1	0.8	1.3	SP	1.00	0.19	3		2.29	0.20	2.34	0.20	0.55	-3.35	26.72
	S-2	6.8	7.3	SW	0.03	5.02	46		0.77	0.59	1.09	0.47	1.71	-0.52	2.34
	S-3	11.8	12.3	SP	1.54	0.00	3		2.64	0.16	2.68	0.16	0.36	-1.44	16.60
D-10	C-1	0.0	8.7	SP	1.38	3.68		23.3	1.69	0.31	2.29	0.20	1.55	-1.63	4.81
	S-1	0.8	1.3	SP	1.14	0.00	3		2.33	0.20	2.38	0.19	0.51	-2.44	16.38
D-11	C-1	0.0	10.9	SP	1.22	2.87		28.9	1.42	0.37	2.06	0.24	1.60	-1.02	3.00
	S-1	0.8	1.3	SP	1.15	1.05	17		1.81	0.29	2.20	0.22	1.20	-1.79	6.03
	S-2	8.8	9.3	SP	1.35	3.48	53		0.58	0.67	0.84	0.56	1.61	-0.27	1.87
D-12	C-1	0.0	8.3	SP	1.41	5.47		27.4	1.34	0.40	2.13	0.23	1.59	-0.97	3.02
	S-1	0.8	1.3	SP	1.32	0.04	4		2.35	0.20	2.47	0.18	0.63	-2.99	15.52
	S-2	5.8	6.3	SP	1.83	5.27	57		0.41	0.75	0.46	0.73	1.61	-0.10	2.15
D-13	C-1	0.0	13.4	SP	1.64	5.67		22.8	1.51	0.35	2.22	0.21	1.77	-1.67	5.15
	S-1	0.8	1.3	SP	1.07	0.14	8		2.31	0.20	2.40	0.19	0.60	-2.85	17.51
	S-2	8.8	9.3	SP	1.61	1.73	31		1.39	0.38	1.73	0.30	1.37	-1.06	3.51

Notes

ft bss = feet below sediment surface

USCS = Unified Soil Classification System

[1] = Defined as the sample fraction which is retained on the Number 4 (or larger) sieve (i.e., greater than 4.75 millimeters).

[2] = Percent shell fragments determined visually using the Terry and Chilingar method (1955).

[3] = Percent carbonate determined using the Twenhofel and Tyler acid digestion method (1941).

mm = millimeters

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Section 3: Discussion

The vibracore study area (depicted on Figure 1) was located at the entrance to Nassau Sound, which is a tidal inlet bounded by two barrier islands: Amelia Island to the north and Little Talbot Island to the south. More specifically, the vibracores were positioned primarily along the northern portion of an ebb-tidal delta located seaward of Nassau Sound. The mean tidal range at the study area is approximately five (5) feet, and tidal current velocities range from 1.5 to greater than 2 knots during peak tidal exchange periods (National Oceanic and Atmospheric Administration).

Sediment surface elevations in the project area ranged from approximately -4 to -18.5 feet NAVD 88 and core termination depths ranged from -15.5 to -32.0 feet NAVD 88. Water depths at the sample locations within the study area ranged from approximately 4 to 18 feet; the average water depth was approximately 6 feet. The relatively shallow nature of the study area, in conjunction with study area's exposure to open ocean processes (e.g., wave refraction), resulted in amplified wave heights and variable wave directions on the ebb tidal delta. The wave action within the study area caused the vessel to pitch in a non-uniform manner, which limited the effectiveness of the vibracore system and made safety an overriding concern during vibracore operations. All reasonable efforts were made to collect vibracores from the desired locations while minimizing risk to crew and equipment.

The clastic (i.e., non-shell) fraction in each core was predominantly fine-grained, poorly graded quartz sand. The average mean grain size for all samples (composite and discrete) reporting less than 20 percent shell or carbonate material was 0.21 millimeters (mm). Conversely, the average mean grain size for samples reporting greater than 20 percent shell or carbonate material was 0.53 mm, which indicates that shell material in the cores are generally fine to medium sand-size.

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Section 4: References

ASTM D 2487-11, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM International, West Conshohocken, PA. 2011.

ASTM D 2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), ASTM International, West Conshohocken, PA. 2000.

ASTM D 6913-04, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis, ASTM International, West Conshohocken, PA. 2004.

National Oceanic and Atmospheric Administration. Tide Station: Nassau River Entrance, FL (Station ID: 8720135).

Terry, R. D. and Chilingar, C. V. (1955). Summary of "Concerning some additional aids in studying sedimentary formations" by M. S. Shvetsov. *Journal of Sedimentary Petrology*, Volume 25, pp. 229-214.

Twenhofel, W.H. and Tyler S.A. (1941). Methods of Study of Sediments, McGraw-Hill, New York, p. 183.

Appendix A:
Core Photographs and Logs

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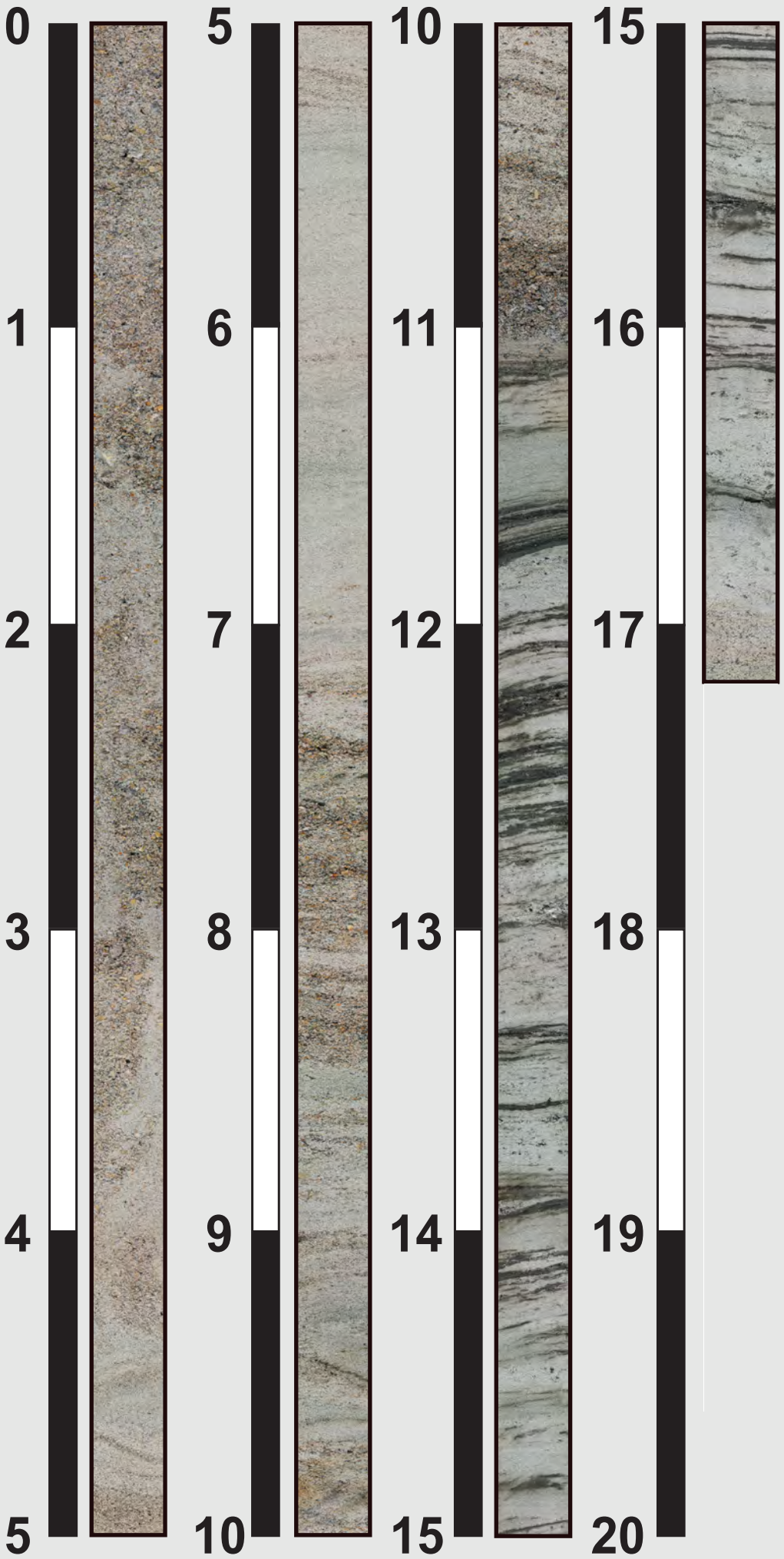

Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-01

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 3 in.

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Boring Designation D-01

DRILLING LOG

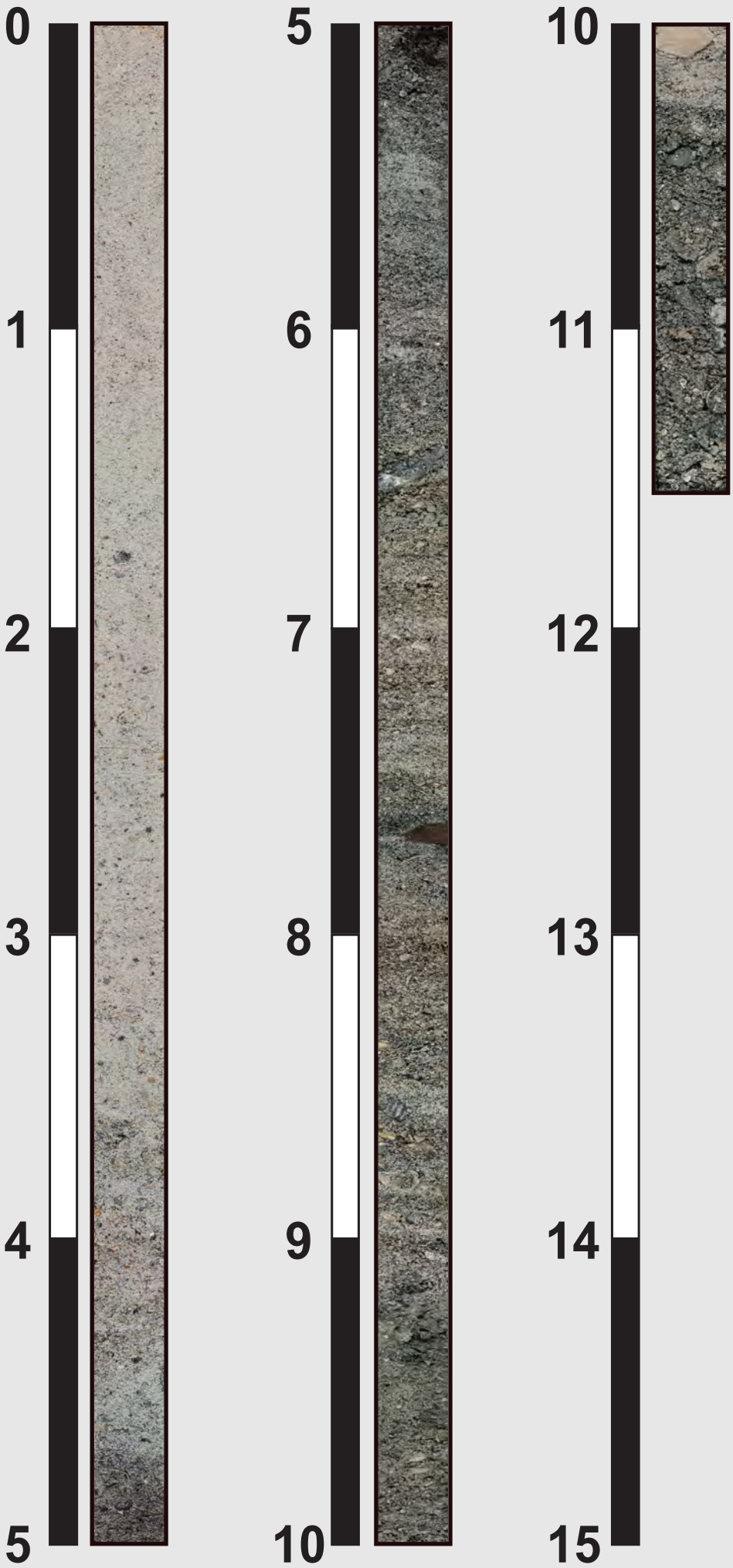
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
2. BORING DESIGNATION	D-01
LOCATION COORDINATES	X = 518,999 Y = 2,245,682
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 2 UNDISTURBED (UD): 2
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.8 Ft.
15. DATE BORING	STARTED: 08-20-18 08:16 COMPLETED: 08-20-18
16. ELEVATION TOP OF BORING	-6.0 Ft.
17. TOTAL RECOVERY FOR BORING	17.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-6.0	0.0					
-11.0	5.0		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, loose, subangular, bidirectional bedding evident at base of interval, light gray (2.5Y-7/2), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.69, Phi Sorting: 1.41 Shell: 51%, Fines (#200) - 0.00 (SP)
					C-1	Sample #C-1, Depth = 0.0' - 11.0' Mean (mm): 0.37, Phi Sorting: 1.29 Carbonate: 23.4%, Fines (#200) - 1.08 (SP)
-13.3	7.3		Poorly graded SAND; mostly fine quartz sand, trace fine to medium sand-sized shell in laminations and in matrix, medium dense, subangular, light gray (2.5Y-7/1), (SP).		S-2	Sample #S-2, Depth = 5.8' - 6.3' Mean (mm): 0.20, Phi Sorting: 0.53 Shell: 6%, Fines (#200) - 1.01 (SP)
-14.5	8.5		Poorly graded SAND; mostly fine to medium quartz sand, little fine to coarse sand-sized shell in matrix, trace inorganic clay as rip-ups, loose, subangular, light gray (2.5Y-7/2), (SP).			
-15.7	9.7					
-17.0	11.0		Poorly graded SAND; mostly fine to medium quartz sand, few fine to coarse sand-sized shell in matrix, trace inorganic silt in occasional lamination, trace organic silt as rip-up clast, medium dense, subangular, bidirectional bedding present, light gray (2.5Y-7/1), (SP).			
			Poorly graded SAND; mostly fine to medium quartz sand, little fine to sand to fine gravel-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, color grades to light brownish gray (2.5Y 6/2) from, light gray (2.5Y-7/2), (SP).		C-2	Sample #C-2, Depth = 0.0' - 16.0' Mean (mm): 0.28, Phi Sorting: 1.32 Carbonate: 18.3%, Fines (#200) - 1.03 (SP)
-23.2	17.2		Poorly graded SAND; mostly fine quartz sand, trace inorganic and organic silt in laminations and burrows, trace fine to coarse sand-sized shell in matrix, loose, subangular, gray (5Y-6/1), (SP).			
-26.0	20.0		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-02

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 3 in.

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Boring Designation D-02

DRILLING LOG

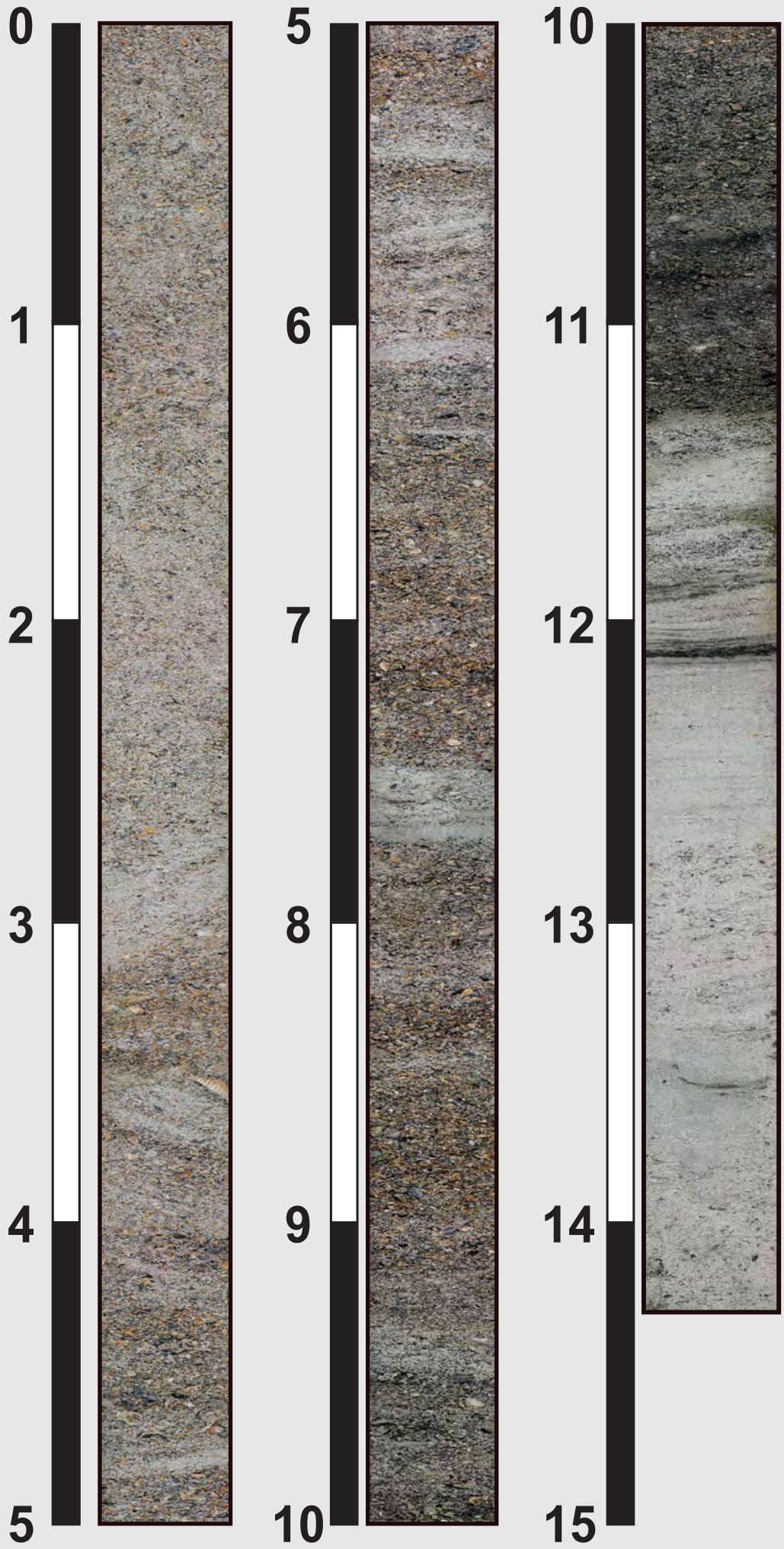
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-02
LOCATION COORDINATES	X = 518,829 Y = 2,244,680
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 2
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	17.7 Ft.
15. DATE BORING	STARTED: 08-23-18 10:01 / COMPLETED: 08-23-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-18.5 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	11.5 Ft.
8. TOTAL DEPTH OF BORING	13.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-18.5	0.0					
			Poorly graded SAND; mostly fine quartz sand, few fine to coarse sand-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.23, Phi Sorting: 0.80 Shell: 8%, Fines (#200) - 1.14 (SP)
-22.1	3.6				C-1	Sample #C-1, Depth = 0.0' - 3.5' Mean (mm): 0.25, Phi Sorting: 1.12 Carbonate: 10.3%, Fines (#200) - 6.12 (SP-SM)
-23.2	4.7		Poorly graded SAND; mostly fine to medium quartz sand, few fine sand to fine gravel-sized shell in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).			
			Poorly graded SAND; mostly medium quartz sand, some fine sand to coarse gravel-sized shell in matrix, coarse gravel-sized wood fragments present, loose, subangular, gray (5Y-5/1), (SP).		S-2	Sample #S-2, Depth = 6.8' - 7.3' Mean (mm): 0.60, Phi Sorting: 1.51 Shell: 46%, Fines (#200) - 1.06 (SP)
-27.7	9.2					
-28.9	10.4		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to coarse gravel-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, gray (5Y-5/1), (SP).			
-30.0	11.5		Poorly graded SAND; mostly fine to coarse sand-sized shell, some fine to medium quartz sand, few fine to coarse sand-sized shell, few fine to coarse sand-sized partially cemented clastic sediments, very loose, subangular, dark gray (5Y-4/1), (SP).			
-32.0	13.5		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-03

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-03

DRILLING LOG

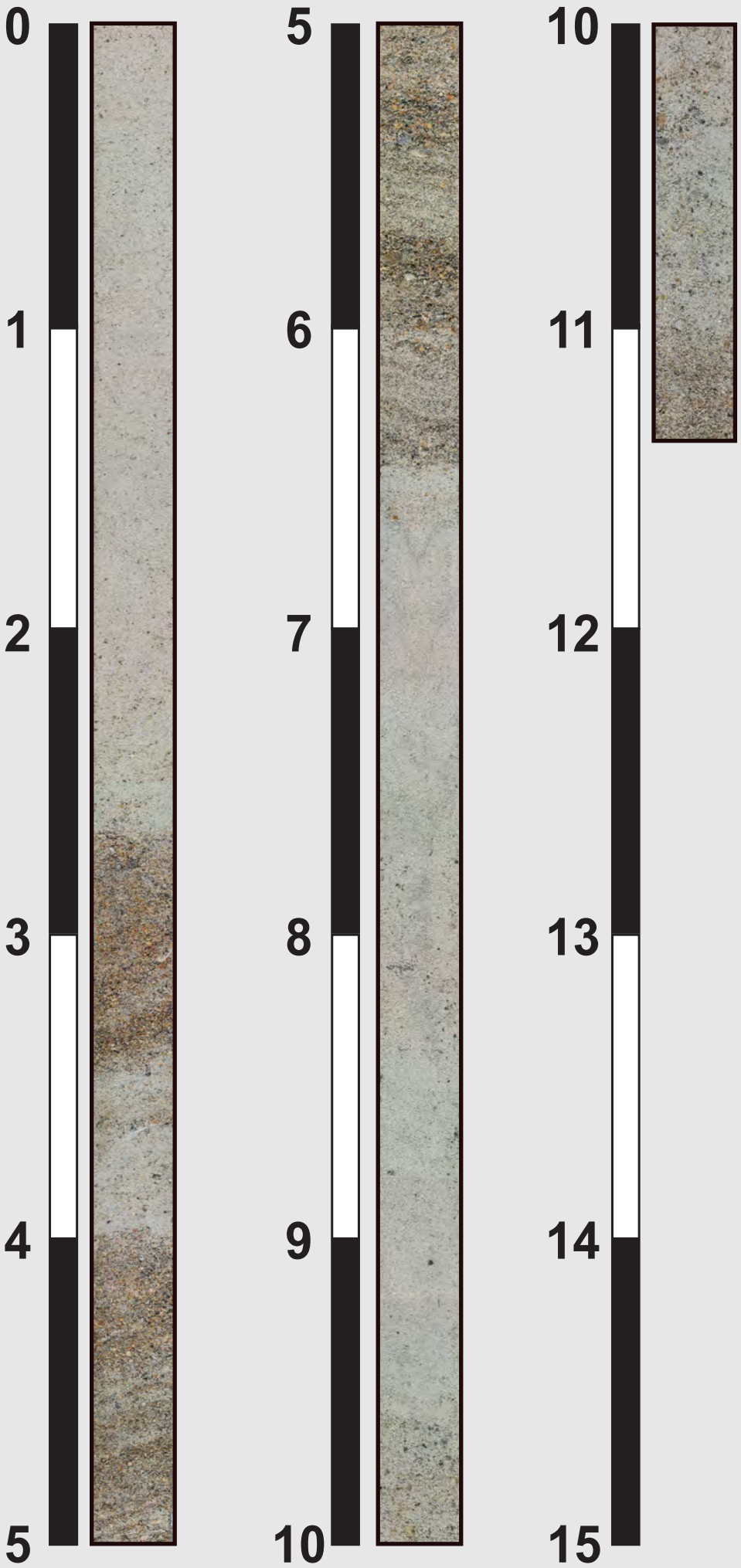
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	D-03
LOCATION COORDINATES	X = 519,667 Y = 2,245,970
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 3
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	4.8 Ft.
15. DATE BORING	STARTED: 09-19-18 08:49 / COMPLETED: 09-19-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-6.8 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	14.3 Ft.
8. TOTAL DEPTH OF BORING	17.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-6.8	0.0					
			Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, loose, subangular, light gray (2.5Y-7/2), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.47, Phi Sorting: 1.47 Shell: 38%, Fines (#200) - 0.99 (SP)
-9.9	3.1					
			Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix and layers, trace inorganic silt in matrix, organic silt rip-up clast at 7.6', loose, subangular, color grades to gray (2.5Y 5/1) from, light gray (2.5Y-7/2), (SP).		C-1	Sample #C-1, Depth = 0.0' - 14.3' Mean (mm): 0.50, Phi Sorting: 1.70 Carbonate: 33.8%, Fines (#200) - 1.85 (SP)
					S-2	Sample #S-2, Depth = 7.8' - 8.3' Mean (mm): 0.82, Phi Sorting: 1.67 Shell: 57%, Fines (#200) - 4.18 (SP)
-17.4	10.6					
-18.1	11.3		Poorly graded SAND with silt; mostly medium quartz sand, few medium sand to fine gravel-sized shell in matrix, few inorganic silt in matrix and burrows, coarse gravel-sized wood fragment at 10.9', medium dense, subangular, very dark gray (2.5Y-3/1), (SP-SM).		S-3	Sample #S-3, Depth = 12.8' - 13.3' Mean (mm): 0.21, Phi Sorting: 0.96 Shell: 7%, Fines (#200) - 0.53 (SP)
-21.1	14.3		Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in layers and in matrix, trace organic silt in occasional laminations and burrows, medium dense, subangular, gray (5Y-6/1), (SP).			
-23.8	17.0		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-04

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 3 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-04

DRILLING LOG

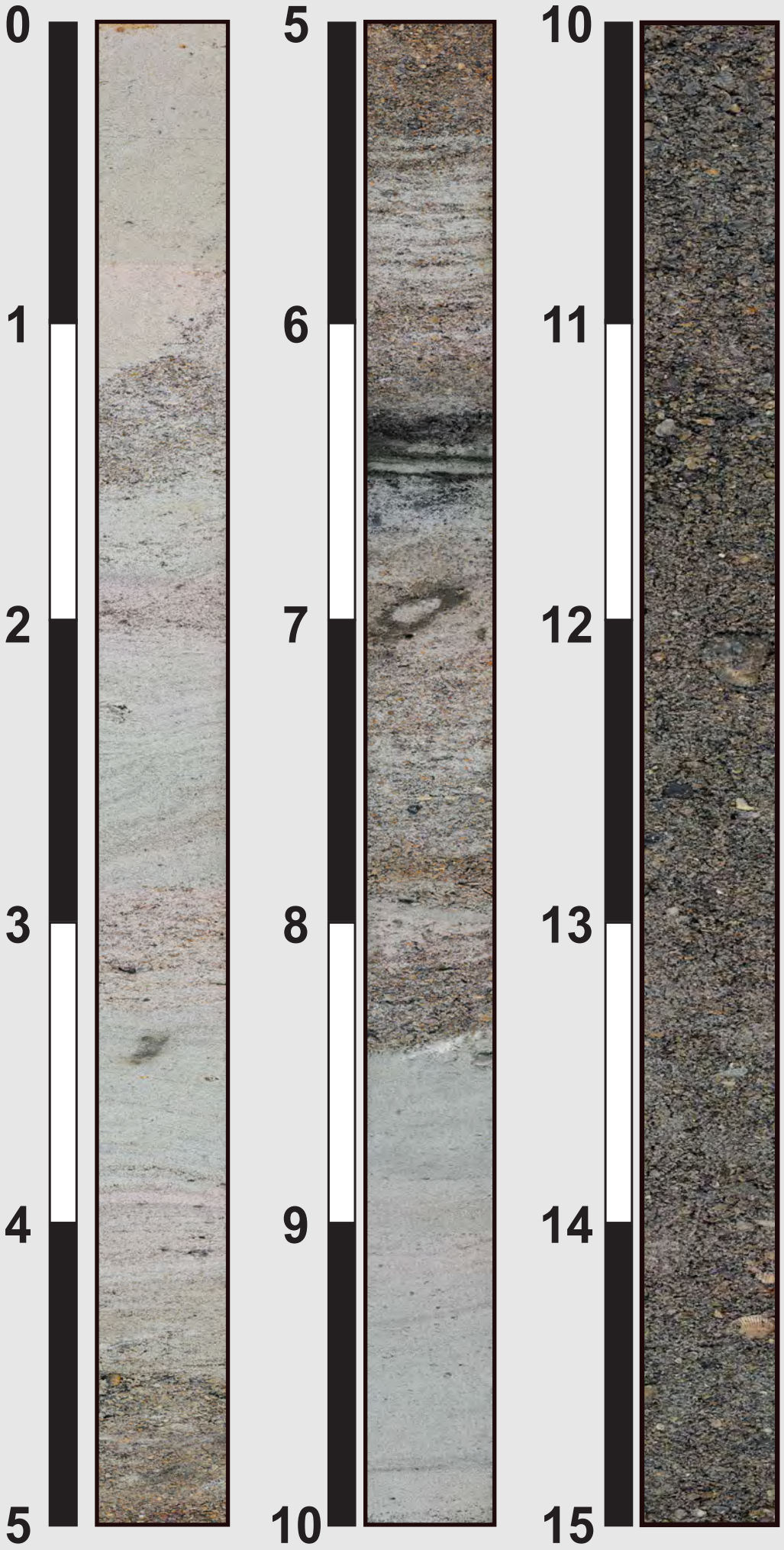
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-04
LOCATION COORDINATES	X = 520,081 Y = 2,245,294
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 2
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	4.6 Ft.
15. DATE BORING	STARTED: 08-20-18 14:41 / COMPLETED: 08-20-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-4.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	11.3 Ft.
8. TOTAL DEPTH OF BORING	13.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-4.0	0.0					
-6.7	2.7		Poorly graded SAND; mostly fine quartz sand, trace fine to medium sand-sized shell in matrix, medium dense, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.66 Shell: 5%, Fines (#200) - 0.30 (SP)
-7.4	3.4		Poorly graded SAND; mostly fine to medium quartz sand, some fine to coarse sand-sized shell in matrix, medium dense, subangular, light brownish gray (2.5Y-6/2), (SP).			
-8.0	4.0					
-10.5	6.5		Poorly graded SAND; mostly fine quartz sand, few fine to coarse sand-sized shell in matrix, medium dense, subangular, light gray (2.5Y-7/1), (SP).		S-2	Sample #S-2, Depth = 4.8' - 5.3' Mean (mm): 0.62, Phi Sorting: 1.39 Shell: 48%, Fines (#200) - 1.57 (SP)
-13.6	9.6		Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix, loose, subangular, light brownish gray (2.5Y-6/2), (SP).		C-1	Sample #C-1, Depth = 0.0' - 11.3' Mean (mm): 0.34, Phi Sorting: 1.46 Carbonate: 26.8%, Fines (#200) - 1.12 (SP)
-15.3	11.3		Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix, medium dense to loose, subangular, light gray (2.5Y-7/1), (SP).			
-17.0	13.0		Poorly graded SAND; mostly fine to medium quartz sand, few fine sand to fine gravel-sized shell in matrix, loose, subangular, light gray (2.5Y-7/2), (SP).			
			The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-05

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-05

DRILLING LOG

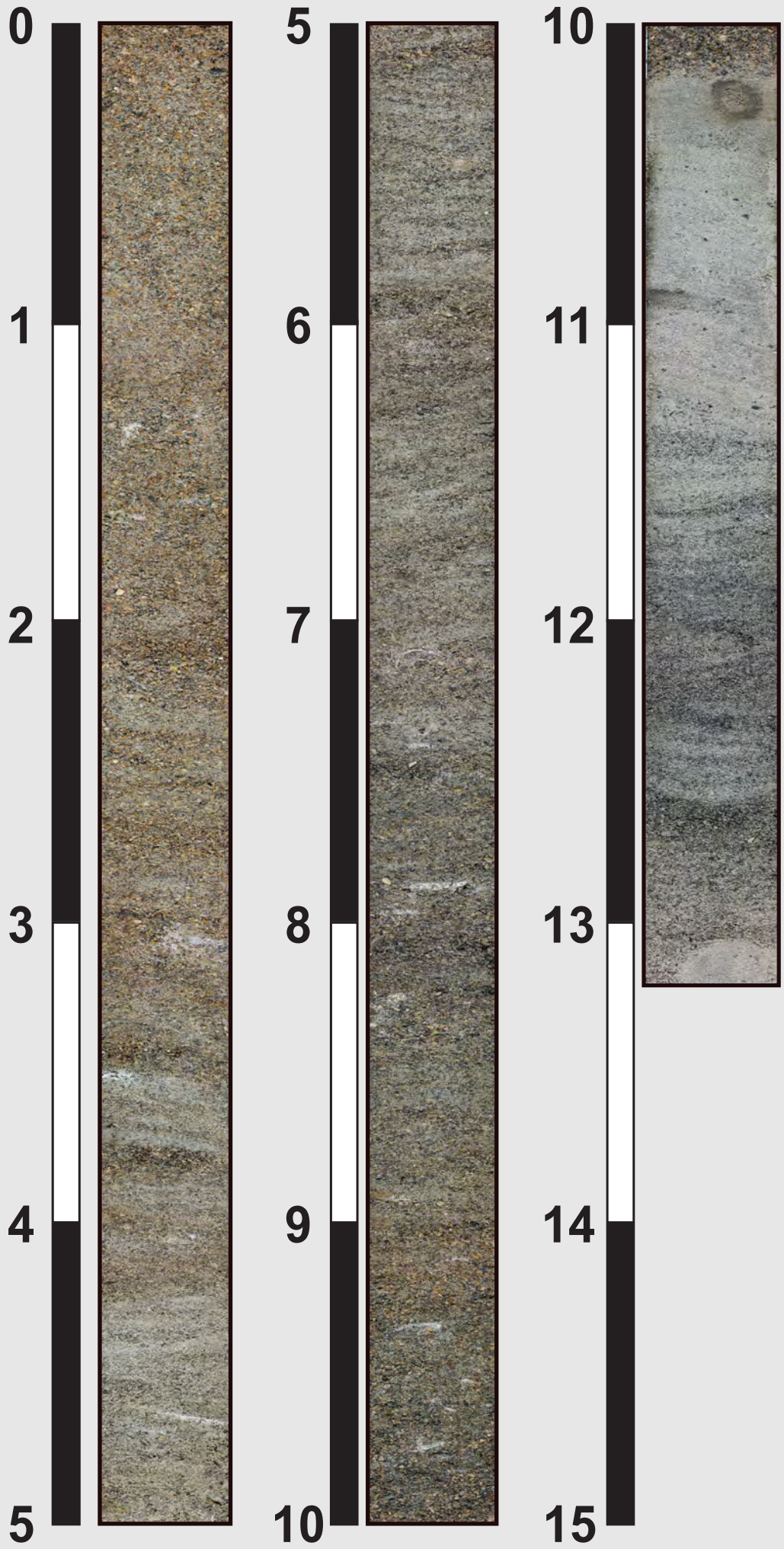
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-05
LOCATION COORDINATES	X = 520,817 Y = 2,244,653
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 3
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	6.7 Ft.
15. DATE BORING	STARTED: 09-18-18 07:59 / COMPLETED: 09-18-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-8.6 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	15.0 Ft.
8. TOTAL DEPTH OF BORING	18.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-8.6	0.0					
-13.1	4.5		Poorly graded SAND; mostly fine to medium quartz sand, few fine to medium sand-sized shell in layers, trace inorganic silt in matrix (at 4.0-4.5') and in burrows (at 8.4-8.5'), trace heavy minerals in laminations, loose stiff, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.24, Phi Sorting: 0.99 Shell: 14%, Fines (#200) - 0.39 (SP)
-17.0	8.4		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix and in layers, trace inorganic and organic silt in laminations and in burrow trace at 6.8-7.1', loose, subangular, color grades to light gray from, grayish brown (2.5Y-5/2), (SP).		S-2	Sample #S-2, Depth = 5.8' - 6.3' Mean (mm): 0.49, Phi Sorting: 1.76 Shell: 32%, Fines (#200) - 4.66 (SP)
-18.6	10.0		Poorly graded SAND; mostly fine quartz sand, trace fine to medium sand-sized shell in matrix, trace heavy minerals in laminations, loose, subangular, light gray (2.5Y-7/1), (SP).		C-1	Sample #C-1, Depth = 0.0' - 13.4' Mean (mm): 0.38, Phi Sorting: 1.60 Carbonate: 28.4%, Fines (#200) - 0.91 (SP)
-23.6	15.0		Poorly graded SAND; mostly medium quartz sand, some fine sand to coarse gravel-sized shell in matrix, trace inorganic silt in matrix, very loose, subangular, dark gray (2.5Y-4/1), (SP).		S-3	Sample #S-3, Depth = 12.8' - 13.3' Mean (mm): 0.86, Phi Sorting: 1.61 Shell: 62%, Fines (#200) - 1.04 (SP)
-27.1	18.5		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-06

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-06

DRILLING LOG

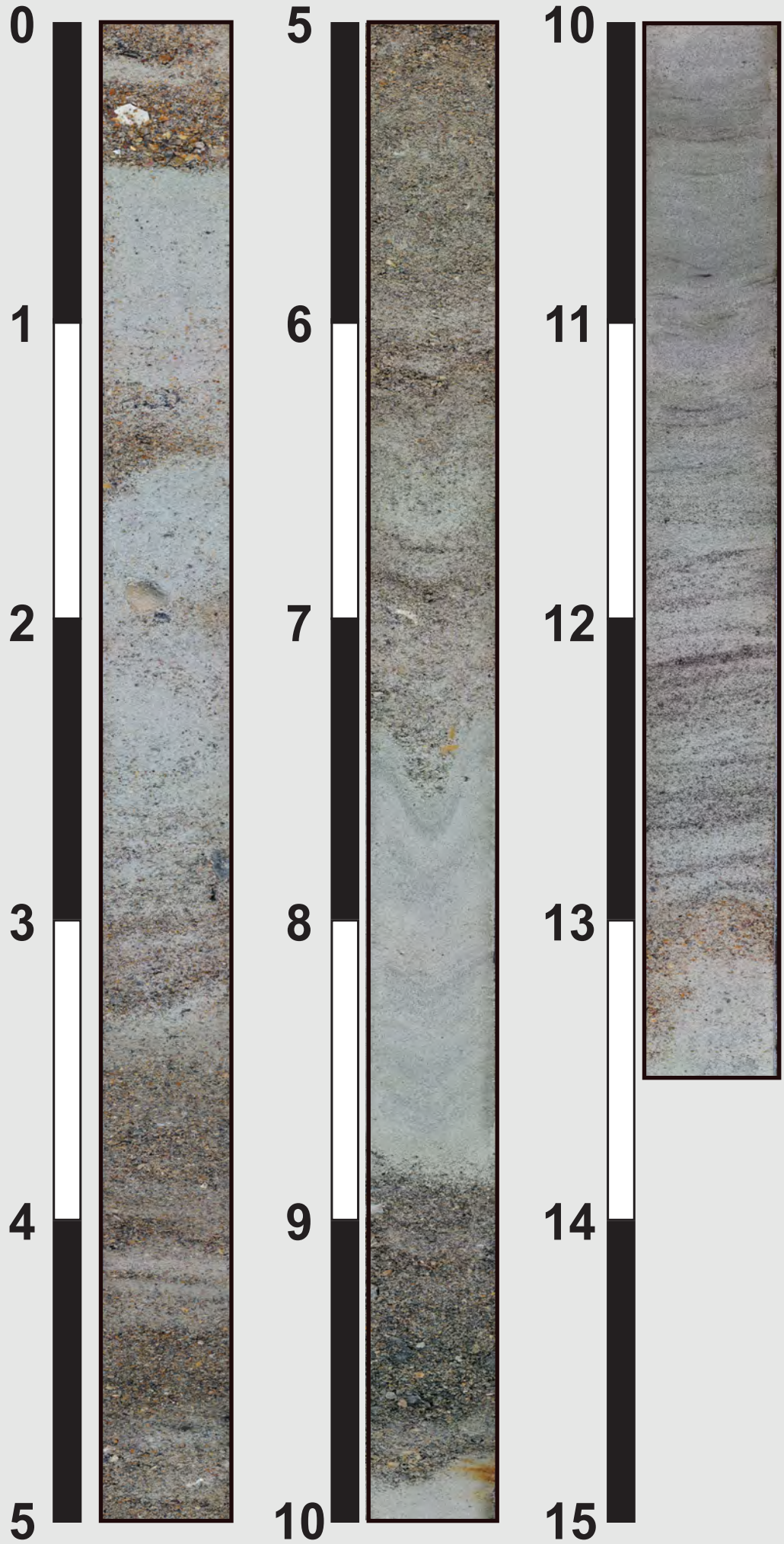
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
2. BORING DESIGNATION	D-06
LOCATION COORDINATES	X = 520,257 Y = 2,246,469
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	16.5 Ft.
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 1 UNDISTURBED (UD): 2
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	5.3 Ft.
15. DATE BORING	STARTED: 08-22-18 08:15 COMPLETED: 08-22-18
16. ELEVATION TOP OF BORING	-5.7 Ft.
17. TOTAL RECOVERY FOR BORING	13.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-5.7	0.0					
			Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix and in layers throughout interval, occasional coarse gravel-sized shell, loose, subangular, light brownish gray (2.5Y-6/2), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.62, Phi Sorting: 1.36 Shell: 47%, Fines (#200) - 0.59 (SP)
					C-1	Sample #C-1, Depth = 0.0' - 13.2' Mean (mm): 0.71, Phi Sorting: 1.59 Carbonate: 40.8%, Fines (#200) - 0.56 (SP)
-15.9	10.2					
			Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix and in layers, trace inorganic silt in burrows (notable silt-lined burrow at top of interval), medium dense, subangular, light gray (5Y-7/1), (SP).		S-2	Sample #S-2, Depth = 10.8' - 11.3' Mean (mm): 0.21, Phi Sorting: 0.83 Shell: 8%, Fines (#200) - 0.79 (SP)
-17.2	11.5					
-18.9	13.2		Poorly graded SAND; mostly fine to medium quartz sand, little fine to coarse sand-sized shell in matrix and layers throughout interval, medium dense, subangular, gray (5Y-5/1), (SP).			
-22.2	16.5		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-07

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-07

DRILLING LOG

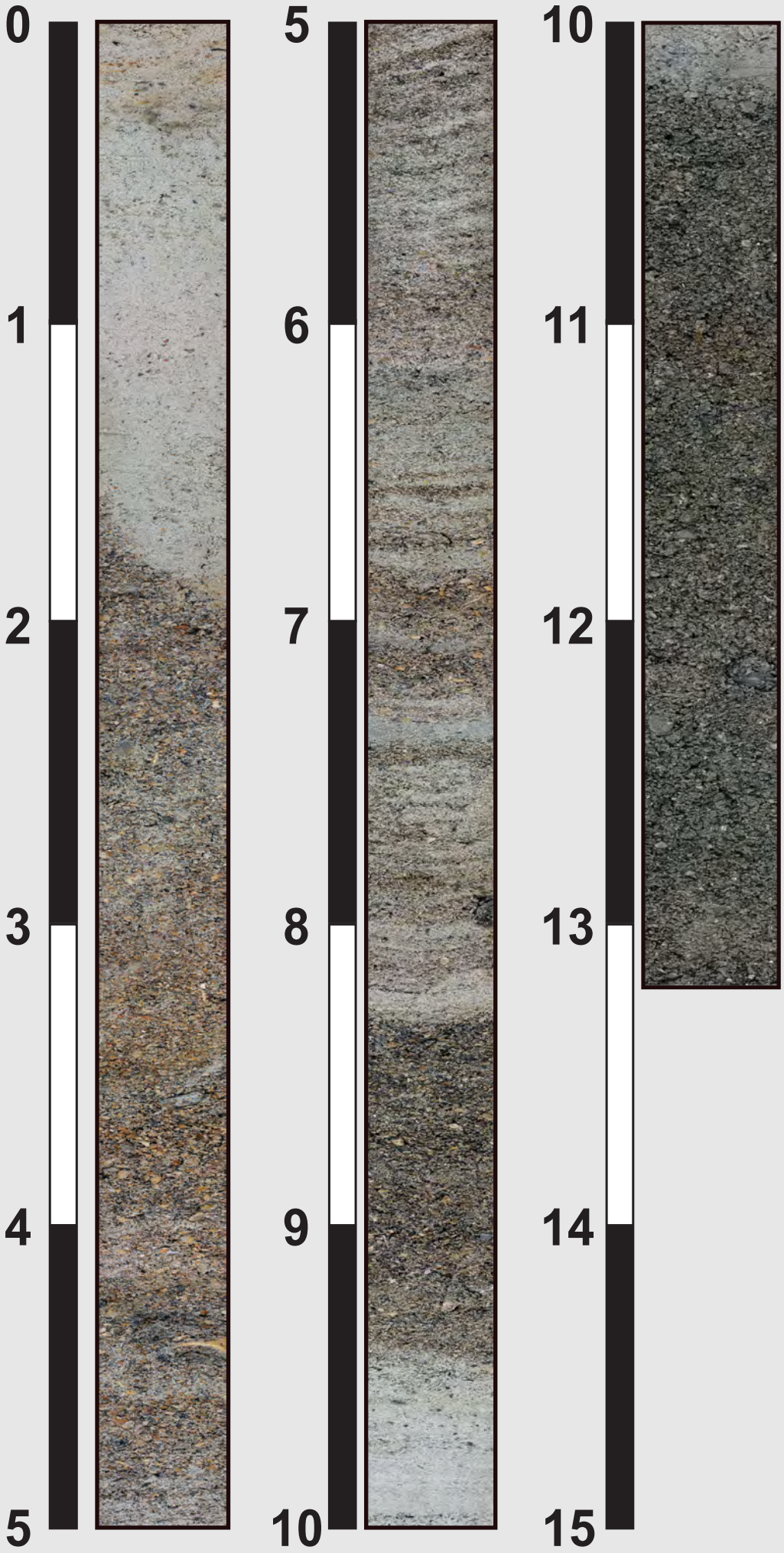
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-07
LOCATION COORDINATES	X = 520,648 Y = 2,245,868
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 3
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	4.8 Ft.
15. DATE BORING	STARTED: 08-22-18 11:27 / COMPLETED: 08-22-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-7.8 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	13.5 Ft.
8. TOTAL DEPTH OF BORING	16.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-7.8	0.0					
-8.3	0.5		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, loose, subangular, light brownish gray (2.5Y-6/2), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.21, Phi Sorting: 0.78 Shell: 6%, Fines (#200) - 1.14 (SP)
-11.3	3.5		Poorly graded SAND; mostly fine to medium quartz sand, few fine sand to fine gravel-sized shell in matrix, trace coarse gravel-sized shell, loose, subangular, color grades to light olive gray (5Y 6/2) from, light gray (2.5Y-7/1), (SP).			
-15.3	7.5		Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix, trace inorganic silt in matrix, trace organic silt as occasional rip-up, loose, subangular, color grades to gray (2.5Y 6/1) from, light gray (2.5Y-7/2), (SP).		S-2	Sample #S-2, Depth = 5.8' - 6.3' Mean (mm): 0.61, Phi Sorting: 1.54 Shell: 46%, Fines (#200) - 1.73 (SP)
-16.7	8.9		Poorly graded SAND; mostly fine quartz sand, trace heavy minerals in laminations, trace fine sand-sized shell in matrix, medium dense, subangular, light gray (2.5Y-7/1), (SP).		C-1	Sample #C-1, Depth = 0.0' - 13.5' Mean (mm): 0.40, Phi Sorting: 1.71 Carbonate: 27.2%, Fines (#200) - 1.96 (SP)
-17.6	9.8					
-19.3	11.5		Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix, trace coarse quartz sand, very loose, subangular, gray (2.5Y-5/1), (SP).		S-3	Sample #S-3, Depth = 10.8' - 11.3' Mean (mm): 0.18, Phi Sorting: 0.50 Shell: 3%, Fines (#200) - 1.43 (SP)
-21.3	13.5		Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in laminations and burrows, trace fine to medium sand-sized shell in matrix, loose, subangular, light gray (5Y-7/1), (SP).			
-24.3	16.5		Poorly graded SAND; mostly medium quartz sand, few fine to coarse sand-sized shell in laminations and layers, loose, subangular, light gray (5Y-7/1), (SP).			
			The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-08

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-08

DRILLING LOG

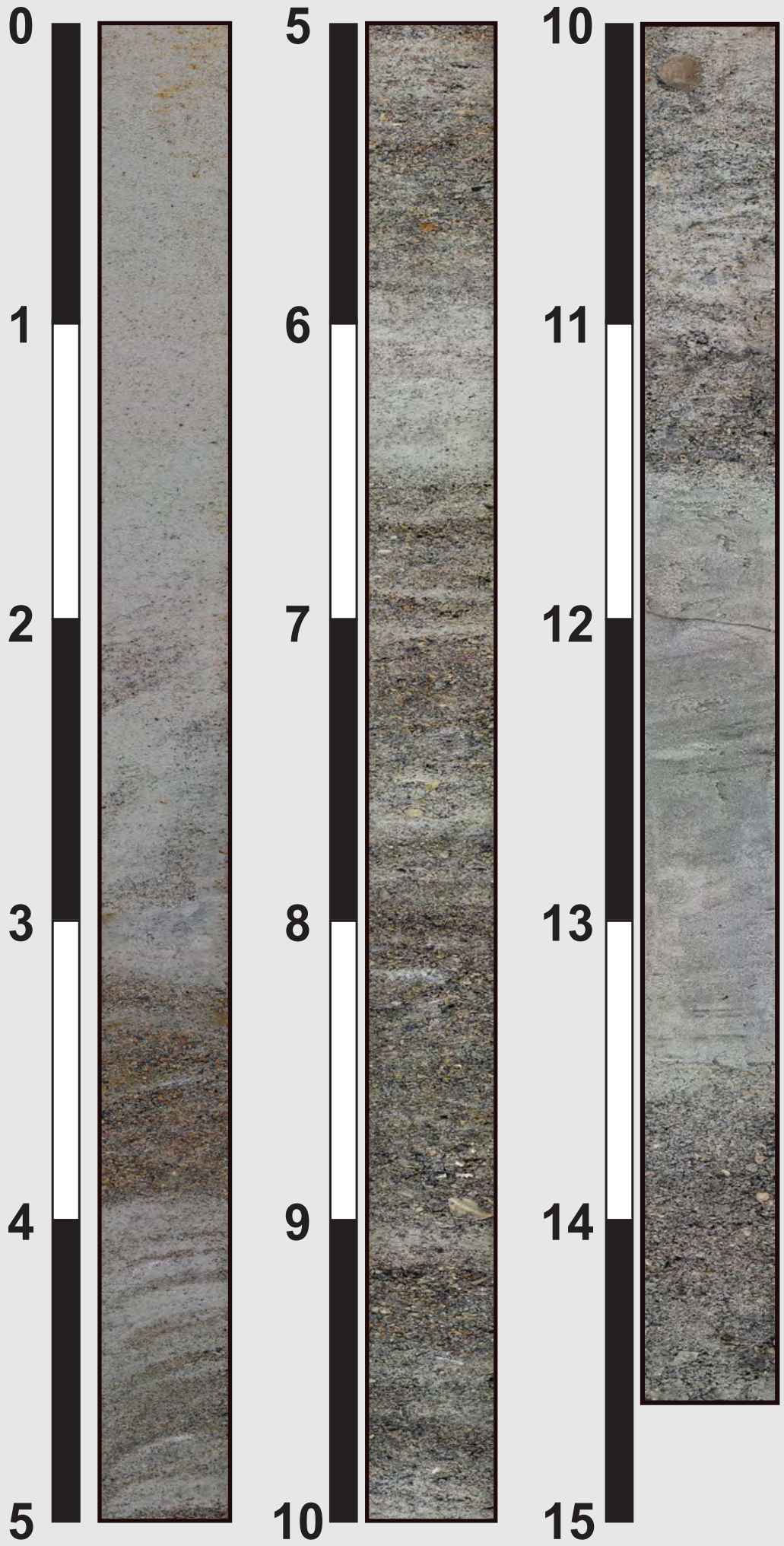
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
2. BORING DESIGNATION	D-08
LOCATION COORDINATES	X = 521,095 Y = 2,245,398
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	16.3 Ft.
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 1 UNDISTURBED (UD): 3
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	6.2 Ft.
15. DATE BORING	STARTED: 09-18-18 10:40 COMPLETED: 09-18-18
16. ELEVATION TOP OF BORING	-8.7 Ft.
17. TOTAL RECOVERY FOR BORING	13.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-8.7	0.0					
-10.5	1.8		Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix, trace inorganic silt in burrows between 0-0.5', loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.22, Phi Sorting: 0.69 Shell: 7%, Fines (#200) - 1.23 (SP)
-13.5	4.8		Poorly graded SAND; mostly fine sand to coarse gravel-sized shell, some medium quartz sand in matrix, loose, subangular, grayish brown (2.5Y-5/2), (SP).		C-1	Sample #C-1, Depth = 0.0' - 10.0' Mean (mm): 0.51, Phi Sorting: 1.65 Carbonate: 34.1%, Fines (#200) - 1.44 (SP)
-17.0	8.3		Poorly graded SAND; mostly fine to medium quartz sand, some fine sand to coarse gravel-sized shell in layers and in matrix, trace inorganic silt in occasionally layer, loose, subangular, gray (2.5Y-6/1), (SP).		S-2	Sample #S-2, Depth = 5.8' - 6.3' Mean (mm): 0.49, Phi Sorting: 1.57 Shell: 40%, Fines (#200) - 1.66 (SP)
-18.1	9.4		Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, dark gray (2.5Y-4/1), (SP).			
-19.0	10.3		Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, light gray (5Y-7/1), (SP).		S-3	Sample #S-3, Depth = 11.8' - 12.3' Mean (mm): 0.88, Phi Sorting: 1.67 Shell: 58%, Fines (#200) - 2.48 (SP)
-21.9	13.2		Poorly graded SAND with silt; mostly medium quartz sand, some fine sand to fine gravel-sized shell in matrix, trace inorganic silt in matrix, very loose, subangular, dark gray (5Y-4/1), (SP).			
-25.0	16.3		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-09

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-09

DRILLING LOG

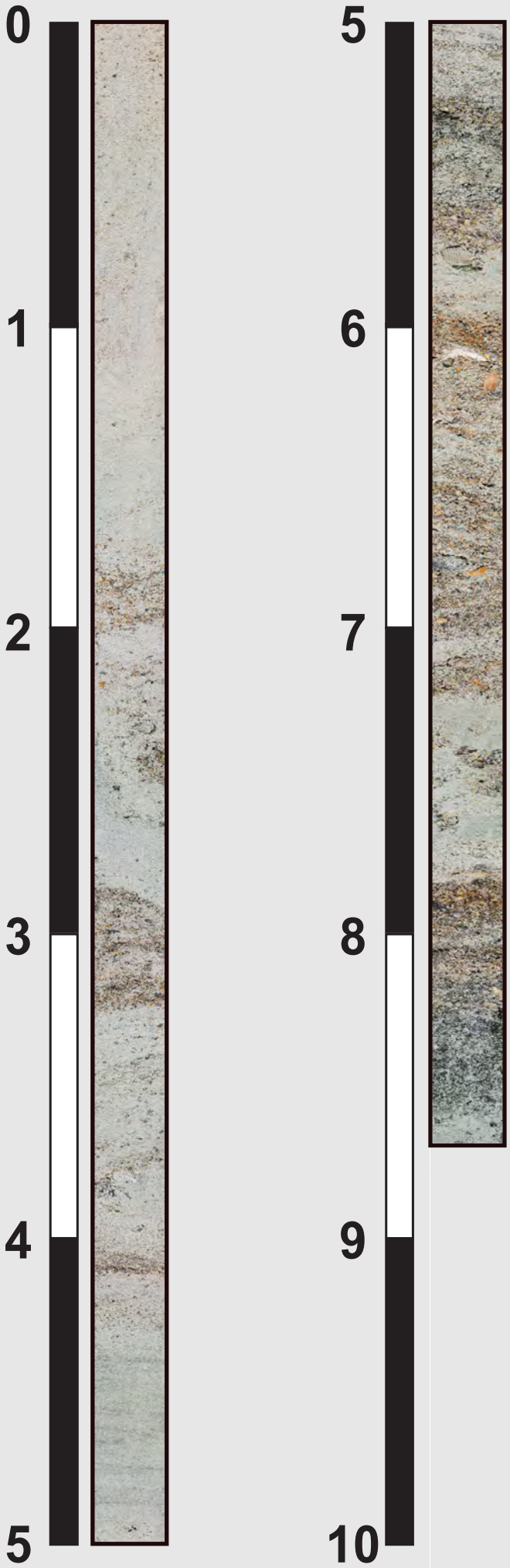
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-09
LOCATION COORDINATES	X = 521,386 Y = 2,246,464
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 3
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	5.7 Ft.
15. DATE BORING	STARTED: 09-19-18 12:42 / COMPLETED: 09-19-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-7.7 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	14.6 Ft.
8. TOTAL DEPTH OF BORING	19.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-7.7	0.0					
			Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.55 Shell: 3%, Fines (#200) - 1.02 (SP)
-10.9	3.2					
			Poorly graded SAND; mostly fine to medium quartz sand, some fine sand to coarse gravel-sized shell in matrix and in layers, trace organic and inorganic silt in occasional burrow (primarily below 8'), loose, subangular, grayish brown (2.5Y-5/2), (SP).		S-2	Sample #S-2, Depth = 6.8' - 7.3' Mean (mm): 0.59, Phi Sorting: 1.71 Shell: 46%, Fines (#200) - 0.04 (SP)
					C-1	Sample #C-1, Depth = 0.0' - 14.6' Mean (mm): 0.40, Phi Sorting: 1.64 Carbonate: 31.6%, Fines (#200) - 1.69 (SP)
-19.2	11.5					
			Poorly graded SAND; mostly fine quartz sand, trace inorganic and organic silt in laminations and burrows, trace fine to medium sand-sized shell in matrix, trace heavy minerals in laminations, bidirectional bedding present, loose, subangular, gray (5Y-6/1), (SP).		S-3	Sample #S-3, Depth = 11.8' - 12.3' Mean (mm): 0.16, Phi Sorting: 0.36 Shell: 3%, Fines (#200) - 1.59 (SP)
-21.2	13.5					
-22.3	14.6		Poorly graded SAND; mostly medium quartz sand, some fine sand to fine gravel-sized shell, trace inorganic silt in matrix, loose, subangular, gray (2.5Y-5/1), (SP).			
			The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
-26.7	19.0					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-10

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 3 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-10

DRILLING LOG

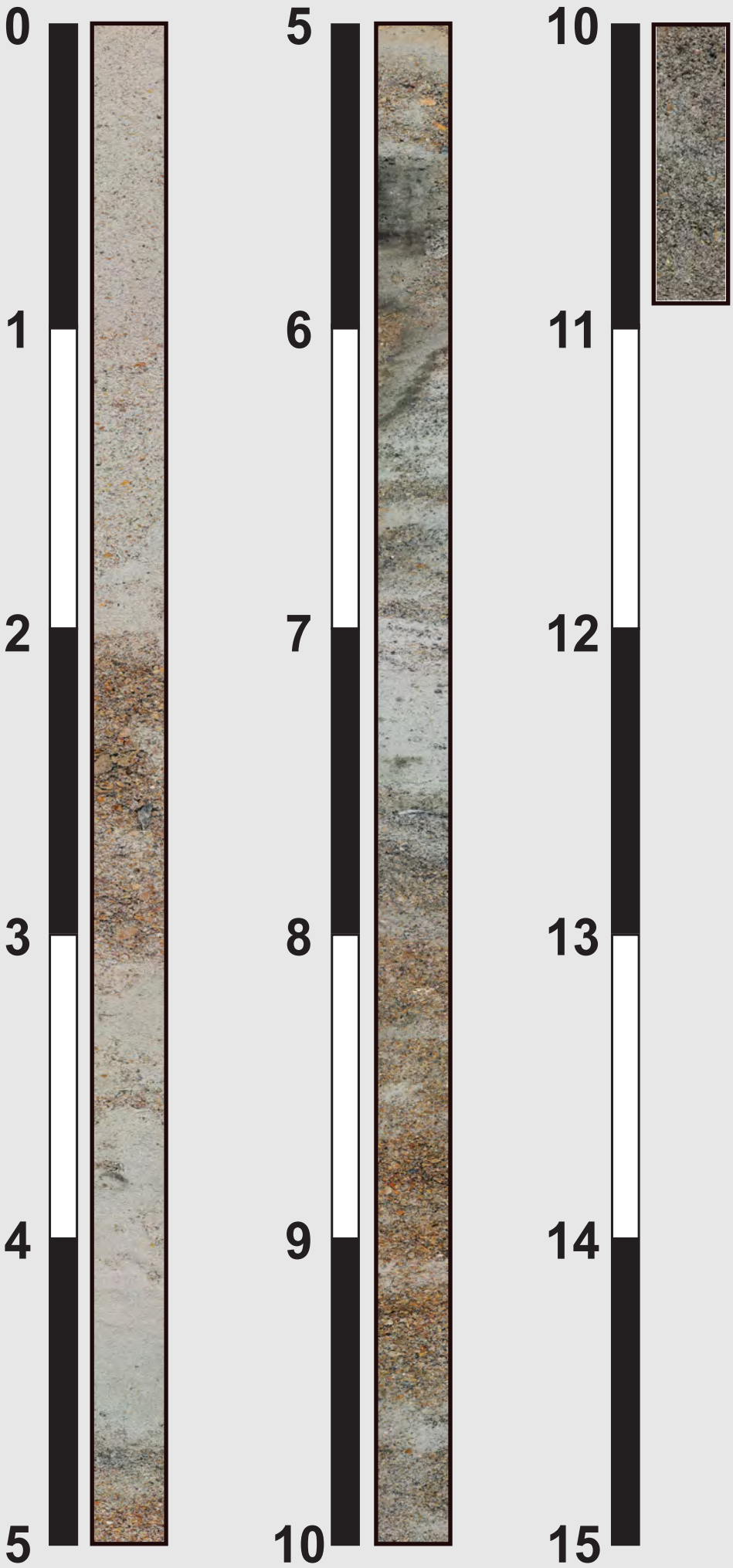
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	D-10
LOCATION COORDINATES	X = 521,862 Y = 2,245,878
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 1
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	4.9 Ft.
15. DATE BORING	STARTED: 08-20-18 13:48 / COMPLETED: 08-20-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-5.5 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	8.7 Ft.
8. TOTAL DEPTH OF BORING	10.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-5.5	0.0					
			Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix and layers, trace inorganic silt in matrix between 4.1-5.0', loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.51 Shell: 3%, Fines (#200) - 1.15 (SP)
-10.8	5.3				C-1	Sample #C-1, Depth = 0.0' - 8.7' Mean (mm): 0.31, Phi Sorting: 1.55 Carbonate: 23.3%, Fines (#200) - 1.39 (SP)
			Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to coarse gravel-sized shell in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).			
-13.5	8.0					
-14.2	8.7		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, loose, subangular, gray (2.5Y-5/1), (SP).			
-16.0	10.5		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-11

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 3 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-11

DRILLING LOG

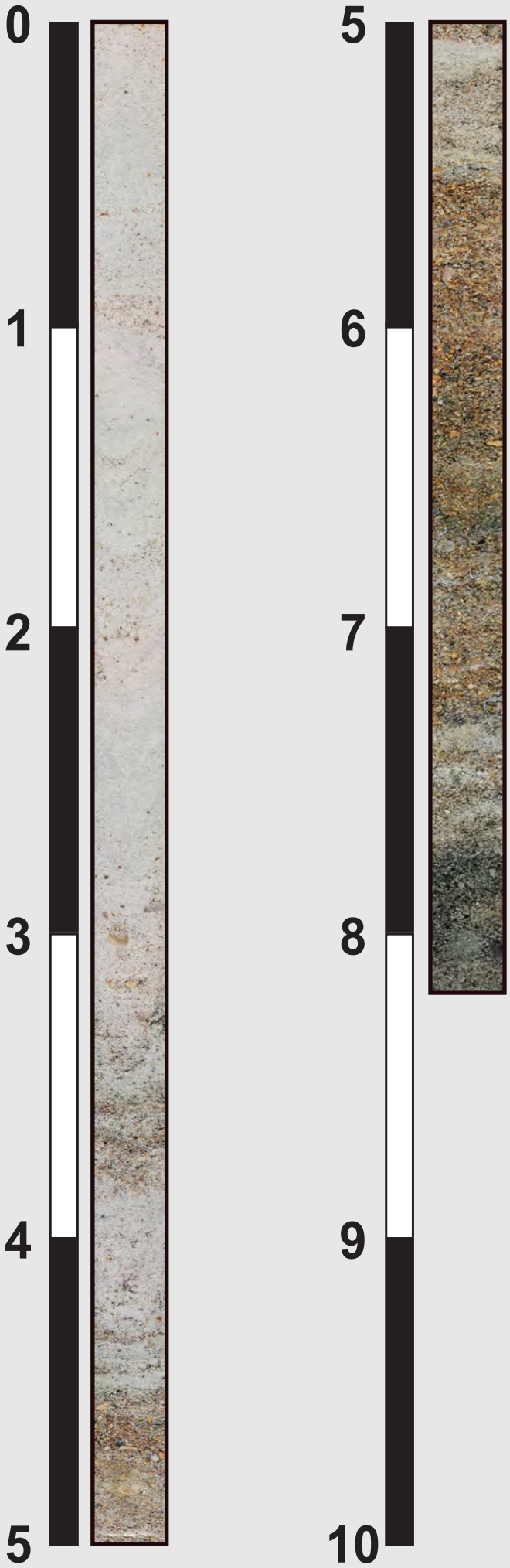
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-11
LOCATION COORDINATES	X = 522,289 Y = 2,247,153
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 2
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	5.8 Ft.
15. DATE BORING	STARTED: 08-20-18 11:46 / COMPLETED: 08-20-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-8.4 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	10.9 Ft.
8. TOTAL DEPTH OF BORING	12.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-8.4	0.0				
-10.4	2.0	Poorly graded SAND; mostly fine quartz sand, few fine to coarse sand-sized shell in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.29, Phi Sorting: 1.20 Shell: 17%, Fines (#200) - 1.16 (SP)
-11.5	3.1	Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, loose, subangular, light brownish gray (10YR-6/2), (SP).			
-13.1	4.7	Poorly graded SAND; mostly fine to medium quartz sand, few fine sand to fine gravel-sized shell in matrix and layers, trace inorganic silt in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).		C-1	Sample #C-1, Depth = 0.0' - 10.9' Mean (mm): 0.37, Phi Sorting: 1.60 Carbonate: 28.9%, Fines (#200) - 1.25 (SP)
-13.8	5.4				
-16.0	7.6	Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, loose, subangular, light brownish gray (10YR-6/2), (SP).			
-17.9	9.5	Poorly graded SAND; mostly fine quartz sand, few fine to coarse sand-sized shell in matrix and layers, trace inorganic silt in matrix and in burrows, subangular, color grades to light gray (5Y 7/1) from, light olive gray (5Y-6/2), (SP).		S-2	Sample #S-2, Depth = 8.8' - 9.3' Mean (mm): 0.67, Phi Sorting: 1.61 Shell: 53%, Fines (#200) - 1.36 (SP)
-19.3	10.9				
-20.9	12.5	Poorly graded SAND; mostly fine to medium quartz sand, some fine sand to fine gravel-sized shell in matrix, loose, subangular, light brownish gray (10YR-6/2), (SP).			
		Poorly graded SAND; mostly fine to medium quartz sand, some fine to coarse sand-sized shell in matrix, loose, subangular, gray (2.5Y-6/1), (SP).			
		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
		End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/19/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-12

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 3 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-12

DRILLING LOG

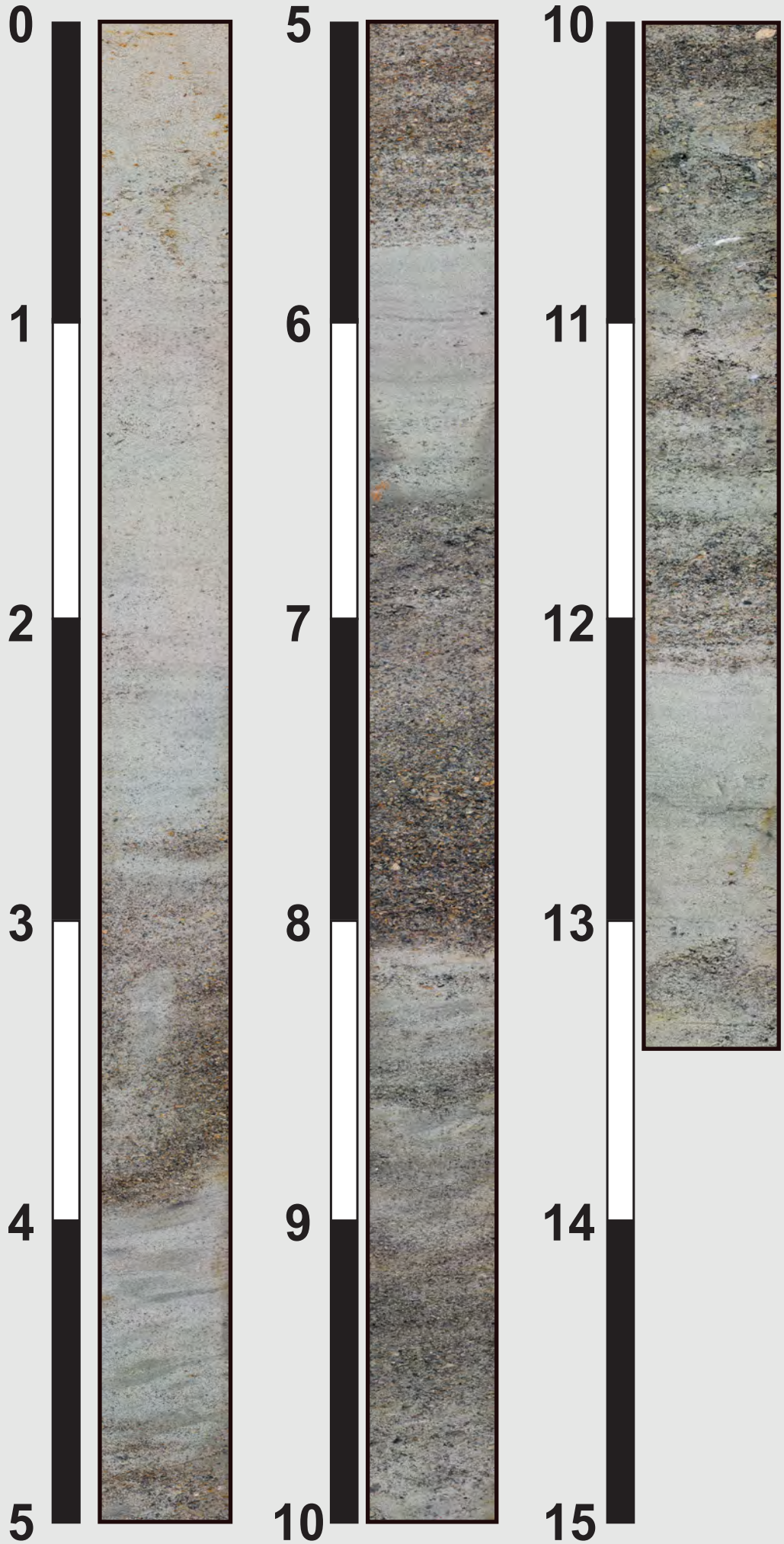
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-12
LOCATION COORDINATES	X = 522,439 Y = 2,246,590
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 2
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	4.6 Ft.
15. DATE BORING	STARTED: 08-20-18 12:44 / COMPLETED: 08-20-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-6.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	8.2 Ft.
8. TOTAL DEPTH OF BORING	9.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-6.0	0.0					
			Poorly graded SAND; mostly fine quartz sand, few fine to coarse sand-sized shell in matrix, shell content increases to ~25% between 2.9-3.8', loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.63 Shell: 4%, Fines (#200) - 1.33 (SP)
-10.5	4.5				C-1	Sample #C-1, Depth = 0.0' - 8.2' Mean (mm): 0.40, Phi Sorting: 1.59 Carbonate: 27.4%, Fines (#200) - 1.42 (SP)
			Poorly graded SAND; mostly fine to medium quartz sand, some fine sand to fine gravel-sized shell in matrix, loose, subangular, light brownish gray (10YR-6/2), (SP).		S-2	Sample #S-2, Depth = 5.8' - 6.3' Mean (mm): 0.75, Phi Sorting: 1.61 Shell: 57%, Fines (#200) - 1.84 (SP)
-13.7	7.7					
-14.2	8.2		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to fine gravel-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, gray (2.5Y-5/1), (SP).			
-15.5	9.5		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Olsen Associates, Inc.

Nassau Sound, Amelia Island, Florida 2018

D-13

Notes:
Scale in Feet
Photo Mosaic Image
Core Diameter = 4 in.

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation D-13

DRILLING LOG

CLIENT	Olsen Associates, Inc.
PROJECT OWNER	Saissa / Nassau County
SHEET	1 OF 1 SHEETS
1. PROJECT	2018 Geotechnical Evaluation Nassau Sound (South Amelia Island), Florida
9. SIZE AND TYPE OF BIT	4.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	D-13
LOCATION COORDINATES	X = 521,574 Y = 2,245,885
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 1 / UNDISTURBED (UD): 2
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	4.7 Ft.
15. DATE BORING	STARTED: 09-19-18 10:59 / COMPLETED: 09-19-18
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-7.6 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	13.4 Ft.
8. TOTAL DEPTH OF BORING	16.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-7.6	0.0				
		Poorly graded SAND; mostly fine quartz sand, trace fine to medium sand-sized shell in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).		S-1	Sample #S-1, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.60 Shell: 8%, Fines (#200) - 1.08 (SP)
-10.3	2.7				
		Poorly graded SAND; mostly fine to medium quartz sand, little fine to coarse sand-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, grayish brown (2.5Y-5/2), (SP).			
-11.5	3.9				
-12.3	4.7				
		Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix, loose, subangular, light gray (2.5Y-7/1), (SP).			
-13.4	5.8				
-14.2	6.6			C-1	Sample #C-1, Depth = 0.0' - 13.4' Mean (mm): 0.35, Phi Sorting: 1.77 Carbonate: 22.8%, Fines (#200) - 1.65 (SP)
		Poorly graded SAND; mostly fine to medium quartz sand, some fine to coarse sand-sized shell in matrix, loose, subangular, gray (2.5Y-6/1), (SP).			
-15.7	8.1				
		Poorly graded SAND; mostly fine quartz sand, trace fine to coarse sand-sized shell in matrix, trace inorganic silt in burrows at base of interval, loose, subangular, light gray (2.5Y-7/1), (SP).		S-2	Sample #S-2, Depth = 8.8' - 9.3' Mean (mm): 0.38, Phi Sorting: 1.37 Shell: 31%, Fines (#200) - 1.62 (SP)
-19.7	12.1				
		Poorly graded SAND; mostly fine to medium quartz sand, some fine sand to fine gravel-sized shell in matrix, trace inorganic silt in matrix, loose, subangular, grayish brown (2.5Y-5/2), (SP).			
-20.6	13.0				
-21.0	13.4				
		Poorly graded SAND; mostly fine to medium quartz sand, little fine sand to coarse gravel-sized shell in layers and matrix, trace inorganic silt in occasional burrow, loose, subangular, color grades to gray (2.5Y 6/1) from, light gray (2.5Y-7/1), (SP).			
-24.1	16.5				
		Poorly graded SAND; mostly fine quartz sand, trace inorganic and organic silt in occasional burrows and laminations, trace fine to medium sand-sized shell in matrix, loose, subangular, light gray (5Y-7/1), (SP).			
		Poorly graded SAND; mostly fine to medium quartz sand, few fine to coarse sand-sized shell in matrix, loose, subangular, gray (5Y-6/1), (SP).			
		The difference between penetration and recovery is interpreted to be due to compaction of sediment within the sample barrel.			
		End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04

Appendix B:
Laboratory Data

ATHENA TECHNOLOGIES, INC.

1293 Graham Farm Road, PO Box 68
McClellanville, South Carolina 29458
(843) 887-3800
www.athenatechnologies.com

Terracon
Consulting Engineers & Scientists

Carbonate Content Data

Project Name: Nassau Sound Geotechnical Evaluation
Project Number: EQ181189
Date: 10/15/2018

Boring No.	Sample No.	Depth Range, Feet	Tare No.	Beaker No.	Dry Sample Wt.		Percent Carbonate
					Before	After	
D-01	C-1	0/11	177	1	76.23	58.4	23.4
D-01	C-2	0/16	63	16	85.53	69.9	18.3
D-02	C-1	0/3.5	426	13	79.07	70.9	10.3
D-03	C-1	0/14.3	319	40	72.70	48.1	33.8
D-04	C-1	0/11.3	88	17	98.87	72.4	26.8
D-05	C-1	0/13.4	422	6	72.21	51.7	28.4
D-06	C-1	0/13.2	71	19	80.33	47.5	40.8
D-07	C-1	0/13.5	201	18	89.40	65.1	27.2
D-08	C-1	0/10	180	11	70.42	46.4	34.1
D-09	C-1	0/14.6	481	5	67.09	45.9	31.6
D-10	C-1	0/8.7	27	10	86.22	66.1	23.3
D-11	C-1	0/10.9	304	12	91.23	64.9	28.9
D-12	C-1	0/8.2	267	8	80.5	58.4	27.4
D-13	C-1	0/13.4	294	2	62.1	47.9	22.8

Tested By: CRM Sr.

Reviewed By: TES

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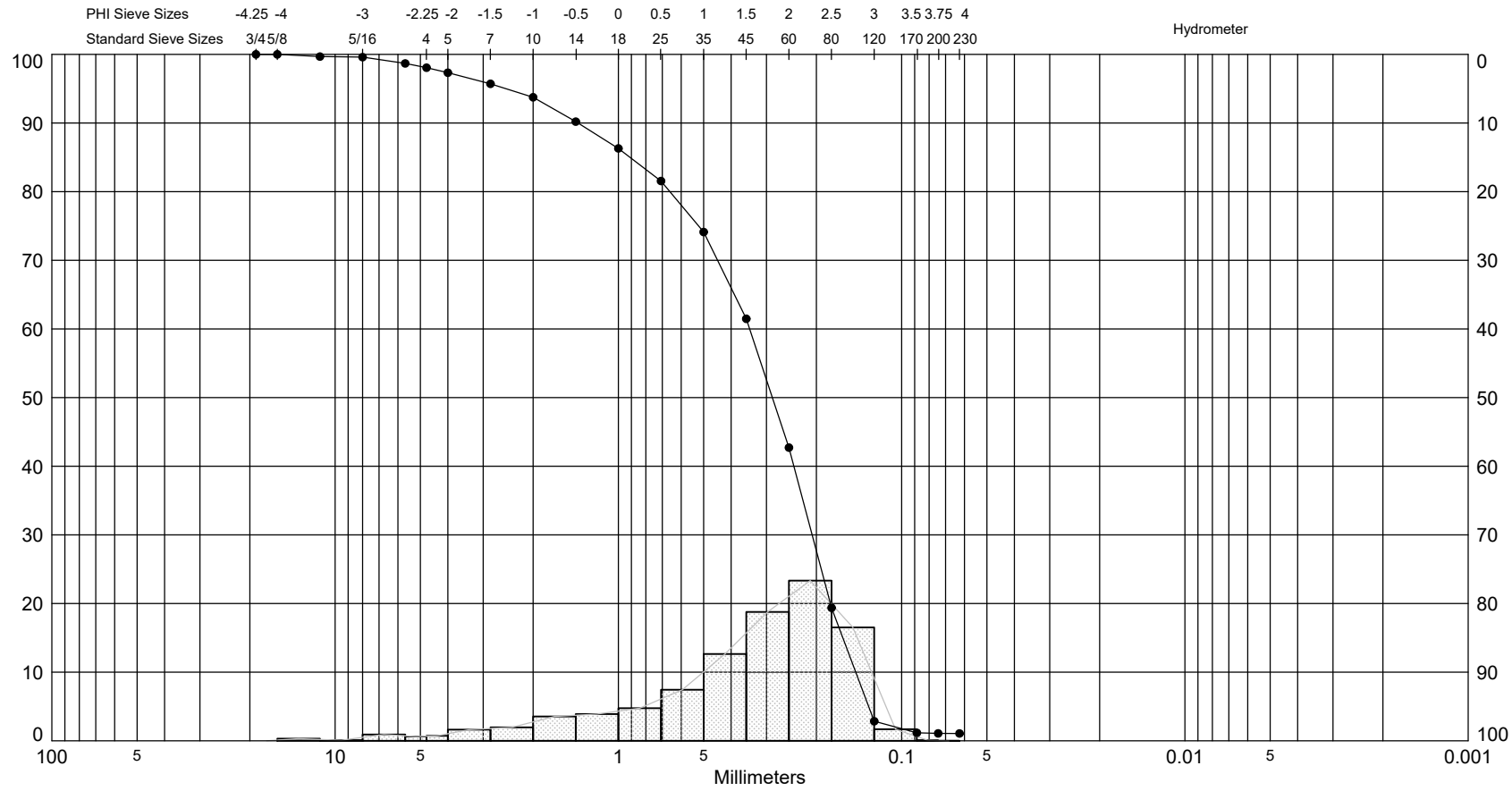
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-11**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-01**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.79	
	216.80	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.53	99.68	100	0.53
5/16	7.938	0.13	99.60	100	0.13
#3.5	5.600	1.51	98.68	100	1.51
#4	4.750	1.02	98.07	100	1.02
#5	4.000	1.21	97.33	100	1.21
#7	2.800	2.68	95.71	100	2.68
#10	2.000	3.23	93.75	100	3.23
#14	1.400	5.86	90.20	100	5.86
#18	1.000	6.44	86.30	100	6.44
#25	0.710	7.84	81.55	90	7.06
#35	0.500	12.26	74.12	50	6.13
#45	0.355	20.85	61.48	20	4.17
#60	0.250	30.98	42.71	10	3.10
#80	0.180	38.51	19.37	5	1.93
#120	0.125	27.26	2.85	0	0.00
#170	0.090	2.79	1.16	0	0.00
#200	0.075	0.14	1.07	0	0.00
#230	0.063	0.02	1.06	0	0.00
Total Shell Content:		**27**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-01 #C-1	—●—	-6.0	SP	#200 - 1.08 #230 - 1.07		23.40	1.81	1.45	-1.34	4.63	1.29

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,999
Northing (Y, ft):	2,245,682
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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Office: 843-887-3800

SIEVE ANALYSIS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

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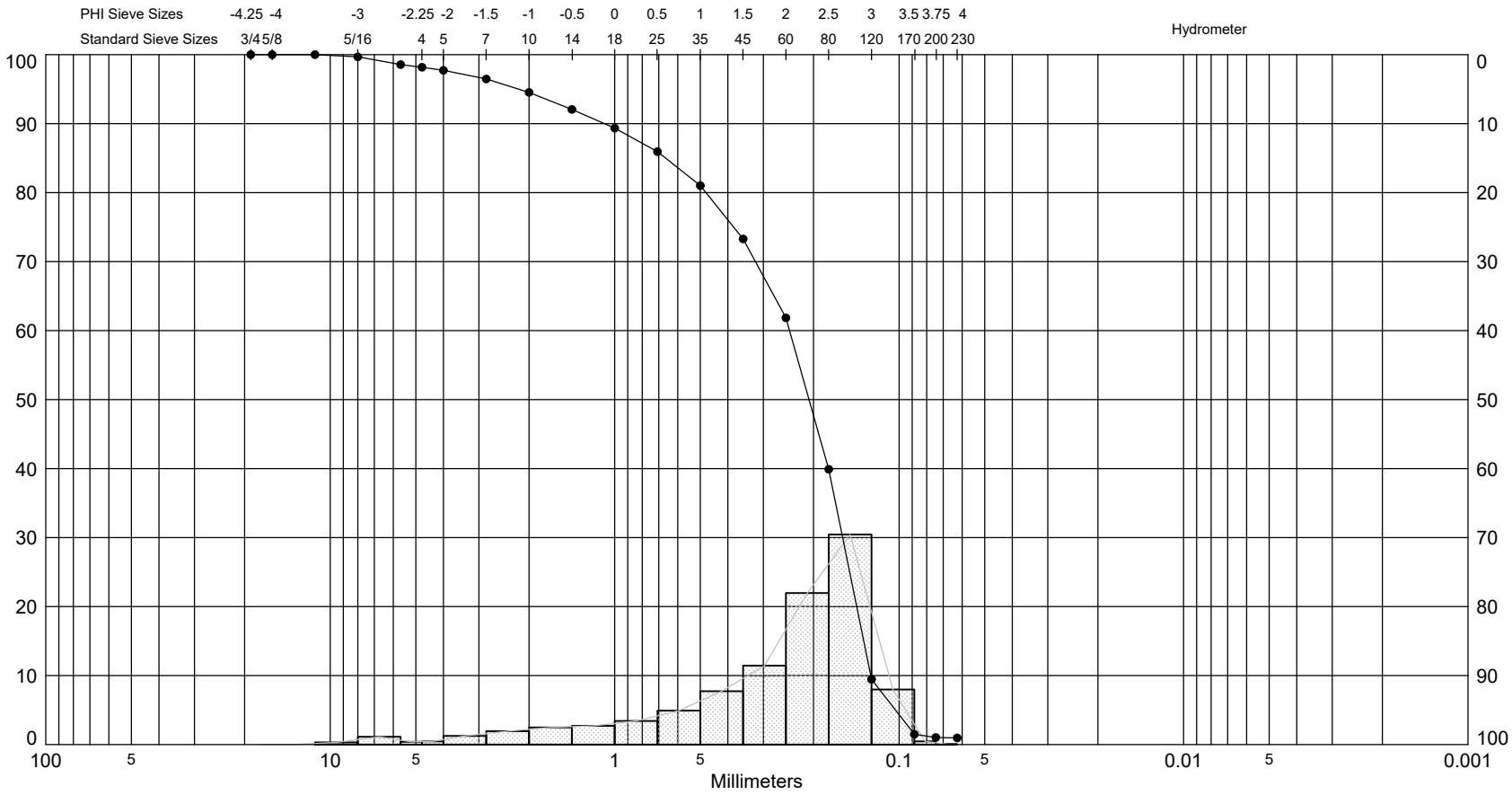
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-16**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-01**		
Sample No.:	**C-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	48.93	
	214.82	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.53	99.68	100	0.53
#3.5	5.600	1.86	98.56	100	1.86
#4	4.750	0.64	98.17	100	0.64
#5	4.000	0.74	97.73	100	0.74
#7	2.800	2.08	96.47	100	2.08
#10	2.000	3.21	94.54	100	3.21
#14	1.400	4.09	92.07	100	4.09
#18	1.000	4.50	89.36	100	4.50
#25	0.710	5.65	85.95	90	5.09
#35	0.500	8.17	81.03	30	2.45
#45	0.355	12.82	73.30	20	2.56
#60	0.250	18.97	61.86	10	1.90
#80	0.180	36.42	39.91	5	1.82
#120	0.125	50.49	9.47	0	0.00
#170	0.090	13.22	1.51	0	0.00
#200	0.075	0.77	1.04	0	0.00
#230	0.063	0.12	0.97	0	0.00
Total Shell Content:		**19**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-01 #C-2	—●—	-6.0	SP	#200 - 1.03 #230 - 0.96		18.30	2.27	1.84	-1.58	5.25	1.32

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,999
Northing (Y, ft):	2,245,682
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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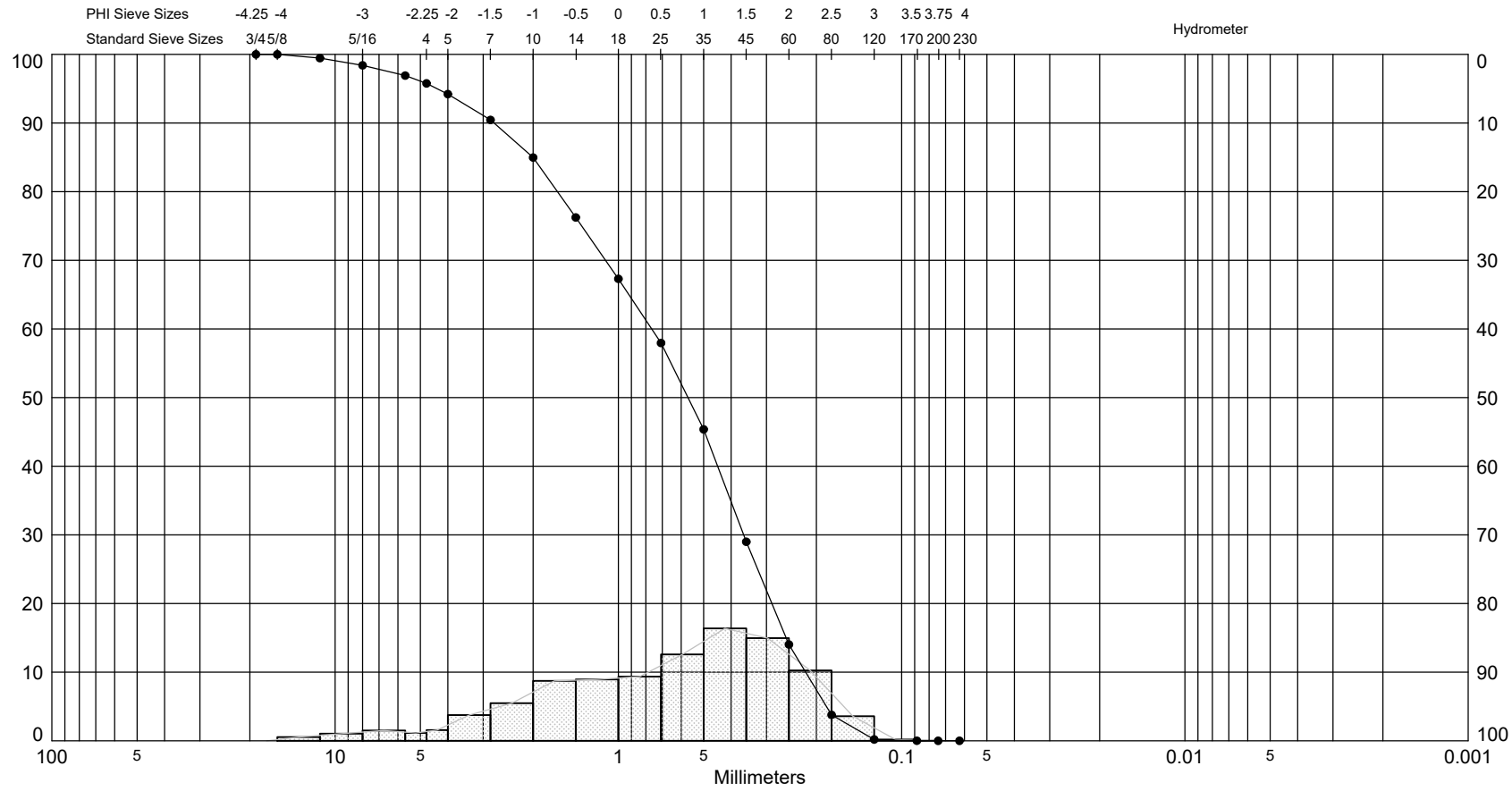
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-01**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grain quartz, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/3**		

Tare Weight, (g):	49.94	
	201.68	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.83	99.45	100	0.83
5/16	7.938	1.59	98.41	100	1.59
#3.5	5.600	2.26	96.92	100	2.26
#4	4.750	1.73	95.78	100	1.73
#5	4.000	2.36	94.22	100	2.36
#7	2.800	5.71	90.46	100	5.71
#10	2.000	8.32	84.97	100	8.32
#14	1.400	13.24	76.25	100	13.24
#18	1.000	13.56	67.31	100	13.56
#25	0.710	14.19	57.96	90	12.77
#35	0.500	19.09	45.38	50	9.55
#45	0.355	24.86	29.00	20	4.97
#60	0.250	22.70	14.04	5	1.14
#80	0.180	15.55	3.79	0	0.00
#120	0.125	5.44	0.20	0	0.00
#170	0.090	0.27	0.03	0	0.00
#200	0.075	0.02	0.01	0	0.00
#230	0.063	0.02	0.00	0	0.00
Total Shell Content:		**51**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-01 #S-1	—●—	-6.8	SP	#200 - 0.00 #230 - 0.00			0.82	0.54	-0.66	2.87	1.41

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,999
Northing (Y, ft):	2,245,682
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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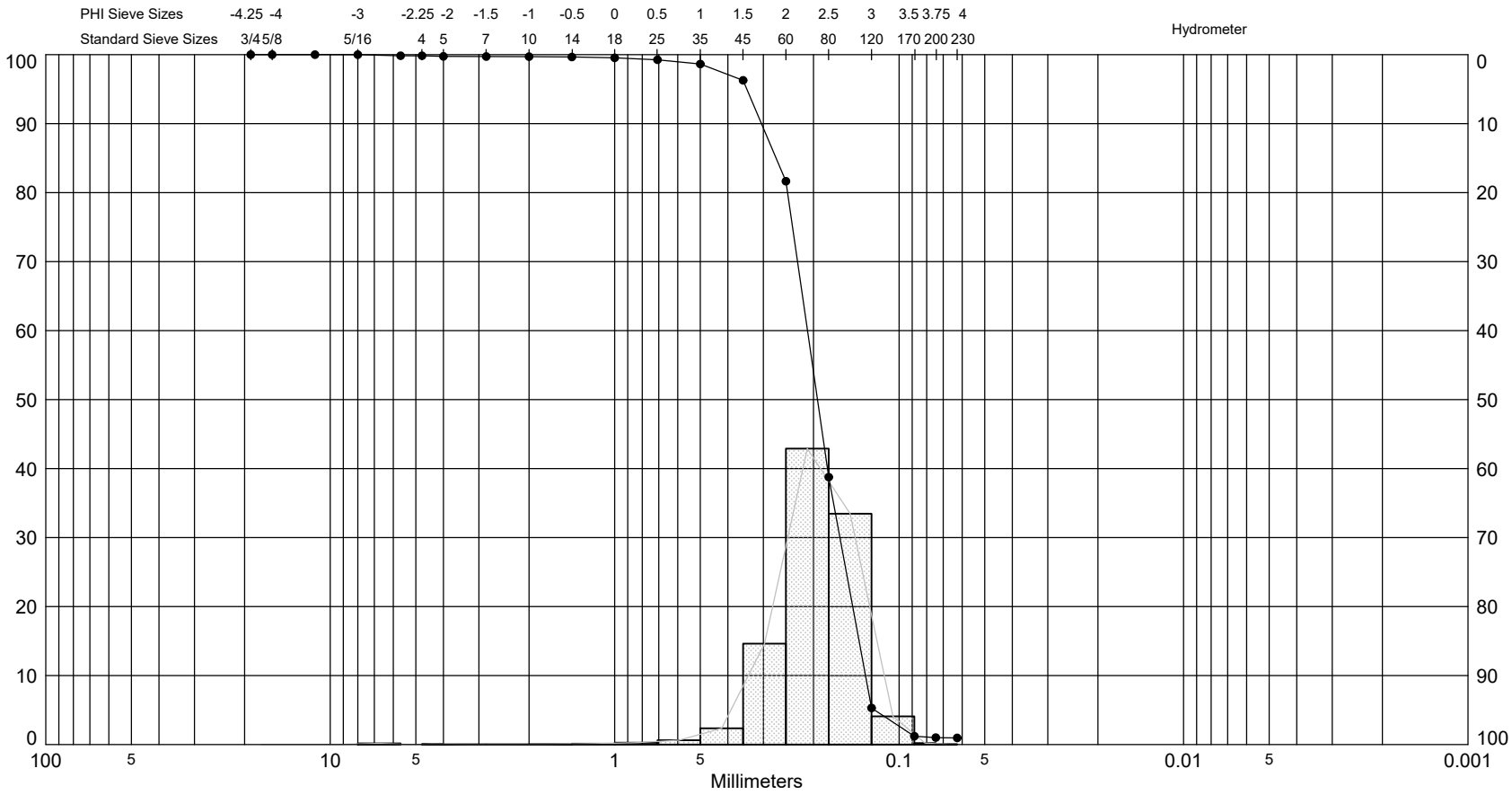
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**6.0**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-01**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, few coarse to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.36	
	153.49	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.17	99.84	100	0.17
#4	4.750	0.00	99.84	0	0.00
#5	4.000	0.09	99.75	100	0.09
#7	2.800	0.02	99.73	100	0.02
#10	2.000	0.02	99.71	100	0.02
#14	1.400	0.05	99.66	100	0.05
#18	1.000	0.12	99.55	100	0.12
#25	0.710	0.29	99.27	100	0.29
#35	0.500	0.65	98.65	90	0.59
#45	0.355	2.46	96.28	40	0.98
#60	0.250	15.23	81.66	10	1.52
#80	0.180	44.66	38.77	5	2.23
#120	0.125	34.84	5.31	0	0.00
#170	0.090	4.26	1.22	0	0.00
#200	0.075	0.21	1.02	0	0.00
#230	0.063	0.05	0.97	0	0.00
Total Shell Content:		**6**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-01 #S-2	—●—	-11.8	SP	#200 - 1.01 #230 - 0.96			2.37	2.33	-2.61	22.34	0.53

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,999
Northing (Y, ft):	2,245,682
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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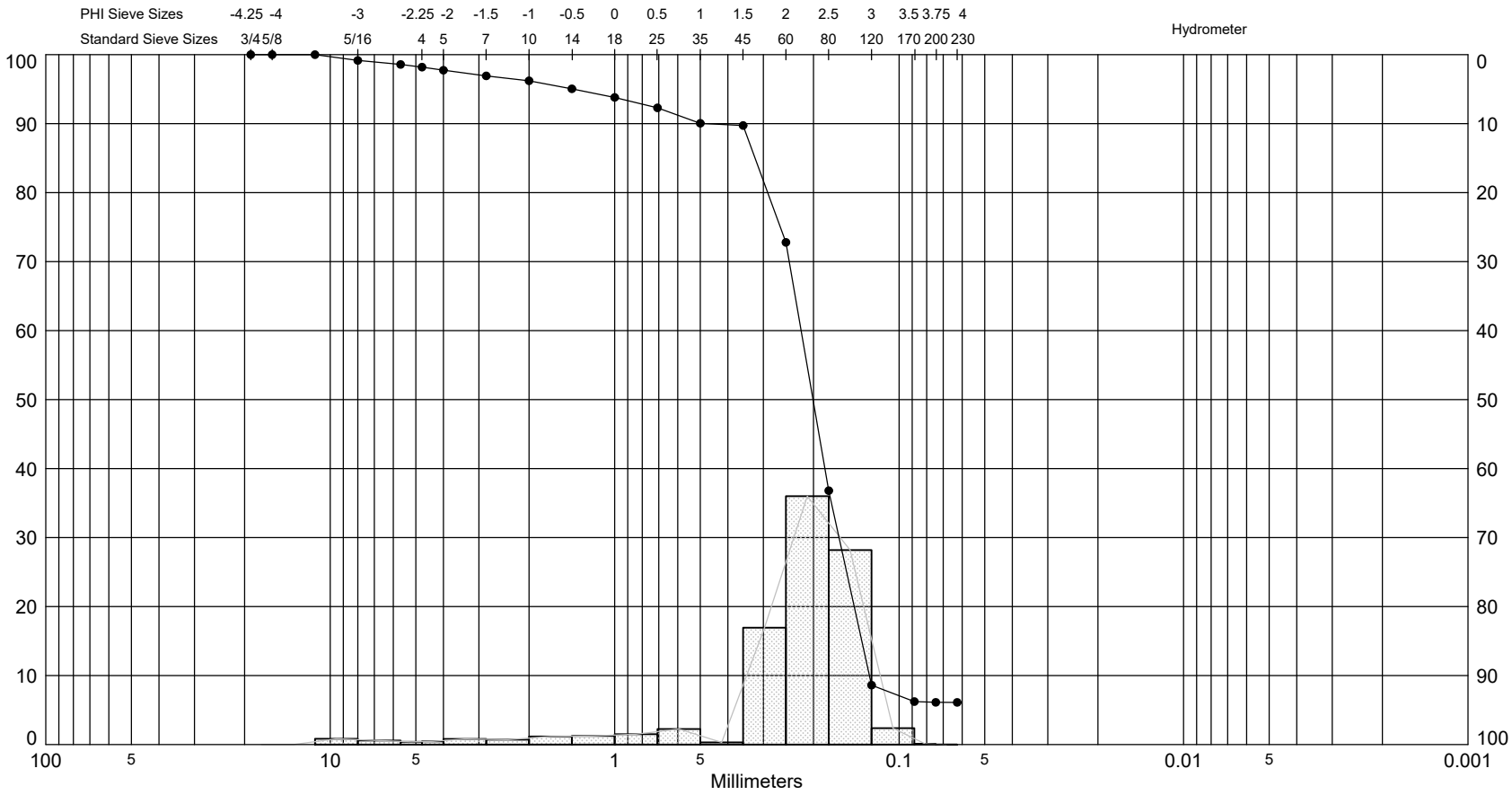
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-3.5**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-02**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded with silt, mostly fine-grained quartz, few coarse to fine sand-size shell fragments, few silt, trace fine gravel-size shell fragments (SP-SM) 10YR 8/1**		

Tare Weight, (g):	50.02	
	169.74	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	1.01	99.16	100	1.01
#3.5	5.600	0.70	98.57	100	0.70
#4	4.750	0.47	98.18	100	0.47
#5	4.000	0.54	97.73	100	0.54
#7	2.800	0.98	96.91	100	0.98
#10	2.000	0.85	96.20	100	0.85
#14	1.400	1.39	95.04	100	1.39
#18	1.000	1.50	93.79	100	1.50
#25	0.710	1.81	92.27	90	1.63
#35	0.500	2.68	90.04	60	1.61
#45	0.355	0.38	89.72	30	0.11
#60	0.250	20.28	72.78	5	1.01
#80	0.180	43.09	36.79	0	0.00
#120	0.125	33.75	8.60	0	0.00
#170	0.090	2.85	6.21	0	0.00
#200	0.075	0.13	6.11	0	0.00
#230	0.063	0.01	6.10	0	0.00
Total Shell Content:		**10**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-02 #C-1	—●—	-18.5	SP-SM	#200 - 6.12 #230 - 6.11		10.30	2.32	2.01	-2.71	10.97	1.12

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,829
Northing (Y, ft):	2,244,680
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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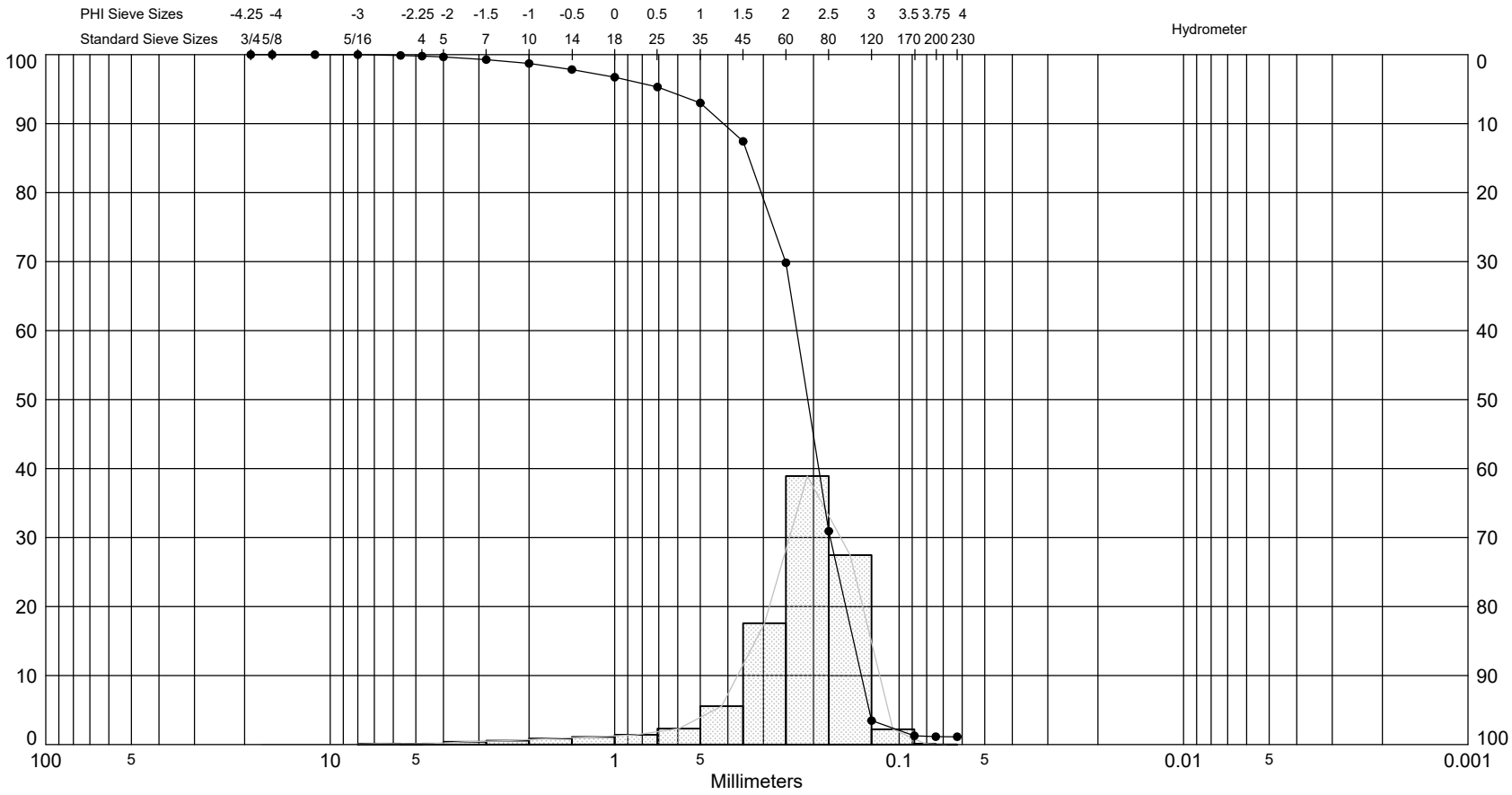
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-02**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few coarse to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.61	
	203.77	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.18	99.88	100	0.18
#4	4.750	0.14	99.79	100	0.14
#5	4.000	0.18	99.67	100	0.18
#7	2.800	0.59	99.28	100	0.59
#10	2.000	0.85	98.73	100	0.85
#14	1.400	1.34	97.84	100	1.34
#18	1.000	1.69	96.73	100	1.69
#25	0.710	2.16	95.31	90	1.94
#35	0.500	3.52	93.00	50	1.76
#45	0.355	8.47	87.43	30	2.54
#60	0.250	26.77	69.84	5	1.34
#80	0.180	59.20	30.93	0	0.00
#120	0.125	41.78	3.48	0	0.00
#170	0.090	3.35	1.27	0	0.00
#200	0.075	0.20	1.14	0	0.00
#230	0.063	0.01	1.14	0	0.00
Total Shell Content:		**8**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-02 #S-1	—●—	-19.3	SP	#200 - 1.14 #230 - 1.13			2.25	2.1	-2.3	10.55	0.8

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,829
Northing (Y, ft):	2,244,680
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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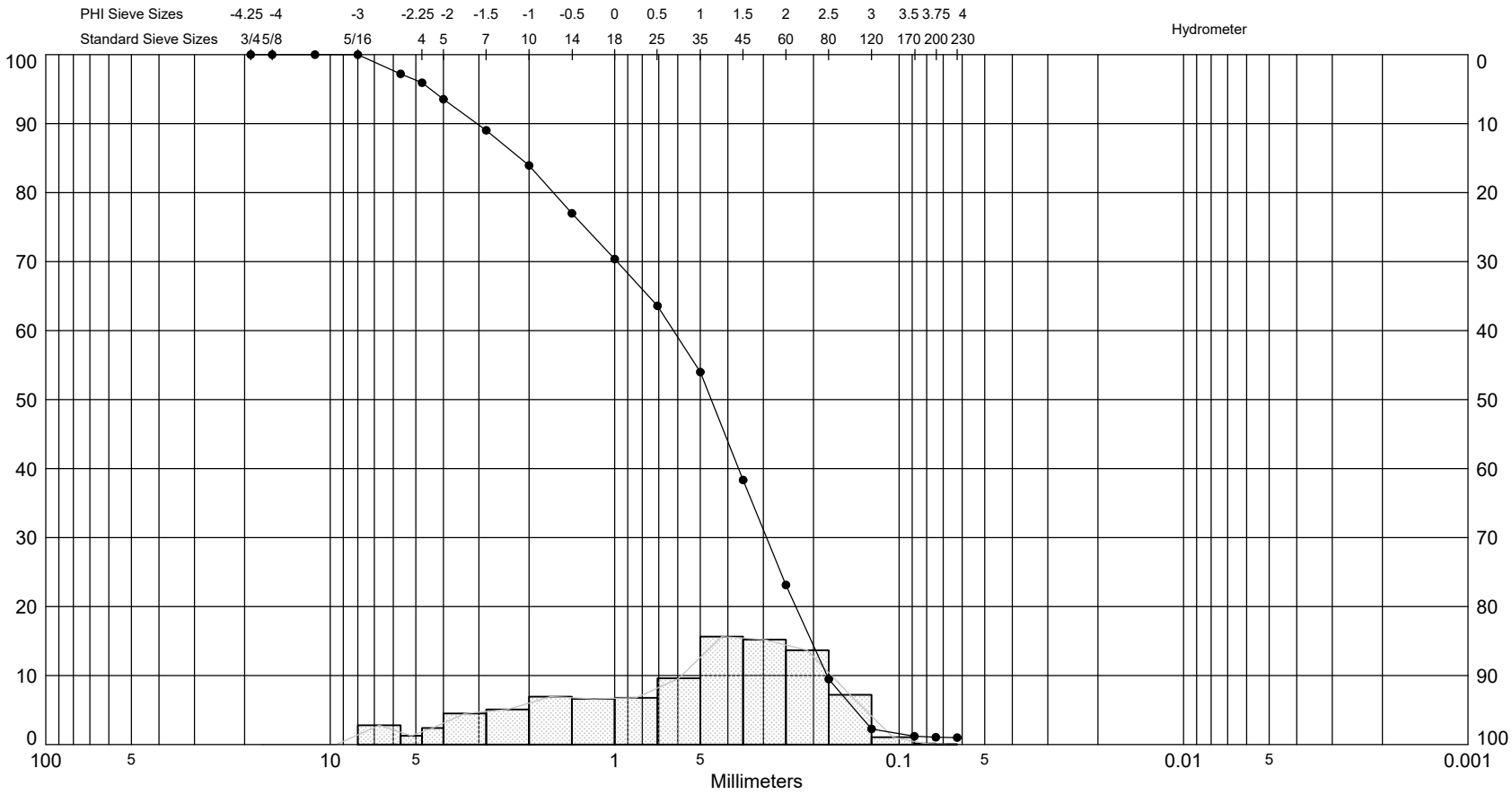
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**7.0**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-02**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	52.06	
	204.00	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	4.24	97.21	100	4.24
#4	4.750	1.95	95.93	100	1.95
#5	4.000	3.63	93.54	100	3.63
#7	2.800	6.85	89.03	100	6.85
#10	2.000	7.74	83.93	100	7.74
#14	1.400	10.54	77.00	100	10.54
#18	1.000	10.07	70.37	100	10.07
#25	0.710	10.30	63.59	90	9.27
#35	0.500	14.59	53.99	70	10.21
#45	0.355	23.78	38.34	20	4.76
#60	0.250	23.11	23.13	5	1.16
#80	0.180	20.75	9.47	0	0.00
#120	0.125	10.95	2.26	0	0.00
#170	0.090	1.61	1.20	0	0.00
#200	0.075	0.22	1.06	0	0.00
#230	0.063	0.07	1.01	0	0.00
Total Shell Content:		**46**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-02 #S-2	—●—	-25.3	SP	#200 - 1.06 #230 - 1.01			1.13	0.74	-0.6	2.42	1.51

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	518,829
Northing (Y, ft):	2,244,680
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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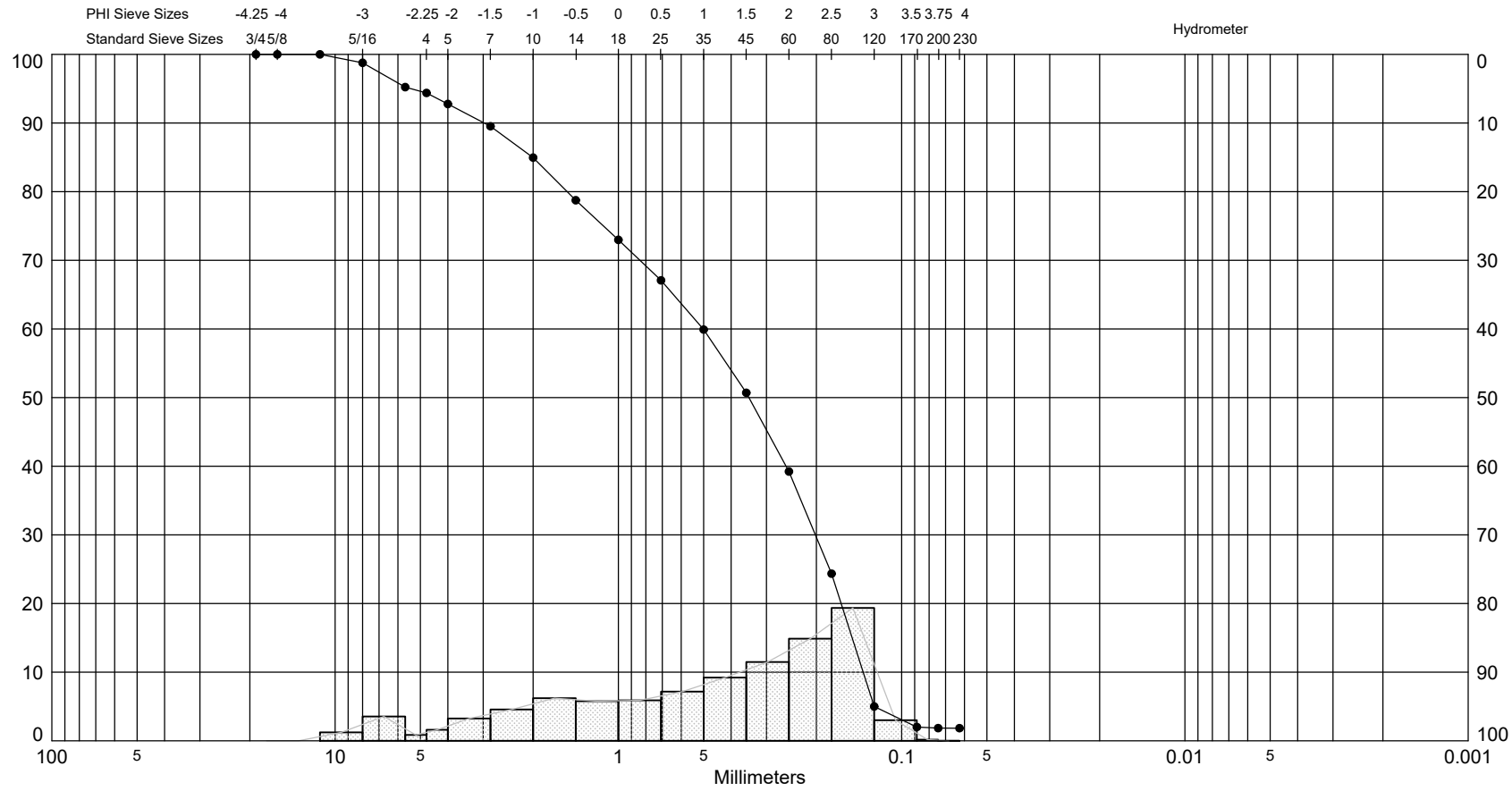
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-14.3**
Project No.:	**EQ181189**	**Date:**	**10/17/2018**
Boring No.:	**D-03**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	49.62	
	200.58	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	1.85	98.77	100	1.85
#3.5	5.600	5.35	95.23	100	5.35
#4	4.750	1.28	94.38	100	1.28
#5	4.000	2.43	92.77	100	2.43
#7	2.800	4.89	89.53	100	4.89
#10	2.000	6.90	84.96	100	6.90
#14	1.400	9.37	78.76	100	9.37
#18	1.000	8.71	72.99	100	8.71
#25	0.710	8.91	67.08	90	8.02
#35	0.500	10.82	59.92	50	5.41
#45	0.355	13.91	50.70	30	4.17
#60	0.250	17.32	39.23	10	1.73
#80	0.180	22.47	24.34	5	1.12
#120	0.125	29.21	4.99	0	0.00
#170	0.090	4.52	2.00	0	0.00
#200	0.075	0.24	1.84	0	0.00
#230	0.063	0.01	1.83	0	0.00
Total Shell Content:		**41**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-03 #C-1	—●—	-6.8	SP	#200 - 1.85 #230 - 1.84		33.80	1.53	1.01	-0.75	2.53	1.7

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-17-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	519,667
Northing (Y, ft):	2,245,970
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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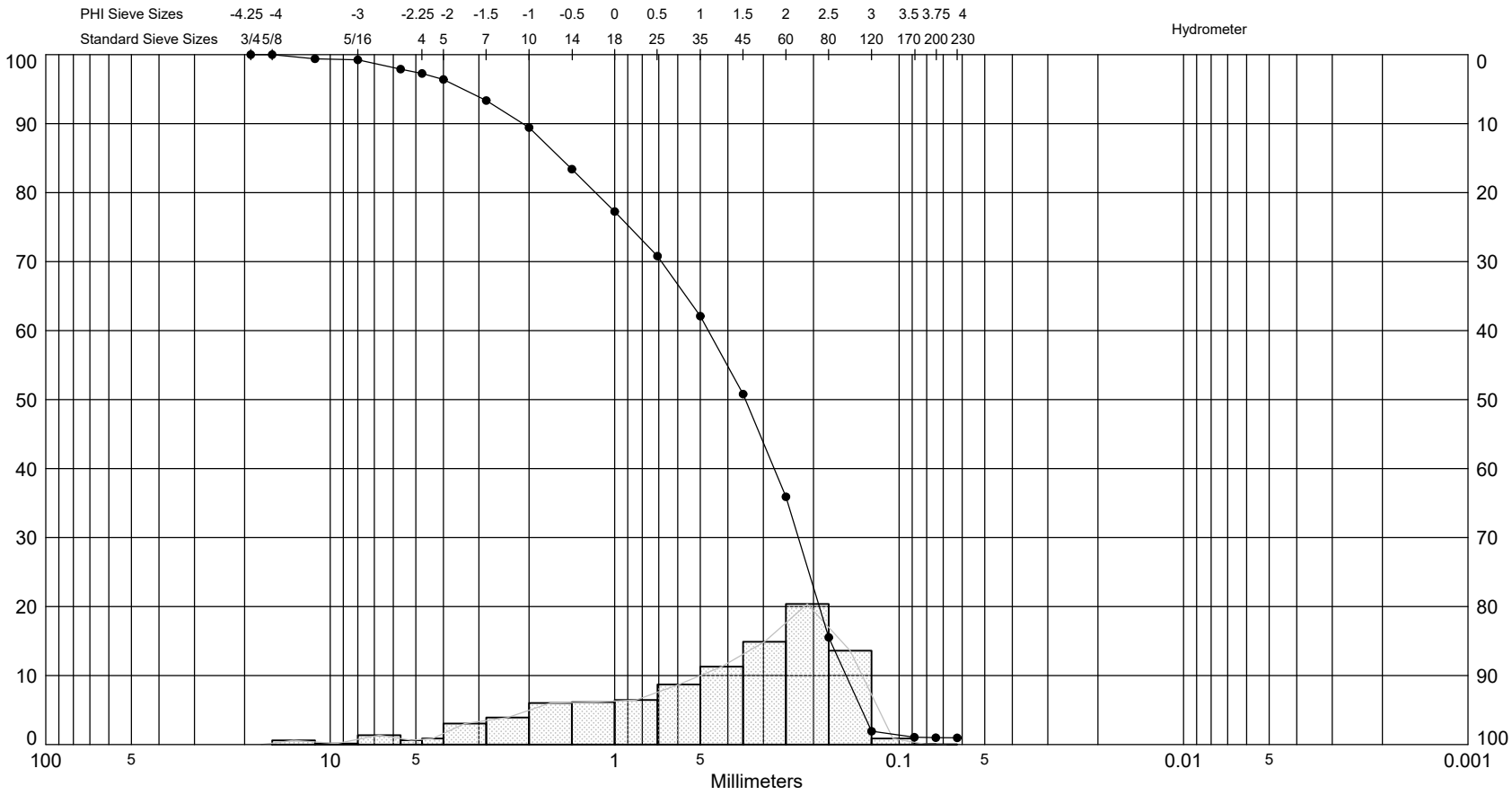
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-03**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/2**		

Tare Weight, (g):	50.44	
	220.38	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	1.02	99.40	100	1.02
5/16	7.938	0.25	99.25	100	0.25
#3.5	5.600	2.30	97.90	100	2.30
#4	4.750	1.07	97.27	100	1.07
#5	4.000	1.47	96.40	100	1.47
#7	2.800	5.19	93.35	100	5.19
#10	2.000	6.67	89.43	100	6.67
#14	1.400	10.24	83.40	100	10.24
#18	1.000	10.44	77.26	100	10.44
#25	0.710	10.98	70.80	90	9.88
#35	0.500	14.78	62.10	50	7.39
#45	0.355	19.20	50.80	20	3.84
#60	0.250	25.31	35.91	10	2.53
#80	0.180	34.64	15.52	5	1.73
#120	0.125	23.11	1.92	0	0.00
#170	0.090	1.48	1.05	0	0.00
#200	0.075	0.12	0.98	0	0.00
#230	0.063	0.04	0.96	0	0.00
Total Shell Content:		**38**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-03 #S-1	—●—	-7.6	SP	#200 - 0.99 #230 - 0.97			1.53	1.1	-0.91	3.15	1.47

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	519,667
Northing (Y, ft):	2,245,970
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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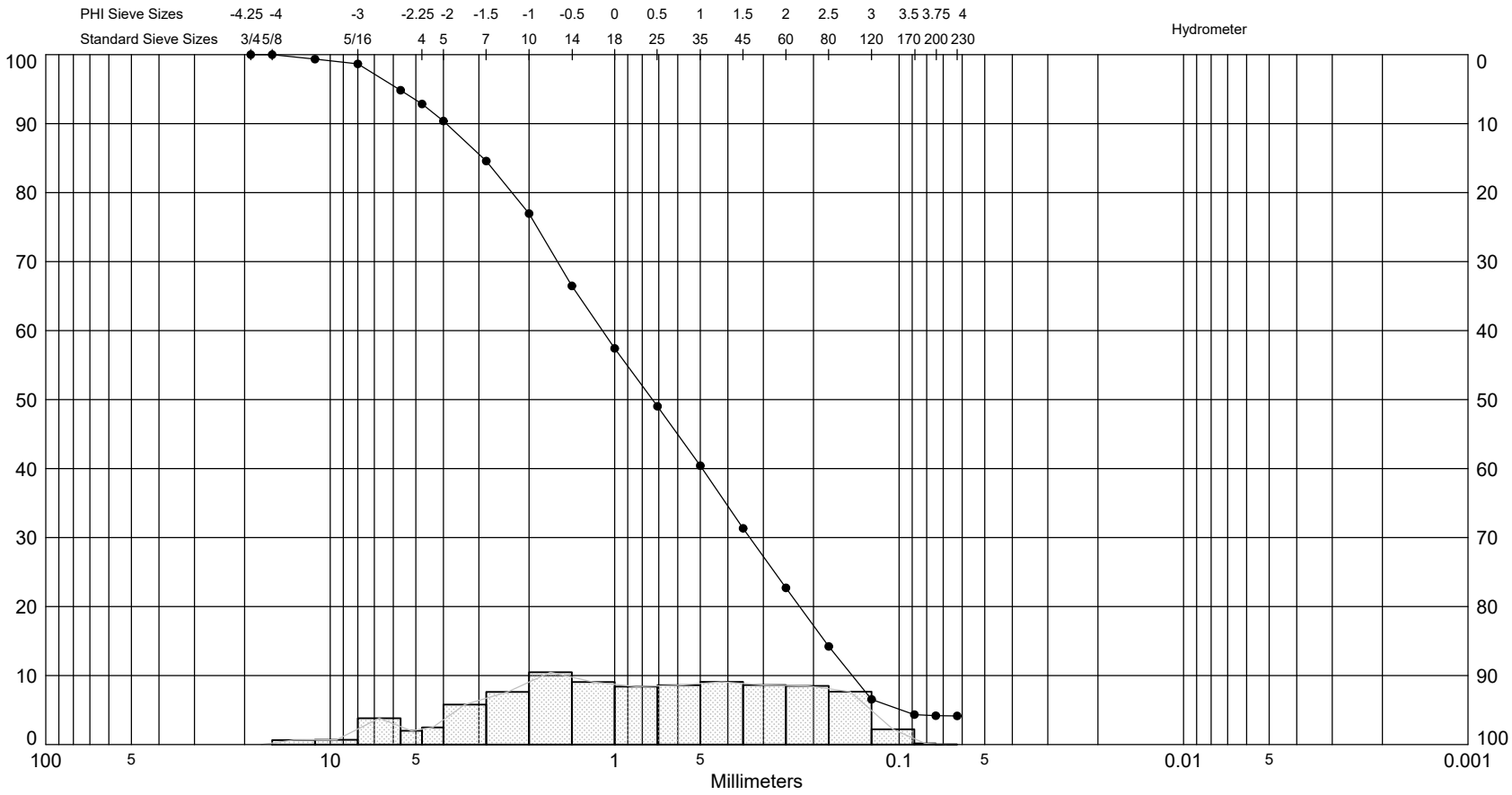
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**8.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-03**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grained quartz, few fine gravel-size shell fragments, trace silt (SP) 10YR 8/2**		

Tare Weight, (g):	49.92	
	209.68	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	1.04	99.35	100	1.04
5/16	7.938	1.11	98.65	100	1.11
#3.5	5.600	6.10	94.84	100	6.10
#4	4.750	3.18	92.85	100	3.18
#5	4.000	3.95	90.37	100	3.95
#7	2.800	9.27	84.57	100	9.27
#10	2.000	12.18	76.95	100	12.18
#14	1.400	16.75	66.46	100	16.75
#18	1.000	14.47	57.40	100	14.47
#25	0.710	13.40	49.02	90	12.06
#35	0.500	13.75	40.41	40	5.50
#45	0.355	14.50	31.33	20	2.90
#60	0.250	13.78	22.71	10	1.38
#80	0.180	13.57	14.22	5	0.68
#120	0.125	12.26	6.54	0	0.00
#170	0.090	3.53	4.33	0	0.00
#200	0.075	0.25	4.18	0	0.00
#230	0.063	0.04	4.15	0	0.00
Total Shell Content:		**57**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-03 #S-2	—●—	-14.6	SP	#200 - 4.18 #230 - 4.15			0.44	0.29	-0.15	2.12	1.67

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	519,667
Northing (Y, ft):	2,245,970
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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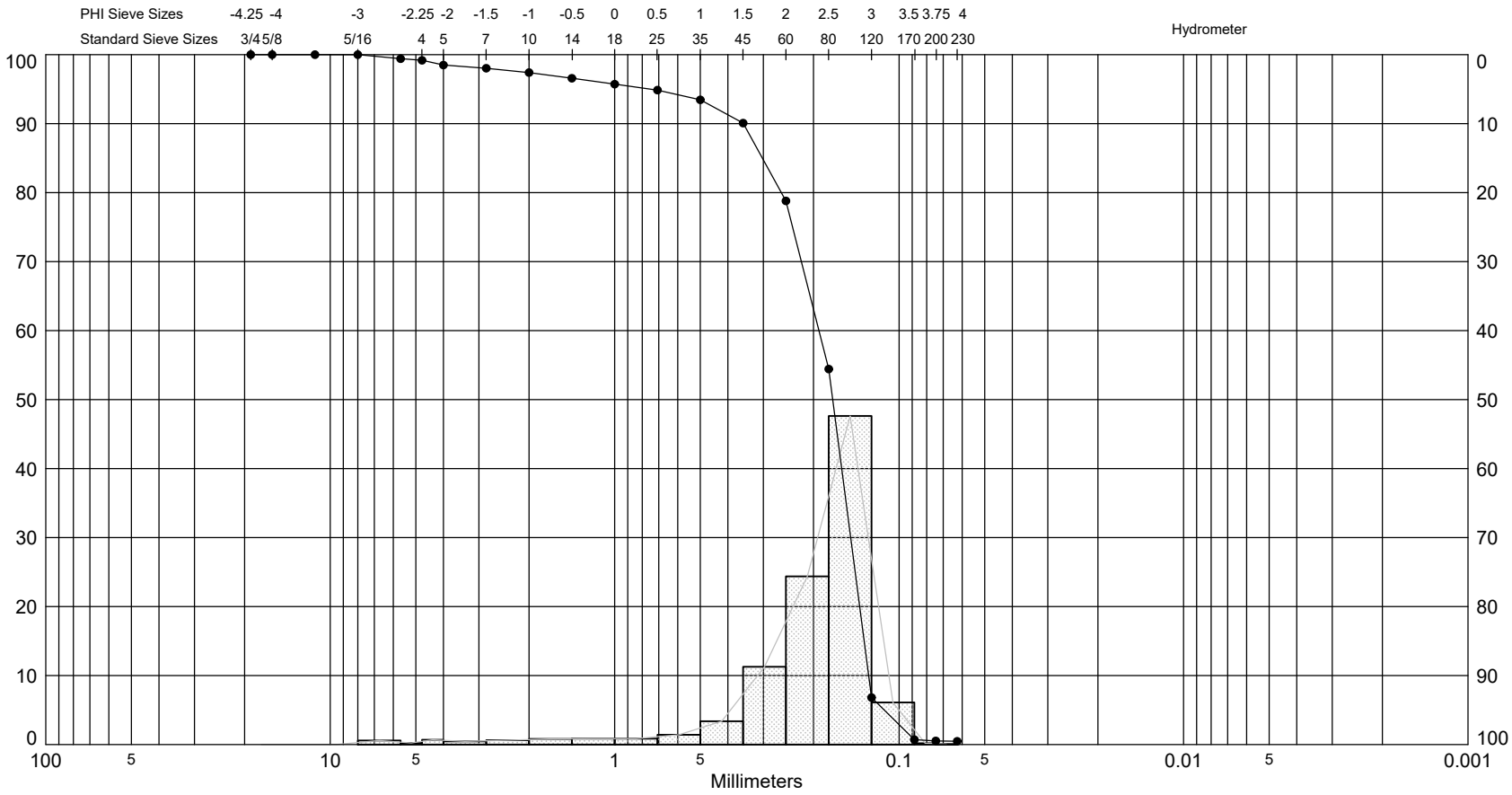
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**13.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-03**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.41	
	174.38	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.74	99.41	100	0.74
#4	4.750	0.29	99.18	100	0.29
#5	4.000	0.86	98.49	100	0.86
#7	2.800	0.58	98.02	100	0.58
#10	2.000	0.79	97.39	100	0.79
#14	1.400	1.02	96.58	100	1.02
#18	1.000	1.07	95.72	100	1.07
#25	0.710	1.08	94.85	90	0.97
#35	0.500	1.76	93.45	60	1.06
#45	0.355	4.21	90.08	20	0.84
#60	0.250	14.10	78.79	5	0.71
#80	0.180	30.46	54.42	0	0.00
#120	0.125	59.51	6.80	0	0.00
#170	0.090	7.62	0.70	0	0.00
#200	0.075	0.23	0.52	0	0.00
#230	0.063	0.07	0.46	0	0.00
Total Shell Content:		**7**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-03 #S-3	—●—	-19.6	SP	#200 - 0.53 #230 - 0.47			2.55	2.27	-2.88	12.84	0.96

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	519,667
Northing (Y, ft):	2,245,970
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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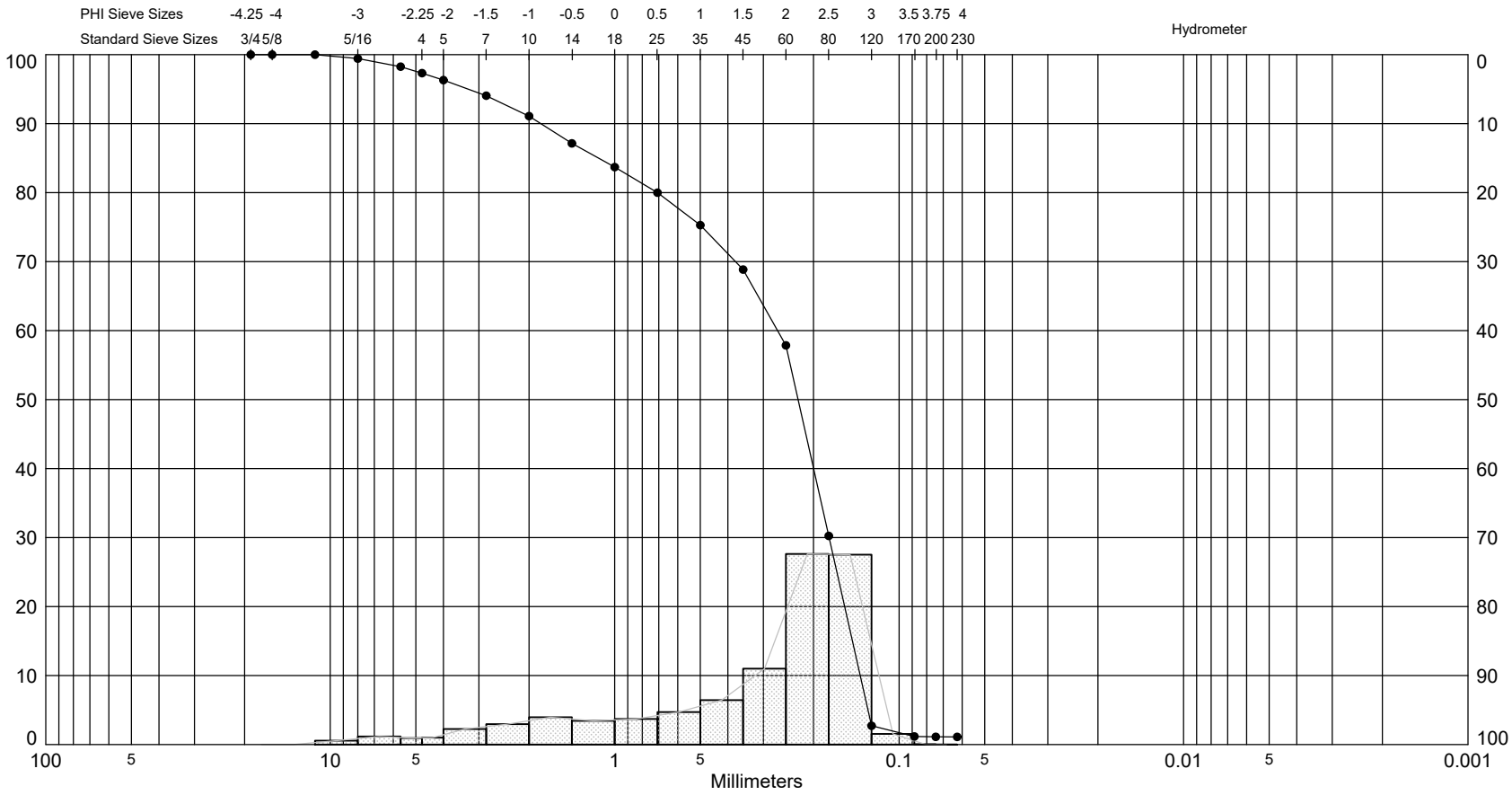
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-11.3**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-04**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	50.40	
	216.16	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.95	99.43	100	0.95
#3.5	5.600	1.94	98.26	100	1.94
#4	4.750	1.55	97.32	100	1.55
#5	4.000	1.68	96.31	100	1.68
#7	2.800	3.74	94.05	100	3.74
#10	2.000	4.90	91.10	100	4.90
#14	1.400	6.55	87.14	100	6.55
#18	1.000	5.70	83.71	100	5.70
#25	0.710	6.15	80.00	90	5.54
#35	0.500	7.79	75.30	50	3.90
#45	0.355	10.68	68.85	30	3.20
#60	0.250	18.22	57.86	10	1.82
#80	0.180	45.79	30.24	5	2.29
#120	0.125	45.62	2.71	0	0.00
#170	0.090	2.57	1.16	0	0.00
#200	0.075	0.09	1.11	0	0.00
#230	0.063	0.01	1.10	0	0.00
Total Shell Content:		**26**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-04 #C-1	—●—	-4.0	SP	#200 - 1.12 #230 - 1.11		26.80	2.14	1.56	-1.39	4.02	1.46

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,081
Northing (Y, ft):	2,245,294
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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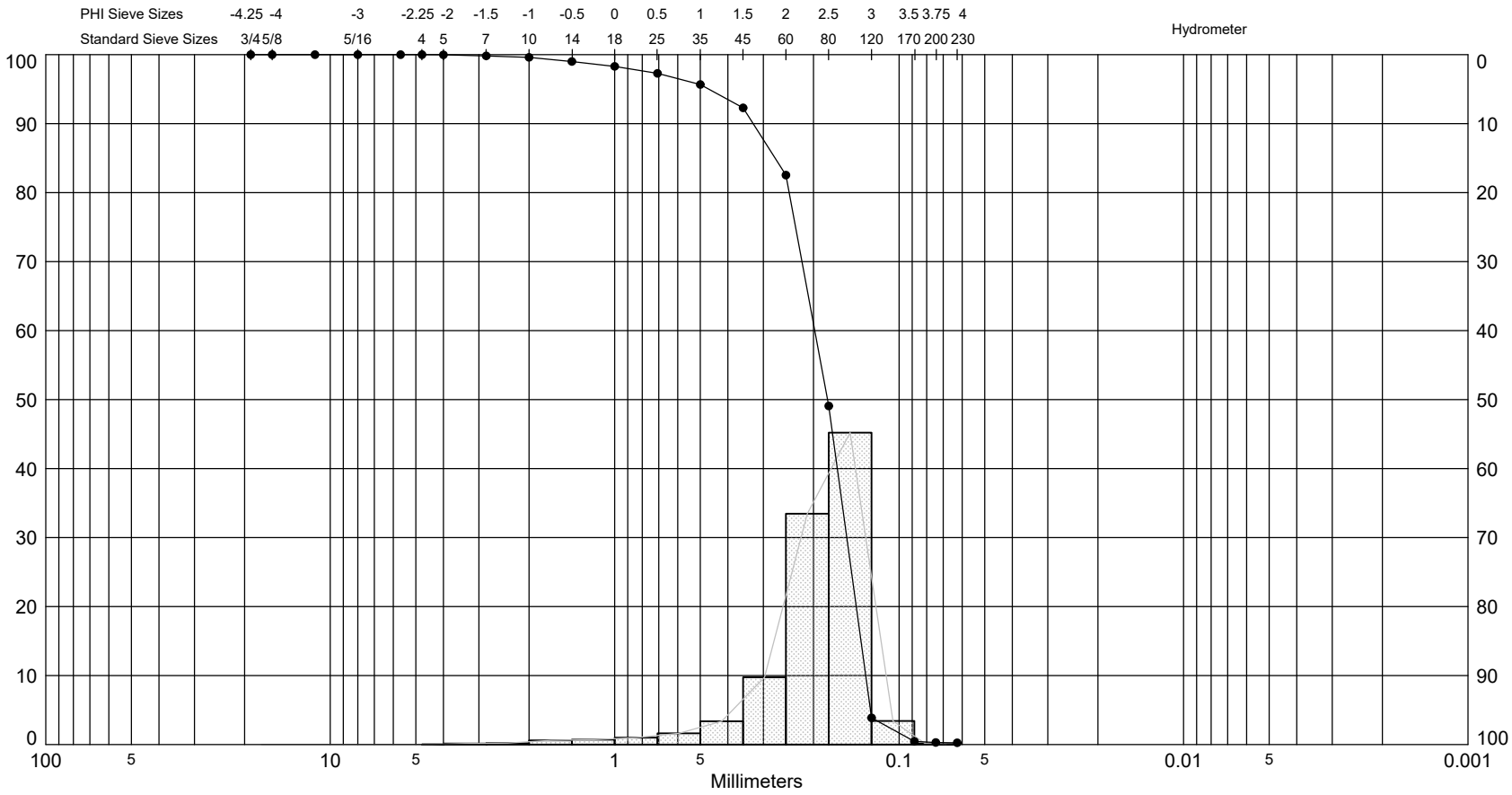
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-04**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few medium to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.79	
	170.75	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.04	99.97	100	0.04
#7	2.800	0.18	99.82	100	0.18
#10	2.000	0.25	99.61	100	0.25
#14	1.400	0.73	99.01	100	0.73
#18	1.000	0.86	98.30	100	0.86
#25	0.710	1.22	97.29	90	1.10
#35	0.500	1.96	95.67	50	0.98
#45	0.355	4.09	92.29	20	0.82
#60	0.250	11.79	82.54	5	0.59
#80	0.180	40.47	49.08	0	0.00
#120	0.125	54.68	3.88	0	0.00
#170	0.090	4.14	0.45	0	0.00
#200	0.075	0.18	0.31	0	0.00
#230	0.063	0.05	0.26	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-04 #S-1	—●—	-4.8	SP	#200 - 0.30 #230 - 0.26			2.49	2.34	-2.39	11.42	0.66

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,081
Northing (Y, ft):	2,245,294
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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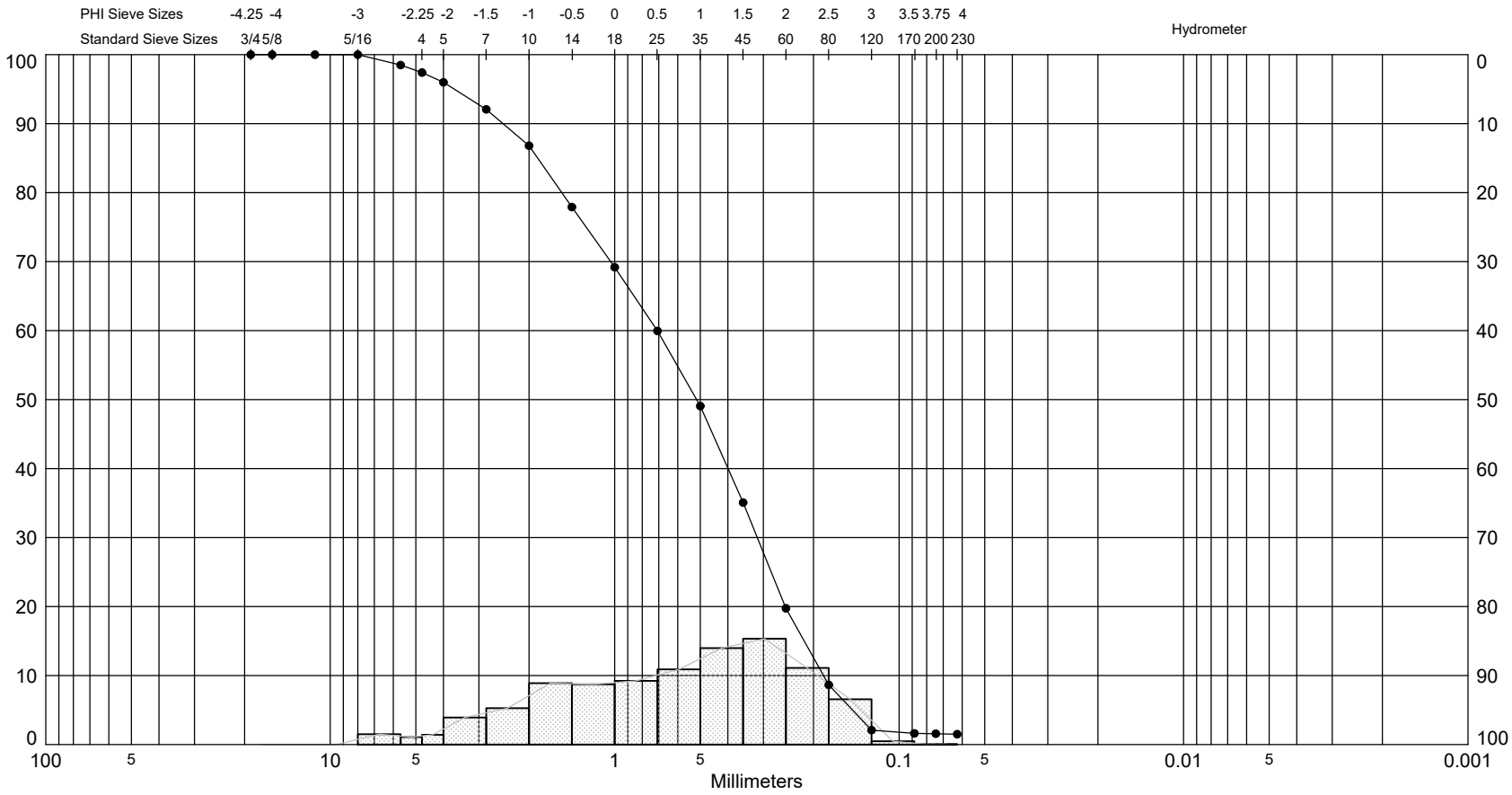
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**5.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-04**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/2**		

Tare Weight, (g):	49.69	
	196.82	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	2.22	98.49	100	2.22
#4	4.750	1.61	97.40	100	1.61
#5	4.000	2.08	95.98	100	2.08
#7	2.800	5.77	92.06	100	5.77
#10	2.000	7.75	86.79	100	7.75
#14	1.400	13.08	77.90	100	13.08
#18	1.000	12.84	69.18	100	12.84
#25	0.710	13.58	59.95	90	12.22
#35	0.500	16.02	49.06	50	8.01
#45	0.355	20.57	35.08	20	4.11
#60	0.250	22.55	19.75	5	1.13
#80	0.180	16.33	8.65	0	0.00
#120	0.125	9.65	2.09	0	0.00
#170	0.090	0.69	1.62	0	0.00
#200	0.075	0.08	1.57	0	0.00
#230	0.063	0.10	1.50	0	0.00
Total Shell Content:		**48**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-04 #S-2	—●—	-8.8	SP	#200 - 1.57 #230 - 1.50			0.96	0.69	-0.46	2.4	1.39

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,081
Northing (Y, ft):	2,245,294
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

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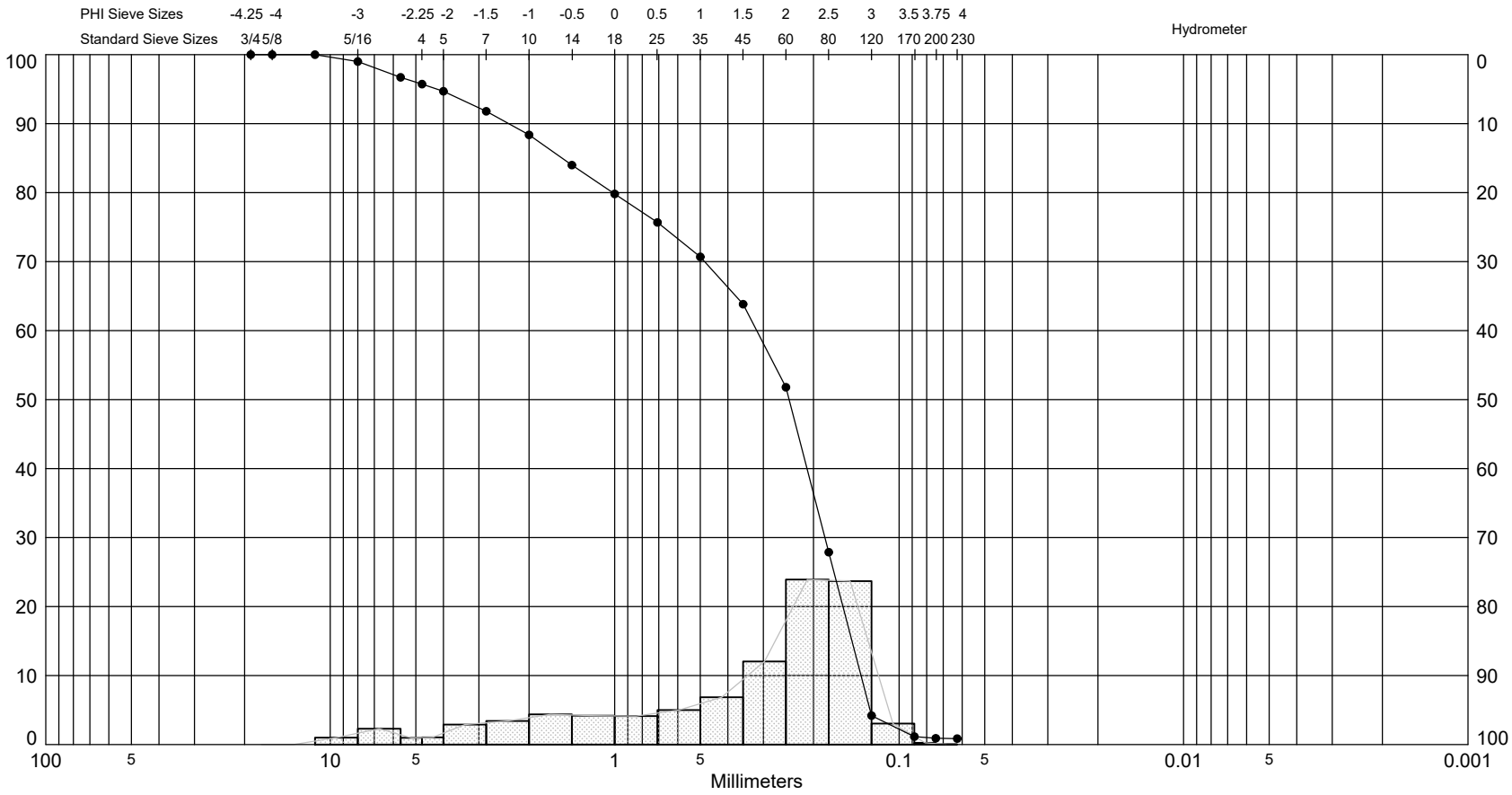
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-13.4**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-05**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	50.27	
	192.17	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	1.42	99.00	100	1.42
#3.5	5.600	3.25	96.71	100	3.25
#4	4.750	1.39	95.73	100	1.39
#5	4.000	1.47	94.69	100	1.47
#7	2.800	4.12	91.79	100	4.12
#10	2.000	4.85	88.37	100	4.85
#14	1.400	6.21	84.00	100	6.21
#18	1.000	5.93	79.82	100	5.93
#25	0.710	5.86	75.69	90	5.27
#35	0.500	7.08	70.70	50	3.54
#45	0.355	9.73	63.84	30	2.92
#60	0.250	17.09	51.80	5	0.85
#80	0.180	33.93	27.89	0	0.00
#120	0.125	33.61	4.20	0	0.00
#170	0.090	4.31	1.16	0	0.00
#200	0.075	0.34	0.92	0	0.00
#230	0.063	0.07	0.87	0	0.00
Total Shell Content:		**29**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-05 #C-1	—●—	-8.6	SP	#200 - 0.91 #230 - 0.86		28.40	2.04	1.38	-1.17	3.36	1.6

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,817
Northing (Y, ft):	2,244,653
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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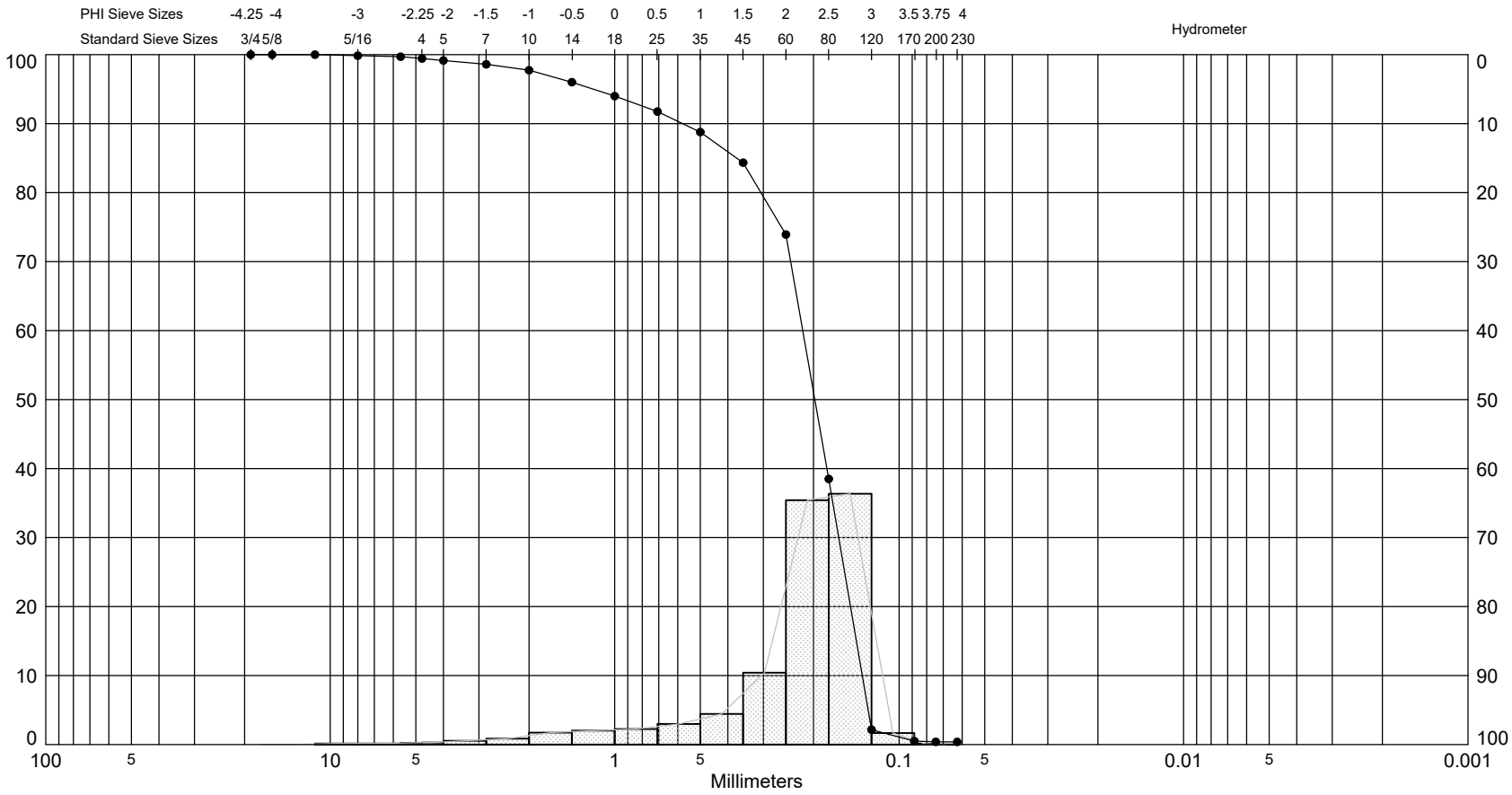
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-05**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.94	
	185.79	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.20	99.85	100	0.20
#3.5	5.600	0.20	99.71	100	0.20
#4	4.750	0.35	99.45	100	0.35
#5	4.000	0.40	99.15	100	0.40
#7	2.800	0.75	98.60	100	0.75
#10	2.000	1.17	97.74	100	1.17
#14	1.400	2.35	96.01	100	2.35
#18	1.000	2.75	93.99	100	2.75
#25	0.710	3.04	91.75	90	2.74
#35	0.500	4.03	88.78	50	2.02
#45	0.355	6.03	84.34	30	1.81
#60	0.250	14.15	73.93	10	1.42
#80	0.180	48.12	38.51	5	2.41
#120	0.125	49.38	2.16	0	0.00
#170	0.090	2.25	0.50	0	0.00
#200	0.075	0.14	0.40	0	0.00
#230	0.063	0.01	0.39	0	0.00
Total Shell Content:		**14**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-05 #S-1	—●—	-9.4	SP	#200 - 0.39 #230 - 0.38			2.34	2.07	-2.26	8.7	0.99

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,817
Northing (Y, ft):	2,244,653
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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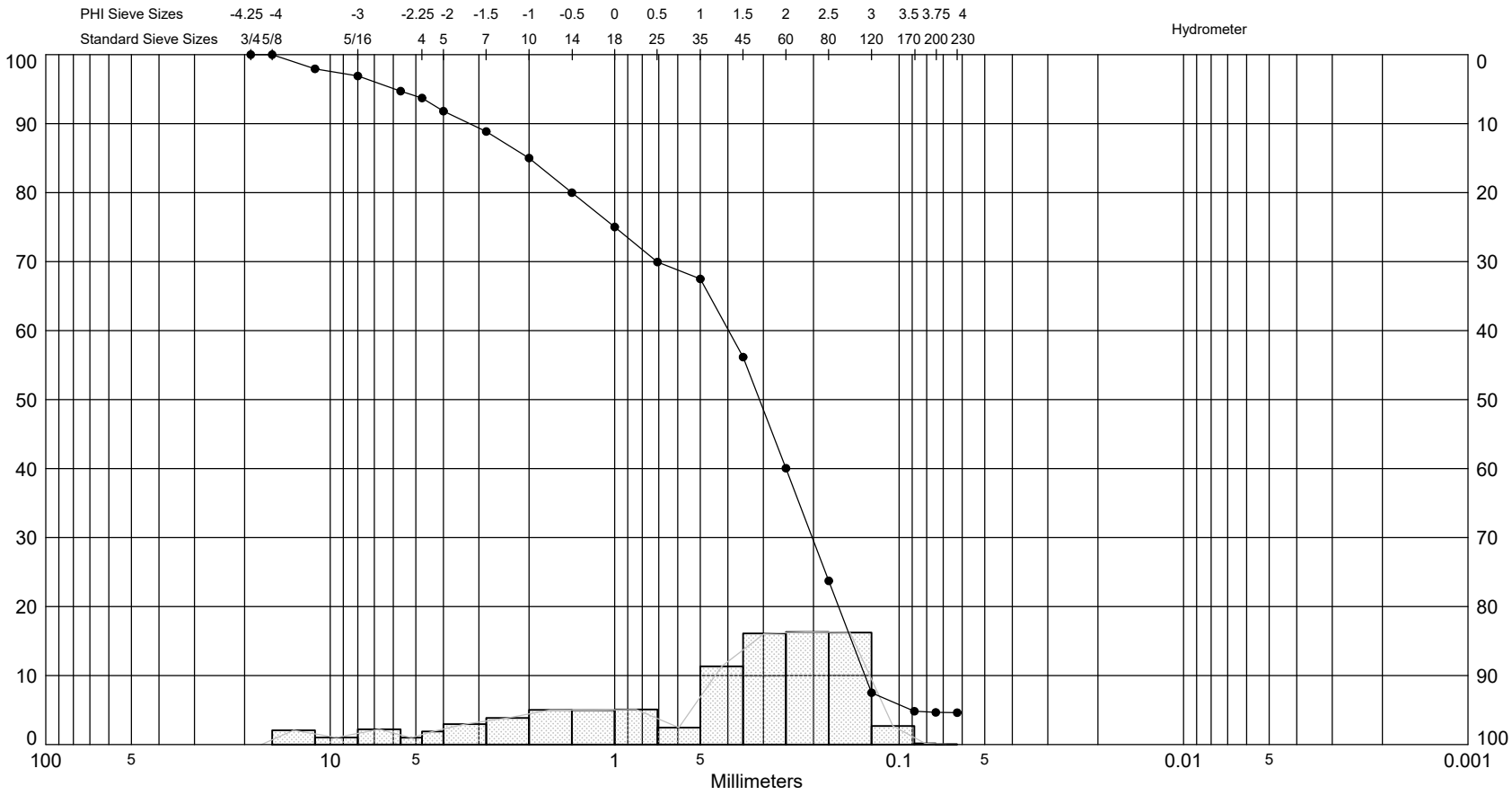
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**6.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-05**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.20	
	216.39	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	3.45	97.94	100	3.45
5/16	7.938	1.73	96.90	100	1.73
#3.5	5.600	3.68	94.70	100	3.68
#4	4.750	1.67	93.70	100	1.67
#5	4.000	3.18	91.80	100	3.18
#7	2.800	4.93	88.85	100	4.93
#10	2.000	6.44	85.00	100	6.44
#14	1.400	8.40	79.97	100	8.40
#18	1.000	8.31	75.00	100	8.31
#25	0.710	8.50	69.92	90	7.65
#35	0.500	4.09	67.47	40	1.64
#45	0.355	18.94	56.15	10	1.89
#60	0.250	26.93	40.04	5	1.35
#80	0.180	27.29	23.72	0	0.00
#120	0.125	27.12	7.49	0	0.00
#170	0.090	4.48	4.81	0	0.00
#200	0.075	0.29	4.64	0	0.00
#230	0.063	0.07	4.60	0	0.00
Total Shell Content:		**32**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-05 #S-2	—●—	-14.4	SP	#200 - 4.66 #230 - 4.62			1.69	1.02	-1	3.08	1.76

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,817
Northing (Y, ft):	2,244,653
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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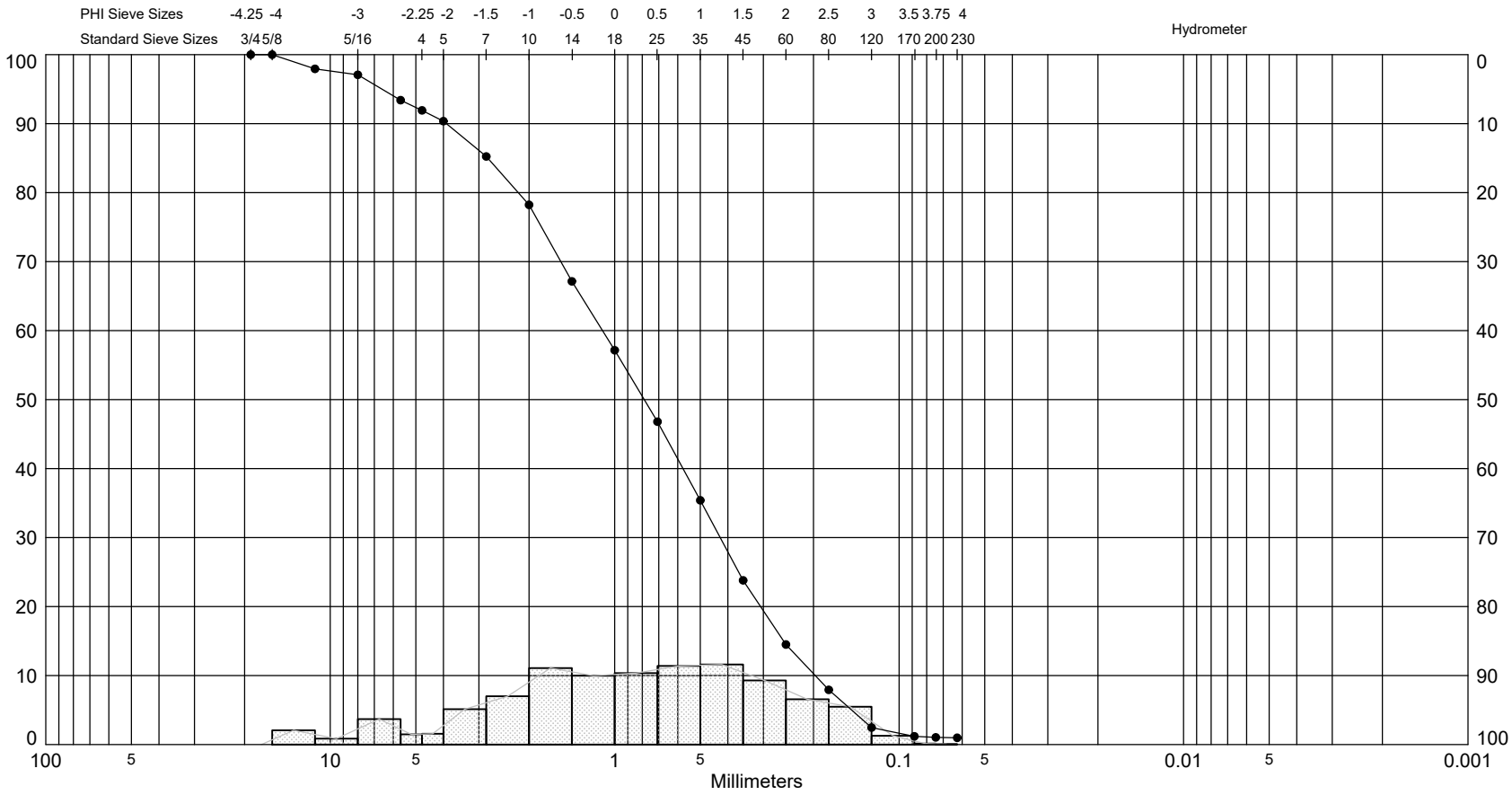
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**13.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-05**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grained quartz, few fine gravel-size shell fragments, trace silt (SP) 10YR 6/1**		

Tare Weight, (g):	49.55	
	208.12	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	3.27	97.94	100	3.27
5/16	7.938	1.37	97.07	100	1.37
#3.5	5.600	5.84	93.39	100	5.84
#4	4.750	2.34	91.92	100	2.34
#5	4.000	2.48	90.35	100	2.48
#7	2.800	8.12	85.23	100	8.12
#10	2.000	11.12	78.22	100	11.12
#14	1.400	17.58	67.13	100	17.58
#18	1.000	15.82	57.15	100	15.82
#25	0.710	16.43	46.79	90	14.79
#35	0.500	18.07	35.40	50	9.04
#45	0.355	18.39	23.80	30	5.52
#60	0.250	14.75	14.50	5	0.74
#80	0.180	10.42	7.93	0	0.00
#120	0.125	8.68	2.45	0	0.00
#170	0.090	2.01	1.19	0	0.00
#200	0.075	0.23	1.04	0	0.00
#230	0.063	0.10	0.98	0	0.00
Total Shell Content:		**62**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-05 #S-3	—●—	-21.4	SP	#200 - 1.04 #230 - 0.98			0.35	0.21	-0.33	2.57	1.61

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,817
Northing (Y, ft):	2,244,653
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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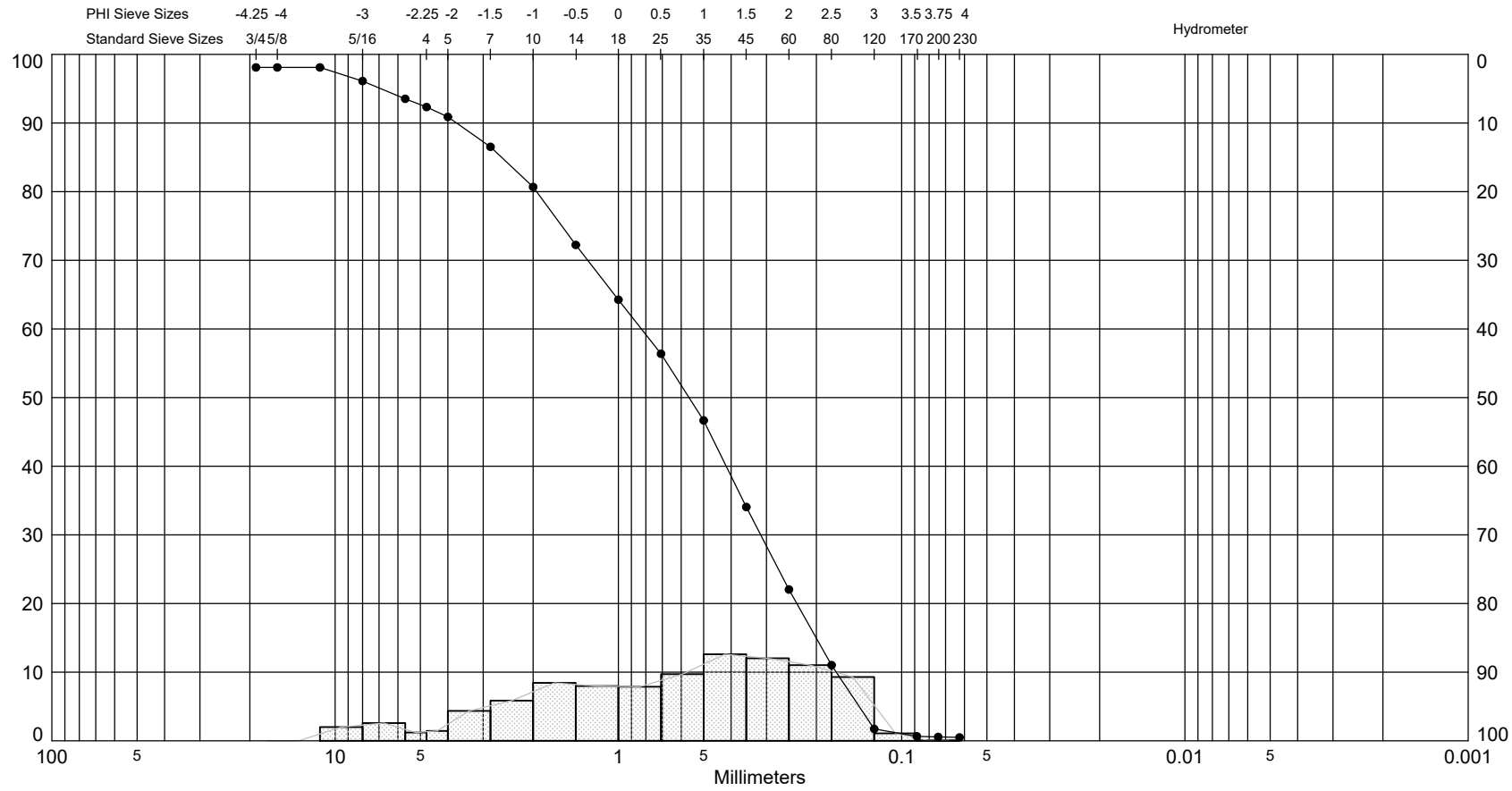
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-13.2**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-06**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grained quartz, few coarse to fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	49.59	
	199.27	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	2.84	98.10	100	2.84
5/8"	16.000	0.00	98.10	0	0.00
7/16	11.112	0.00	98.10	0	0.00
5/16	7.938	2.98	96.11	100	2.98
#3.5	5.600	3.86	93.53	100	3.86
#4	4.750	1.80	92.33	100	1.80
#5	4.000	2.15	90.89	100	2.15
#7	2.800	6.52	86.54	100	6.52
#10	2.000	8.75	80.69	100	8.75
#14	1.400	12.63	72.25	100	12.63
#18	1.000	11.95	64.27	100	11.95
#25	0.710	11.80	56.39	90	10.62
#35	0.500	14.53	46.68	50	7.27
#45	0.355	18.87	34.07	20	3.77
#60	0.250	17.99	22.05	5	0.90
#80	0.180	16.50	11.03	0	0.00
#120	0.125	13.91	1.74	0	0.00
#170	0.090	1.61	0.66	0	0.00
#200	0.075	0.13	0.57	0	0.00
#230	0.063	0.10	0.51	0	0.00
Total Shell Content:		**51**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-06 #C-1	—●—	-5.7	SP	#200 - 0.56 #230 - 0.49		40.80	0.83	0.5	-0.32	2.34	1.59

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,257
Northing (Y, ft):	2,246,469
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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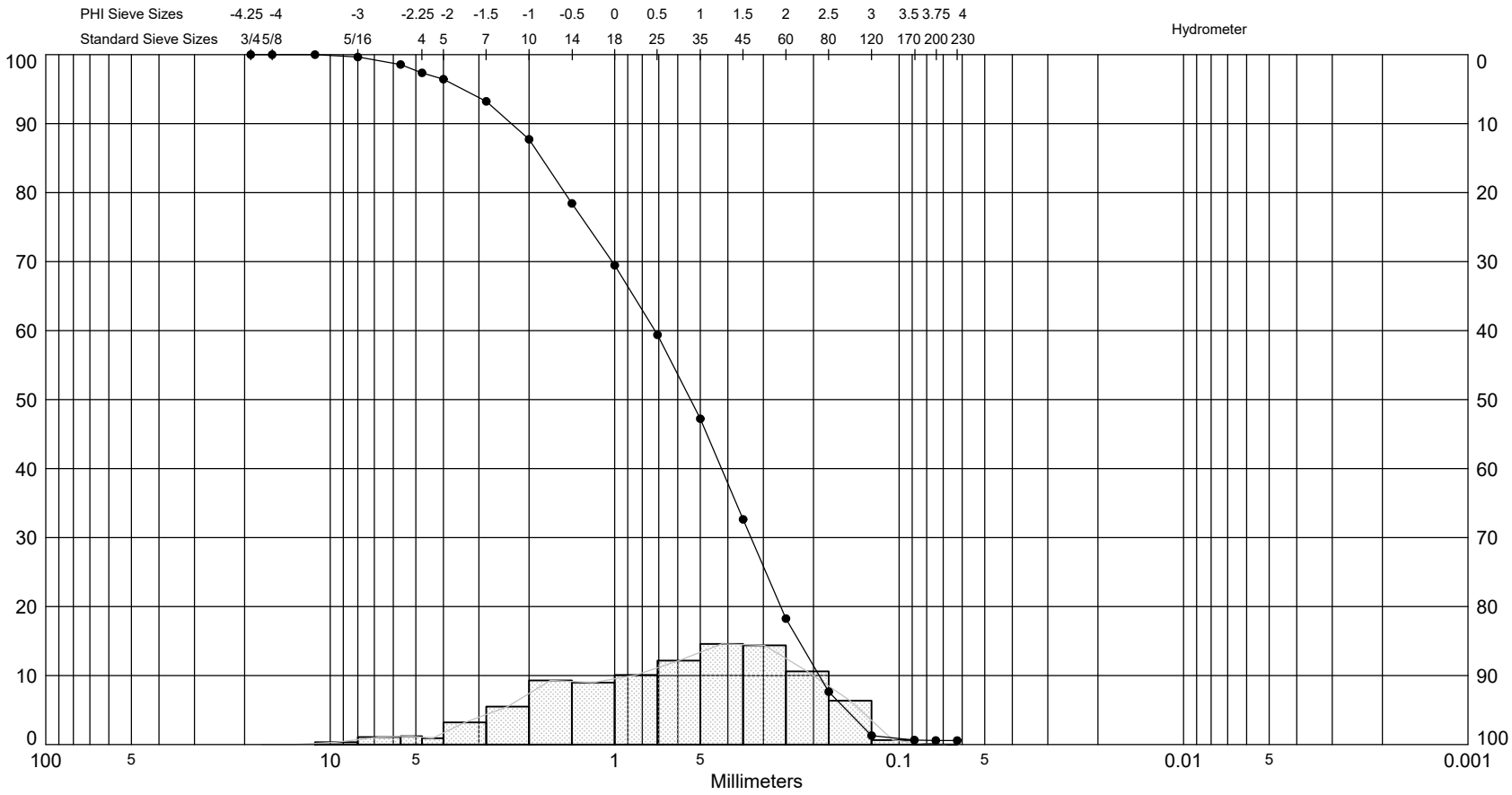
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-06**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/2**		

Tare Weight, (g):	50.32	
	203.46	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.52	99.66	100	0.52
#3.5	5.600	1.67	98.57	100	1.67
#4	4.750	1.85	97.36	100	1.85
#5	4.000	1.41	96.44	100	1.41
#7	2.800	4.92	93.23	100	4.92
#10	2.000	8.42	87.73	100	8.42
#14	1.400	14.22	78.44	100	14.22
#18	1.000	13.74	69.47	100	13.74
#25	0.710	15.44	59.39	90	13.90
#35	0.500	18.63	47.22	40	7.45
#45	0.355	22.33	32.64	10	2.23
#60	0.250	22.02	18.26	5	1.10
#80	0.180	16.25	7.65	0	0.00
#120	0.125	9.72	1.31	0	0.00
#170	0.090	1.00	0.65	0	0.00
#200	0.075	0.09	0.59	0	0.00
#230	0.063	0.01	0.59	0	0.00
Total Shell Content:		**47**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-06 #S-1	—●—	-6.5	SP	#200 - 0.59 #230 - 0.58			0.89	0.68	-0.45	2.54	1.36

Comments:

Depths and elevations based on measured values

ATHENA TECHNOLOGIES, INC.

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,257
Northing (Y, ft):	2,246,469
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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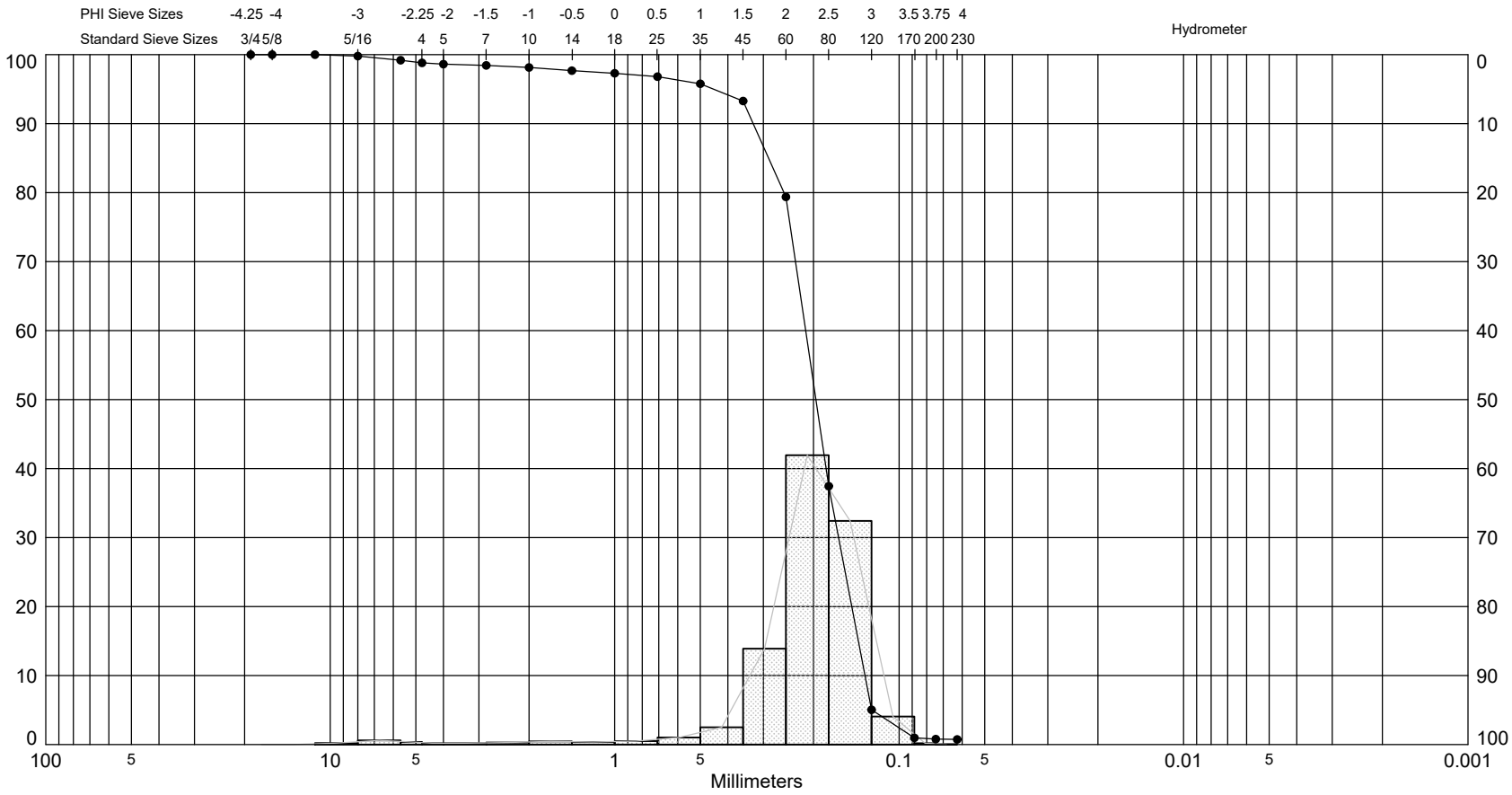
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**11.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-06**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.91	
	191.08	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.29	99.79	100	0.29
#3.5	5.600	0.84	99.20	100	0.84
#4	4.750	0.54	98.82	100	0.54
#5	4.000	0.27	98.63	100	0.27
#7	2.800	0.25	98.45	100	0.25
#10	2.000	0.43	98.14	100	0.43
#14	1.400	0.65	97.68	100	0.65
#18	1.000	0.53	97.31	100	0.53
#25	0.710	0.69	96.82	90	0.62
#35	0.500	1.45	95.79	50	0.73
#45	0.355	3.53	93.29	30	1.06
#60	0.250	19.62	79.39	10	1.96
#80	0.180	59.19	37.47	5	2.96
#120	0.125	45.75	5.06	0	0.00
#170	0.090	5.75	0.98	0	0.00
#200	0.075	0.25	0.81	0	0.00
#230	0.063	0.07	0.76	0	0.00
Total Shell Content:		**8**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-06 #S-2	—●—	-16.5	SP	#200 - 0.79 #230 - 0.74			2.35	2.23	-3.55	19.98	0.83

Comments:

Depths and elevations based on measured values

ATHENA TECHNOLOGIES, INC.

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Office: 843-887-3800

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,257
Northing (Y, ft):	2,246,469
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

SIEVE ANALYSIS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

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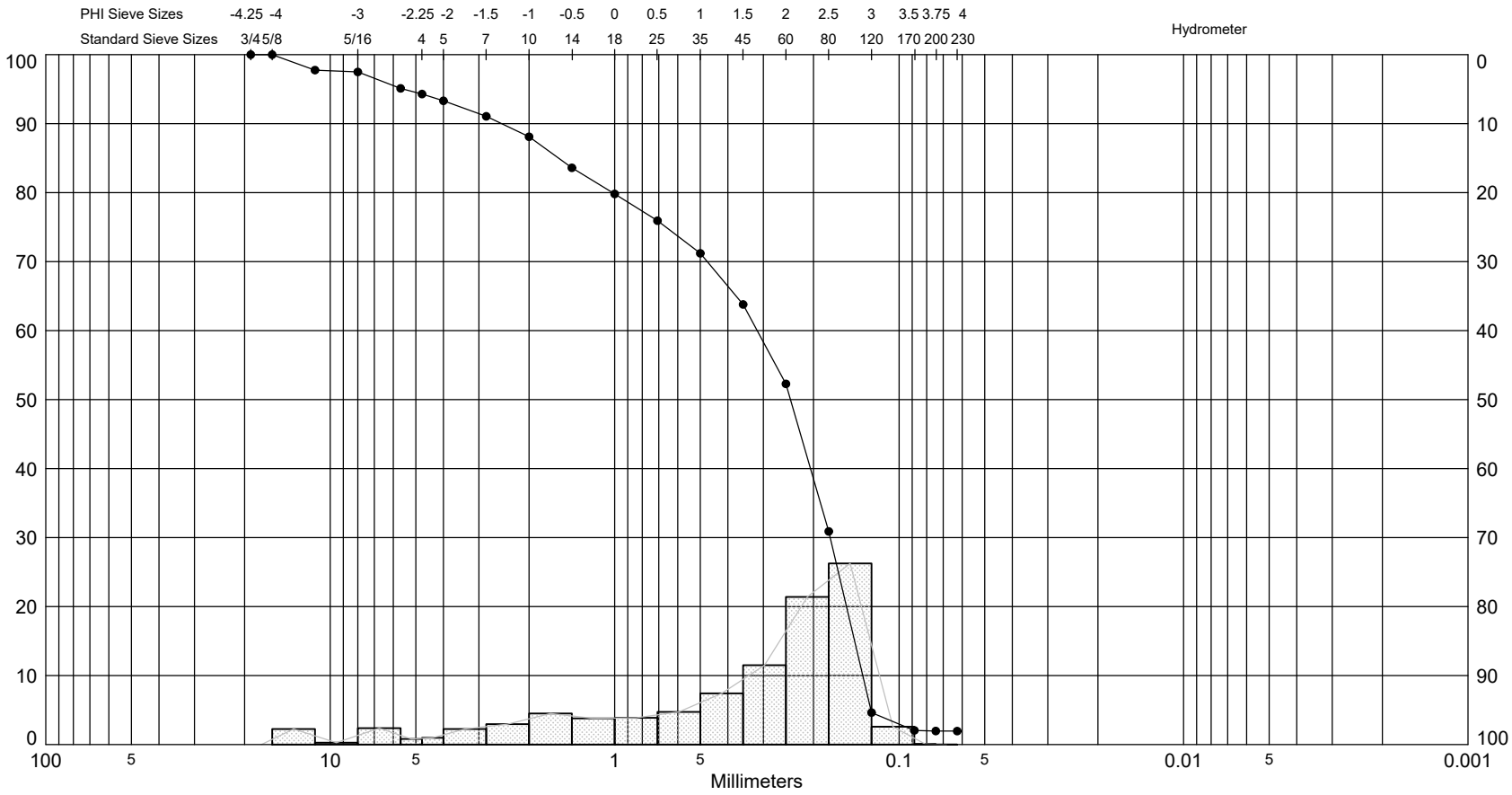
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-13.5**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-07**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.71	
	212.32	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	3.59	97.76	100	3.59
5/16	7.938	0.44	97.49	100	0.44
#3.5	5.600	3.83	95.11	100	3.83
#4	4.750	1.31	94.29	100	1.31
#5	4.000	1.58	93.31	100	1.58
#7	2.800	3.62	91.05	100	3.62
#10	2.000	4.75	88.10	100	4.75
#14	1.400	7.23	83.59	100	7.23
#18	1.000	6.09	79.80	100	6.09
#25	0.710	6.23	75.92	90	5.61
#35	0.500	7.59	71.20	50	3.80
#45	0.355	11.90	63.79	30	3.57
#60	0.250	18.49	52.28	10	1.85
#80	0.180	34.36	30.88	5	1.72
#120	0.125	42.18	4.62	0	0.00
#170	0.090	4.15	2.04	0	0.00
#200	0.075	0.14	1.95	0	0.00
#230	0.063	0.02	1.94	0	0.00
Total Shell Content:		**30**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-07 #C-1	—●—	-7.8	SP	#200 - 1.96 #230 - 1.95		27.20	2.05	1.34	-1.31	3.84	1.71

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,648
Northing (Y, ft):	2,245,868
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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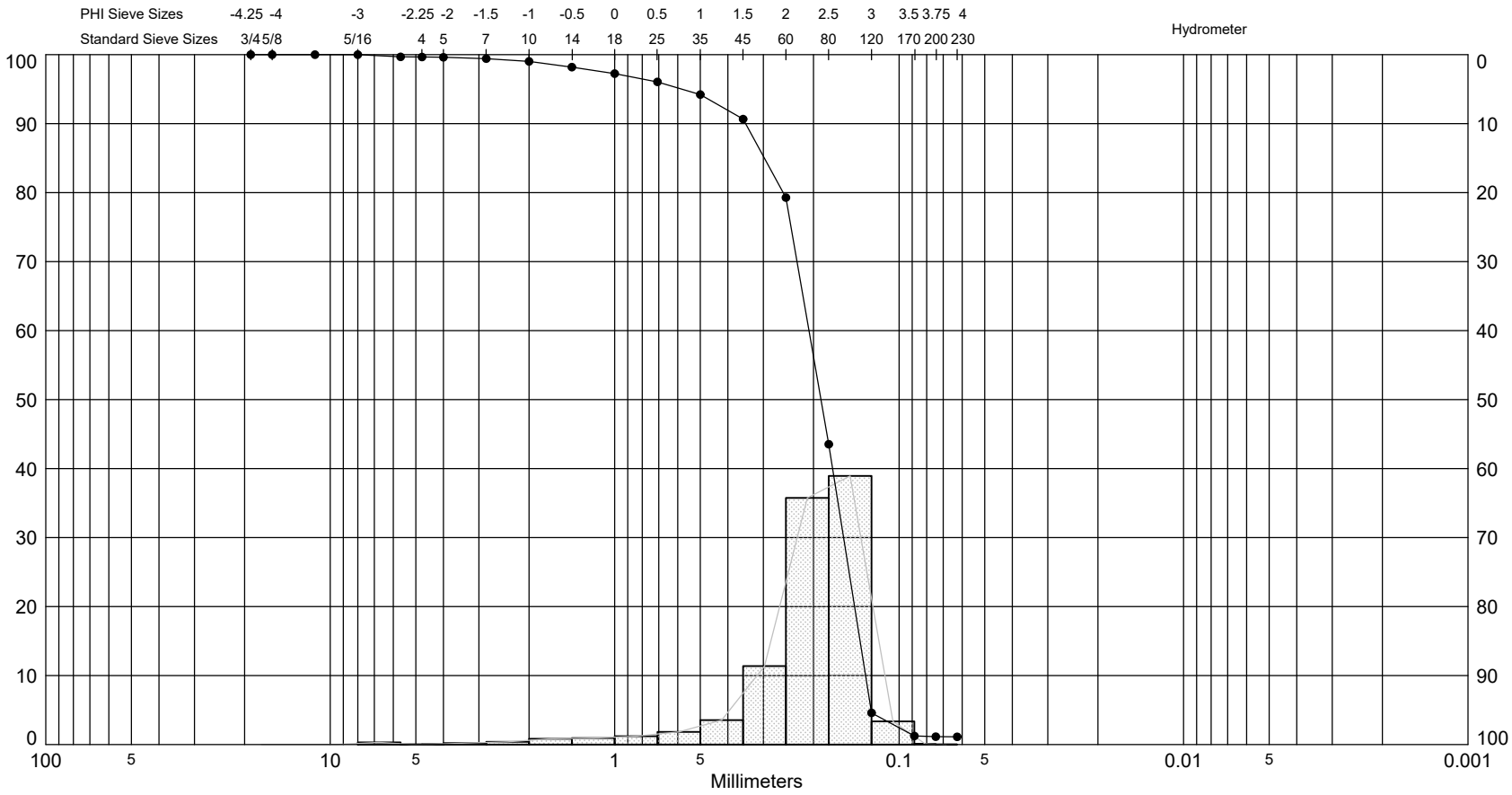
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-07**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, few coarse to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.99	
	173.99	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.40	99.68	100	0.40
#4	4.750	0.03	99.65	100	0.03
#5	4.000	0.05	99.61	100	0.05
#7	2.800	0.25	99.41	100	0.25
#10	2.000	0.50	99.01	100	0.50
#14	1.400	1.03	98.18	100	1.03
#18	1.000	1.17	97.23	100	1.17
#25	0.710	1.49	96.03	90	1.34
#35	0.500	2.28	94.19	50	1.14
#45	0.355	4.40	90.65	20	0.88
#60	0.250	14.11	79.27	5	0.71
#80	0.180	44.33	43.52	0	0.00
#120	0.125	48.29	4.57	0	0.00
#170	0.090	4.16	1.22	0	0.00
#200	0.075	0.13	1.11	0	0.00
#230	0.063	0.02	1.10	0	0.00
Total Shell Content:		**6**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-07 #S-1	—●—	-8.6	SP	#200 - 1.14 #230 - 1.12			2.41	2.25	-2.7	13.41	0.78

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,648
Northing (Y, ft):	2,245,868
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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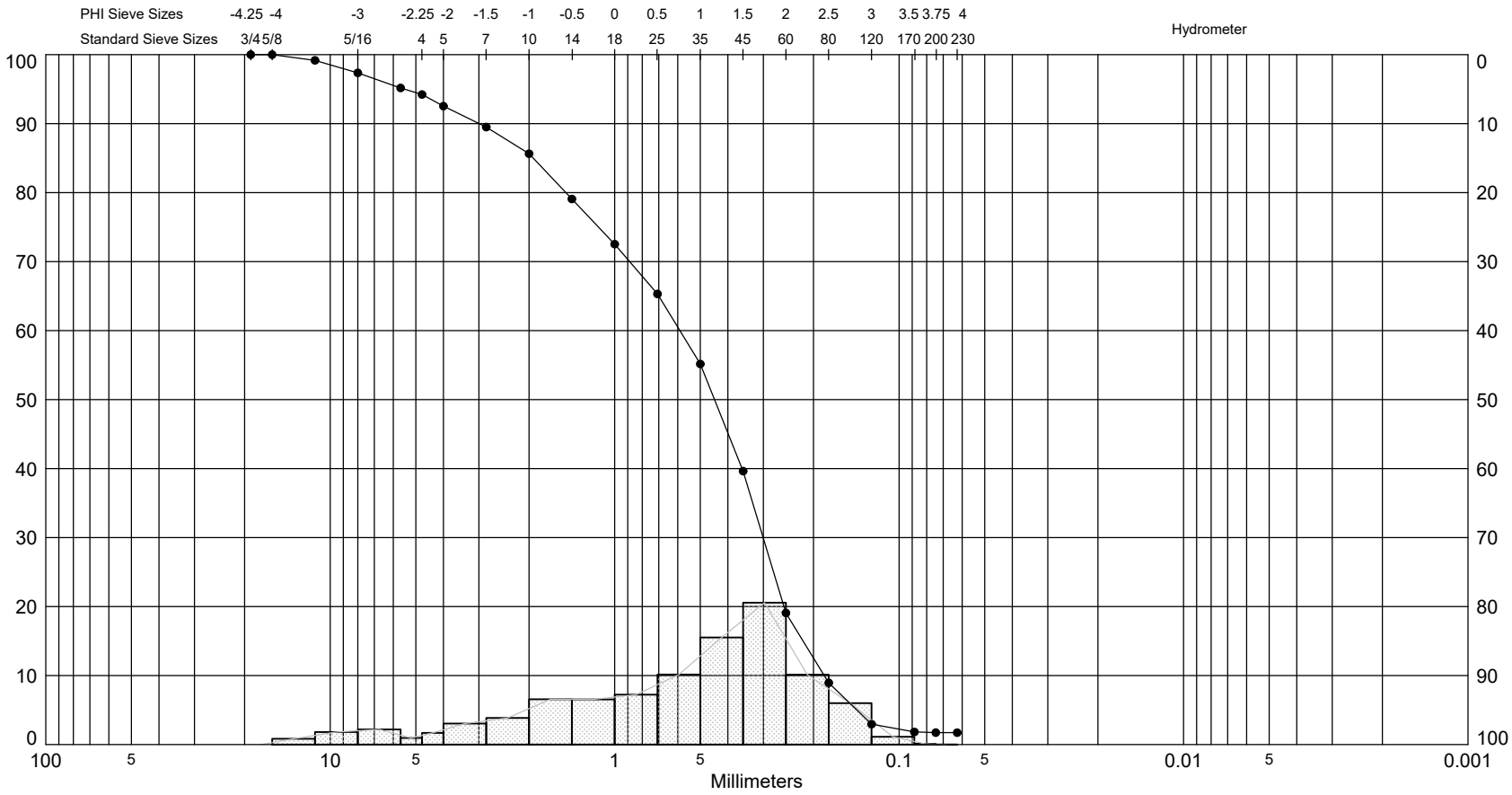
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**6.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-07**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	52.19	
	195.88	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	1.19	99.17	100	1.19
5/16	7.938	2.60	97.36	100	2.60
#3.5	5.600	3.15	95.17	100	3.15
#4	4.750	1.36	94.22	100	1.36
#5	4.000	2.42	92.54	100	2.42
#7	2.800	4.37	89.50	100	4.37
#10	2.000	5.55	85.64	100	5.55
#14	1.400	9.43	79.07	100	9.43
#18	1.000	9.41	72.52	100	9.41
#25	0.710	10.37	65.31	90	9.33
#35	0.500	14.58	55.16	50	7.29
#45	0.355	22.31	39.63	30	6.69
#60	0.250	29.54	19.08	10	2.95
#80	0.180	14.55	8.95	5	0.73
#120	0.125	8.61	2.96	0	0.00
#170	0.090	1.61	1.84	0	0.00
#200	0.075	0.14	1.74	0	0.00
#230	0.063	0.01	1.73	0	0.00
Total Shell Content:		**46**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-07 #S-2	—●—	-13.6	SP	#200 - 1.73 #230 - 1.72			1.17	0.72	-0.88	3.16	1.54

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,648
Northing (Y, ft):	2,245,868
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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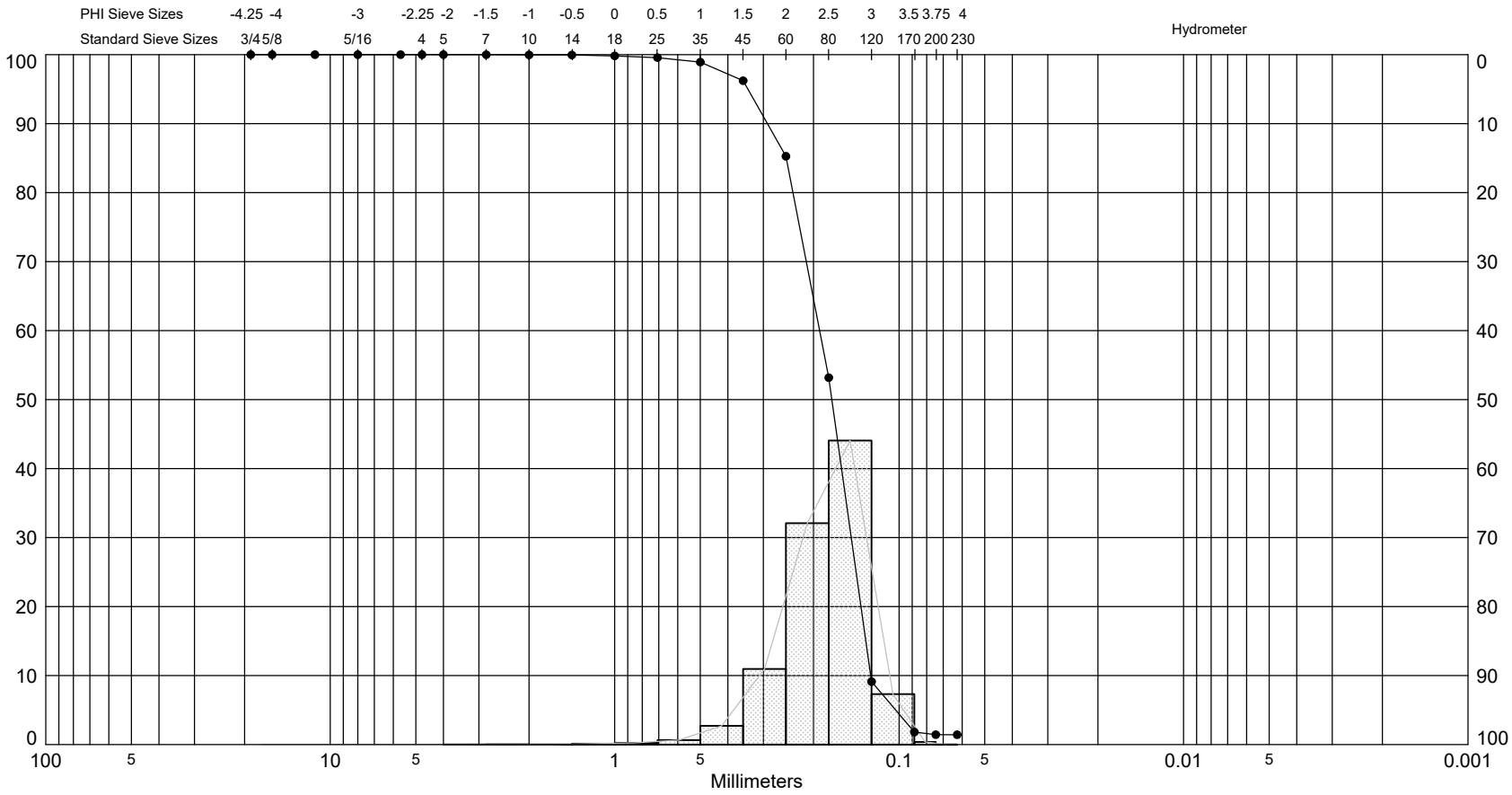
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**11.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-07**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace medium to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.33	
	186.22	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.02	99.99	100	0.02
#10	2.000	0.04	99.96	100	0.04
#14	1.400	0.02	99.94	100	0.02
#18	1.000	0.18	99.81	100	0.18
#25	0.710	0.34	99.56	90	0.31
#35	0.500	0.89	98.91	50	0.45
#45	0.355	3.70	96.21	30	1.11
#60	0.250	14.99	85.26	10	1.50
#80	0.180	43.93	53.17	0	0.00
#120	0.125	60.32	9.10	0	0.00
#170	0.090	10.00	1.80	0	0.00
#200	0.075	0.52	1.42	0	0.00
#230	0.063	0.02	1.40	0	0.00
Total Shell Content:		**3**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-07 #S-3	—●—	-18.6	SP	#200 - 1.43 #230 - 1.42			2.54	2.45	-1.19	6.88	0.5

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	520,648
Northing (Y, ft):	2,245,868
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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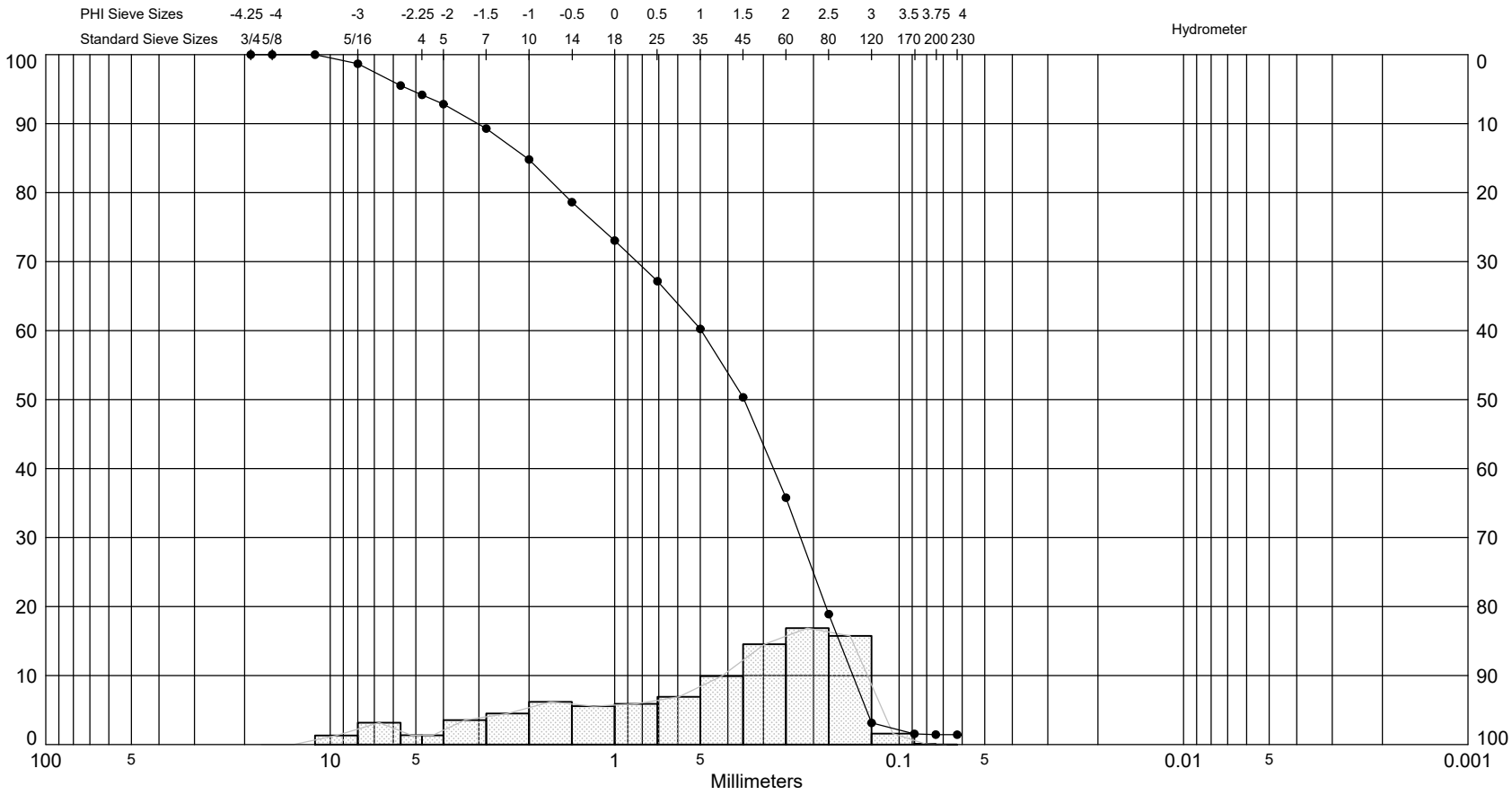
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-10**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-08**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	50.06	
	178.67	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	1.70	98.68	100	1.70
#3.5	5.600	4.06	95.52	100	4.06
#4	4.750	1.74	94.17	100	1.74
#5	4.000	1.72	92.83	100	1.72
#7	2.800	4.55	89.29	100	4.55
#10	2.000	5.78	84.80	100	5.78
#14	1.400	7.95	78.62	100	7.95
#18	1.000	7.17	73.04	100	7.17
#25	0.710	7.57	67.16	90	6.81
#35	0.500	8.90	60.24	50	4.45
#45	0.355	12.74	50.33	20	2.55
#60	0.250	18.71	35.78	5	0.94
#80	0.180	21.71	18.90	0	0.00
#120	0.125	20.27	3.14	0	0.00
#170	0.090	2.05	1.55	0	0.00
#200	0.075	0.14	1.44	0	0.00
#230	0.063	0.01	1.43	0	0.00
Total Shell Content:		**38**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-08 #C-1	—●—	-8.7	SP	#200 - 1.44 #230 - 1.43		34.10	1.51	0.96	-0.8	2.61	1.65

Comments:

Depths and elevations based on measured values

ATHENA TECHNOLOGIES, INC.

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Office: 843-887-3800

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,095
Northing (Y, ft):	2,245,398
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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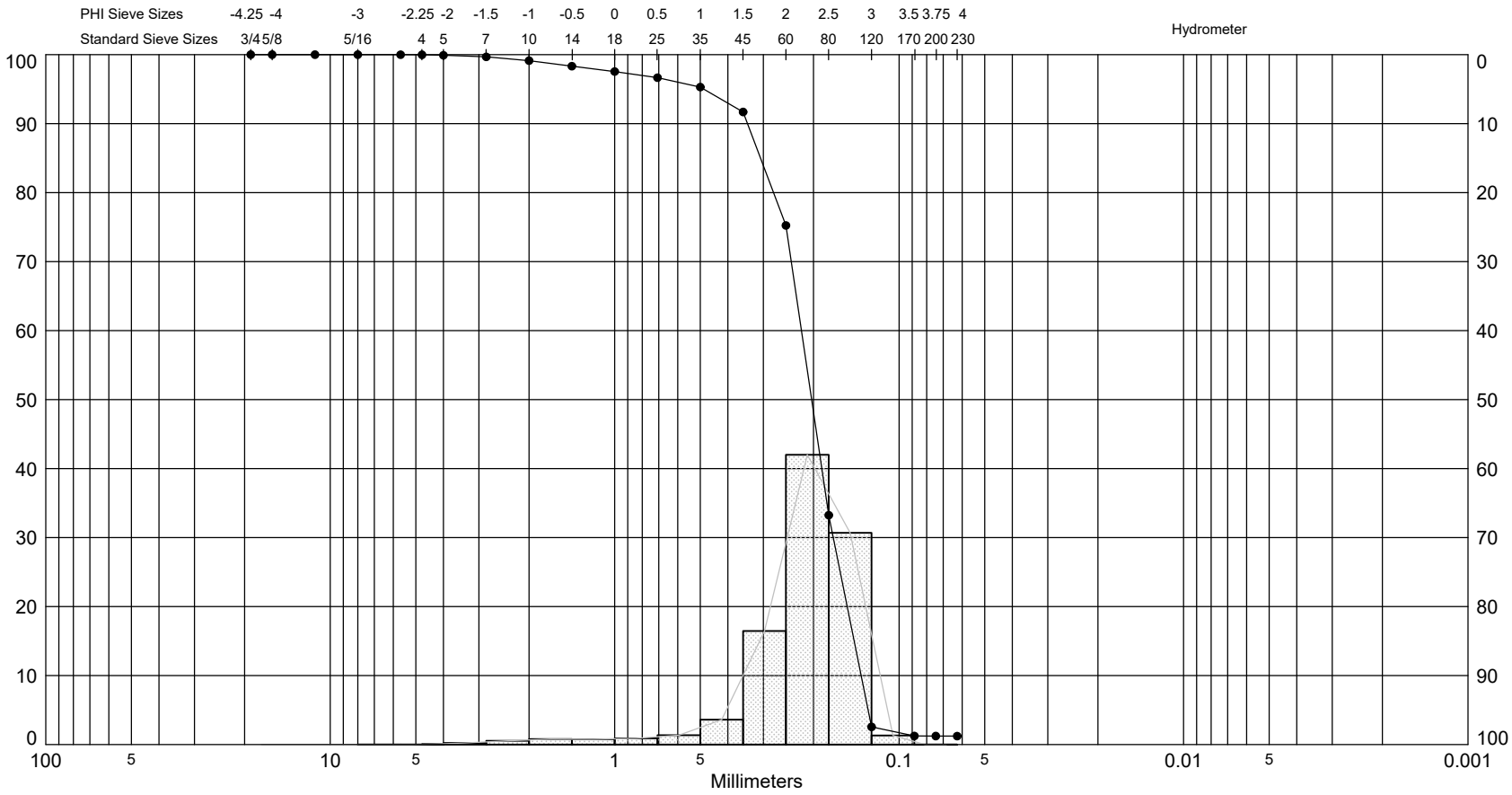
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-08**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, few coarse to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	50.03	
	186.71	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.02	99.99	100	0.02
#4	4.750	0.01	99.98	100	0.01
#5	4.000	0.09	99.91	100	0.09
#7	2.800	0.32	99.68	100	0.32
#10	2.000	0.75	99.13	100	0.75
#14	1.400	1.09	98.33	100	1.09
#18	1.000	1.06	97.56	100	1.06
#25	0.710	1.22	96.66	90	1.10
#35	0.500	1.86	95.30	60	1.12
#45	0.355	4.94	91.69	30	1.48
#60	0.250	22.49	75.23	10	2.25
#80	0.180	57.40	33.24	0	0.00
#120	0.125	41.93	2.56	0	0.00
#170	0.090	1.80	1.24	0	0.00
#200	0.075	0.02	1.23	0	0.00
#230	0.063	0.01	1.22	0	0.00
Total Shell Content:		**7**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-08 #S-1	—●—	-9.5	SP	#200 - 1.23 #230 - 1.22			2.3	2.18	-2.54	12.38	0.69

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,095
Northing (Y, ft):	2,245,398
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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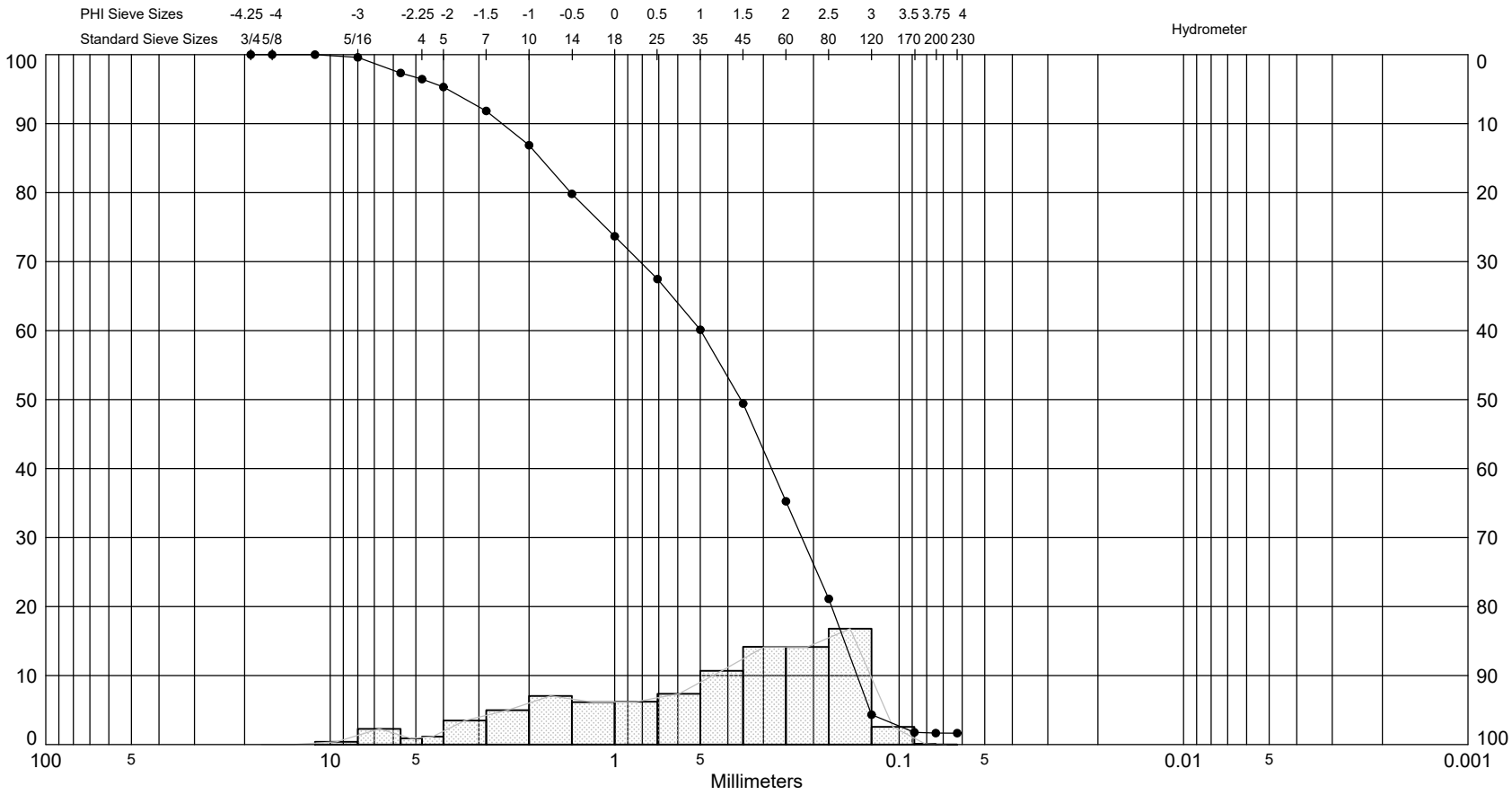
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**6.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-08**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medum to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	51.22	
	177.50	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.49	99.61	100	0.49
#3.5	5.600	2.87	97.34	100	2.87
#4	4.750	1.13	96.44	100	1.13
#5	4.000	1.44	95.30	100	1.44
#7	2.800	4.38	91.84	100	4.38
#10	2.000	6.28	86.86	100	6.28
#14	1.400	8.90	79.81	100	8.90
#18	1.000	7.76	73.67	100	7.76
#25	0.710	7.83	67.47	90	7.05
#35	0.500	9.28	60.12	70	6.50
#45	0.355	13.50	49.43	20	2.70
#60	0.250	17.89	35.26	5	0.89
#80	0.180	17.85	21.13	0	0.00
#120	0.125	21.20	4.34	0	0.00
#170	0.090	3.23	1.78	0	0.00
#200	0.075	0.14	1.67	0	0.00
#230	0.063	0.01	1.66	0	0.00
Total Shell Content:		**40**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-08 #S-2	—●—	-14.5	SP	#200 - 1.66 #230 - 1.65			1.47	1.02	-0.69	2.51	1.57

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,095
Northing (Y, ft):	2,245,398
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

Athena Technologies, Inc.
1293 Graham Farm Road
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Office: 843-887-3800

SIEVE ANALYSIS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

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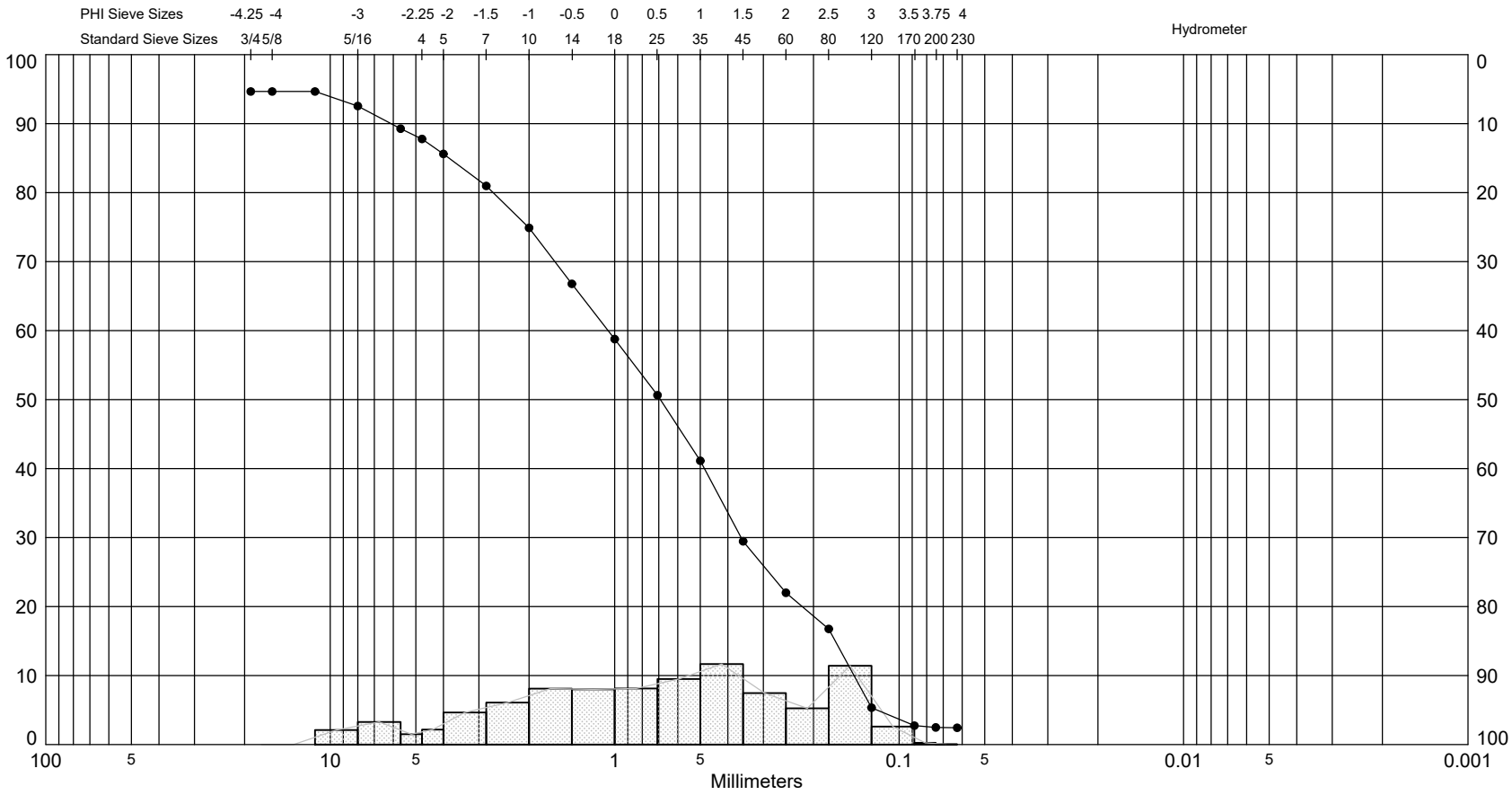
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**12.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-08**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grained quartz, little coarse to fine gravel-size shell fragments, trace silt (SP) 10YR 5/1**		

Tare Weight, (g):	50.25	
	198.17	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	7.90	94.66	100	7.90
5/8"	16.000	0.00	94.66	0	0.00
7/16	11.112	0.00	94.66	0	0.00
5/16	7.938	3.12	92.55	100	3.12
#3.5	5.600	4.85	89.27	100	4.85
#4	4.750	2.20	87.78	100	2.20
#5	4.000	3.21	85.61	100	3.21
#7	2.800	6.86	80.98	100	6.86
#10	2.000	9.00	74.89	100	9.00
#14	1.400	12.00	66.78	100	12.00
#18	1.000	11.85	58.77	100	11.85
#25	0.710	12.03	50.64	90	10.83
#35	0.500	14.06	41.13	50	7.03
#45	0.355	17.26	29.46	30	5.18
#60	0.250	11.04	22.00	10	1.10
#80	0.180	7.75	16.76	0	0.00
#120	0.125	16.89	5.34	0	0.00
#170	0.090	3.85	2.74	0	0.00
#200	0.075	0.39	2.47	0	0.00
#230	0.063	0.07	2.43	0	0.00
Total Shell Content:		**58**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-08 #S-3	—●—	-20.5	SP	#200 - 2.48 #230 - 2.43			0.53	0.19	0.2	2.2	1.67

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,095
Northing (Y, ft):	2,245,398
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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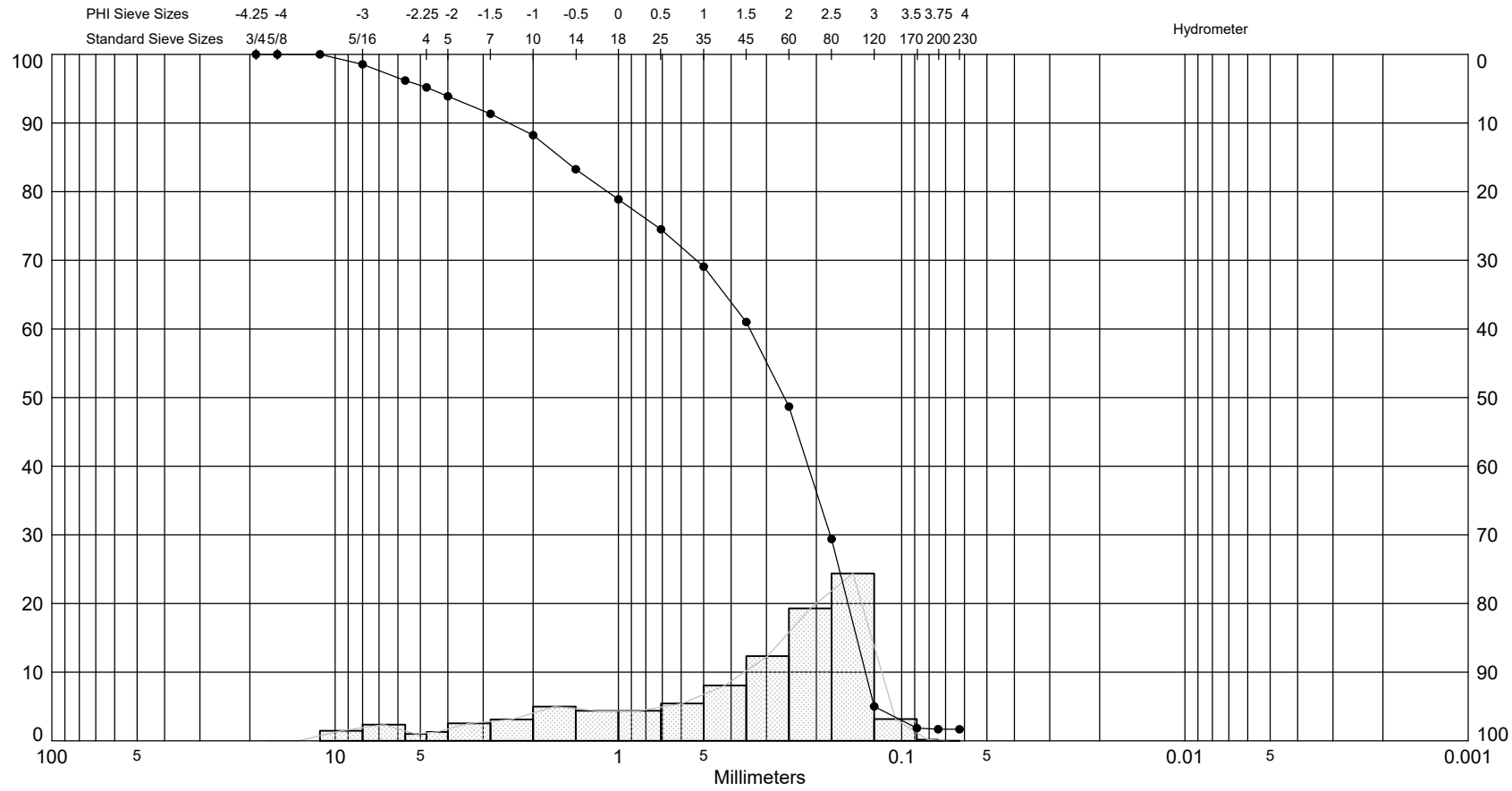
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-14.6**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-09**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	49.59	
	170.32	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	1.75	98.55	100	1.75
#3.5	5.600	2.85	96.19	100	2.85
#4	4.750	1.21	95.19	100	1.21
#5	4.000	1.57	93.89	100	1.57
#7	2.800	3.08	91.34	100	3.08
#10	2.000	3.75	88.23	100	3.75
#14	1.400	6.00	83.26	100	6.00
#18	1.000	5.29	78.88	100	5.29
#25	0.710	5.28	74.51	90	4.75
#35	0.500	6.55	69.08	50	3.28
#45	0.355	9.74	61.01	30	2.92
#60	0.250	14.88	48.69	10	1.49
#80	0.180	23.29	29.40	0	0.00
#120	0.125	29.44	5.01	0	0.00
#170	0.090	3.82	1.85	0	0.00
#200	0.075	0.19	1.69	0	0.00
#230	0.063	0.01	1.68	0	0.00
Total Shell Content:		**31**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-09 #C-1	—●—	-7.7	SP	#200 - 1.69 #230 - 1.68		31.60	1.95	1.31	-1.1	3.23	1.64

Comments:

Depths and elevations based on measured values

ATHENA TECHNOLOGIES, INC.

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,386
Northing (Y, ft):	2,246,464
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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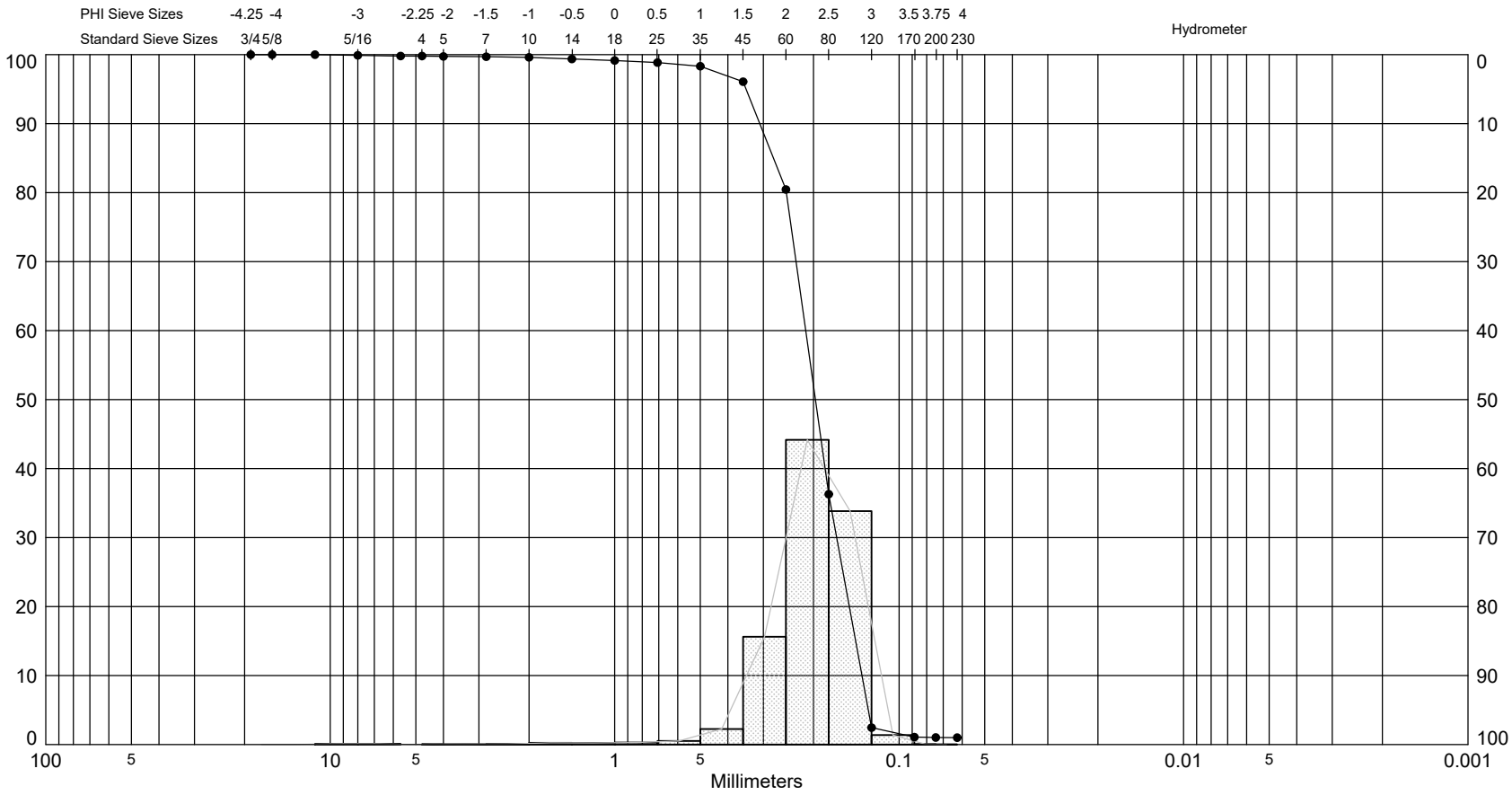
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-09**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace medium to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	52.22	
	177.00	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.12	99.90	100	0.12
#3.5	5.600	0.12	99.81	100	0.12
#4	4.750	0.00	99.81	0	0.00
#5	4.000	0.08	99.74	100	0.08
#7	2.800	0.05	99.70	100	0.05
#10	2.000	0.11	99.62	100	0.11
#14	1.400	0.30	99.37	100	0.30
#18	1.000	0.28	99.15	100	0.28
#25	0.710	0.38	98.85	90	0.34
#35	0.500	0.66	98.32	50	0.33
#45	0.355	2.80	96.07	30	0.84
#60	0.250	19.50	80.45	5	0.98
#80	0.180	55.10	36.29	0	0.00
#120	0.125	42.22	2.45	0	0.00
#170	0.090	1.71	1.08	0	0.00
#200	0.075	0.07	1.03	0	0.00
#230	0.063	0.02	1.01	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-09 #S-1	—●—	-8.5	SP	#200 - 1.02 #230 - 1.00			2.34	2.29	-3.35	26.72	0.55

Comments:

Depths and elevations based on measured values

ATHENA TECHNOLOGIES, INC.

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,386
Northing (Y, ft):	2,246,464
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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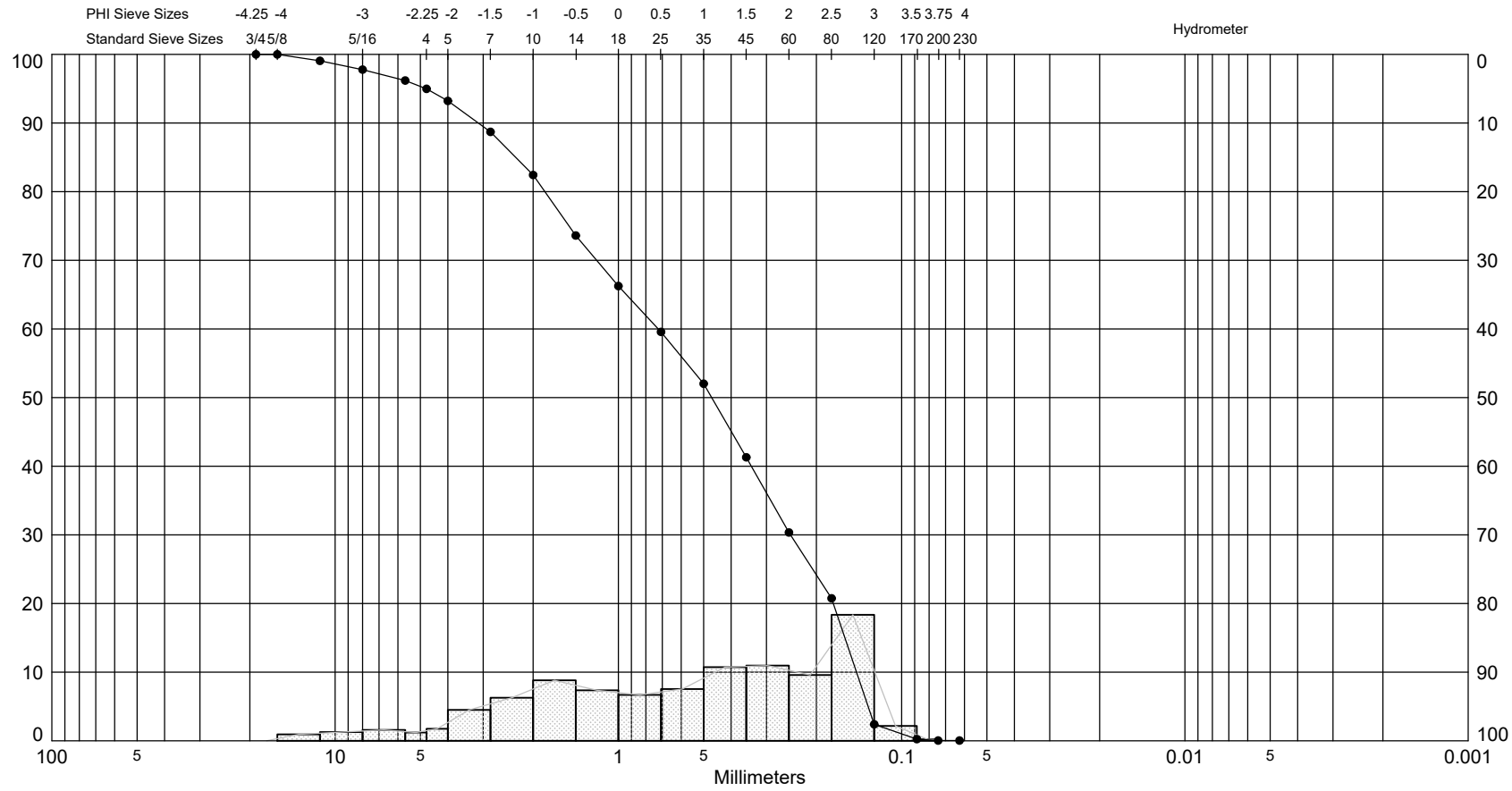
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**7.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-09**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	49.99	
	207.70	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	1.48	99.06	100	1.48
5/16	7.938	2.02	97.78	100	2.02
#3.5	5.600	2.50	96.20	100	2.50
#4	4.750	1.91	94.98	100	1.91
#5	4.000	2.77	93.23	100	2.77
#7	2.800	7.12	88.71	100	7.12
#10	2.000	9.90	82.44	100	9.90
#14	1.400	13.91	73.62	100	13.91
#18	1.000	11.61	66.25	100	11.61
#25	0.710	10.54	59.57	90	9.49
#35	0.500	11.91	52.02	50	5.96
#45	0.355	16.91	41.30	20	3.38
#60	0.250	17.27	30.35	5	0.86
#80	0.180	15.12	20.76	0	0.00
#120	0.125	28.96	2.40	0	0.00
#170	0.090	3.41	0.23	0	0.00
#200	0.075	0.32	0.03	0	0.00
#230	0.063	0.01	0.03	0	0.00
Total Shell Content:		**46**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-09 #S-2	—●—	-14.5	SP	#200 - 0.04 #230 - 0.04			1.09	0.77	-0.52	2.34	1.71

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,386
Northing (Y, ft):	2,246,464
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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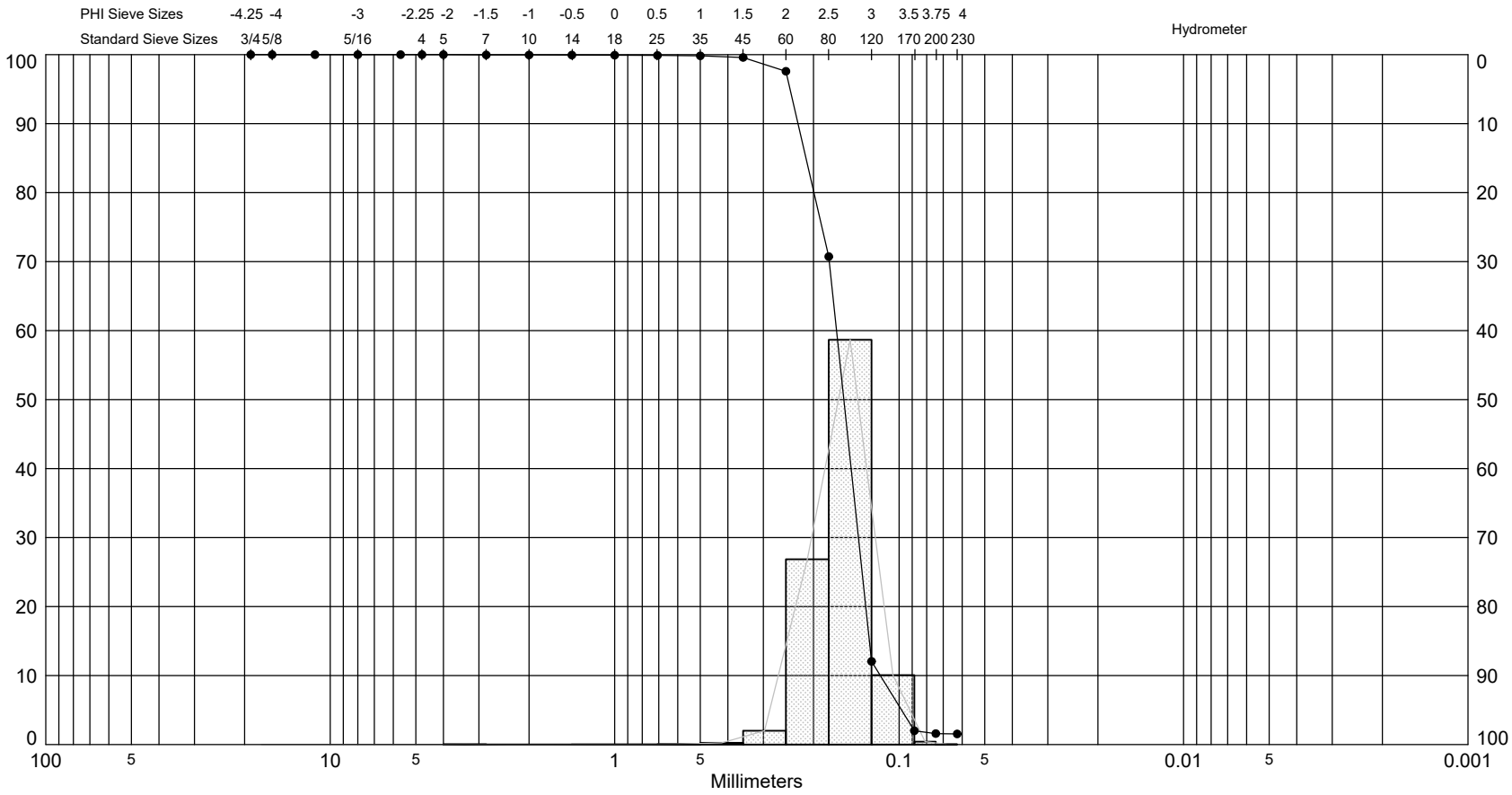
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**12.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-09**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace medium to fine sand-sized shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	51.54	
	165.39	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.05	99.96	100	0.05
#10	2.000	0.01	99.95	100	0.01
#14	1.400	0.01	99.94	100	0.01
#18	1.000	0.02	99.92	100	0.02
#25	0.710	0.03	99.89	100	0.03
#35	0.500	0.07	99.83	90	0.06
#45	0.355	0.27	99.60	70	0.19
#60	0.250	2.28	97.59	50	1.14
#80	0.180	30.58	70.73	5	1.53
#120	0.125	66.80	12.06	0	0.00
#170	0.090	11.45	2.00	0	0.00
#200	0.075	0.47	1.59	0	0.00
#230	0.063	0.06	1.54	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-09 #S-3	—●—	-19.5	SP	#200 - 1.59 #230 - 1.54			2.68	2.64	-1.44	16.6	0.36

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,386
Northing (Y, ft):	2,246,464
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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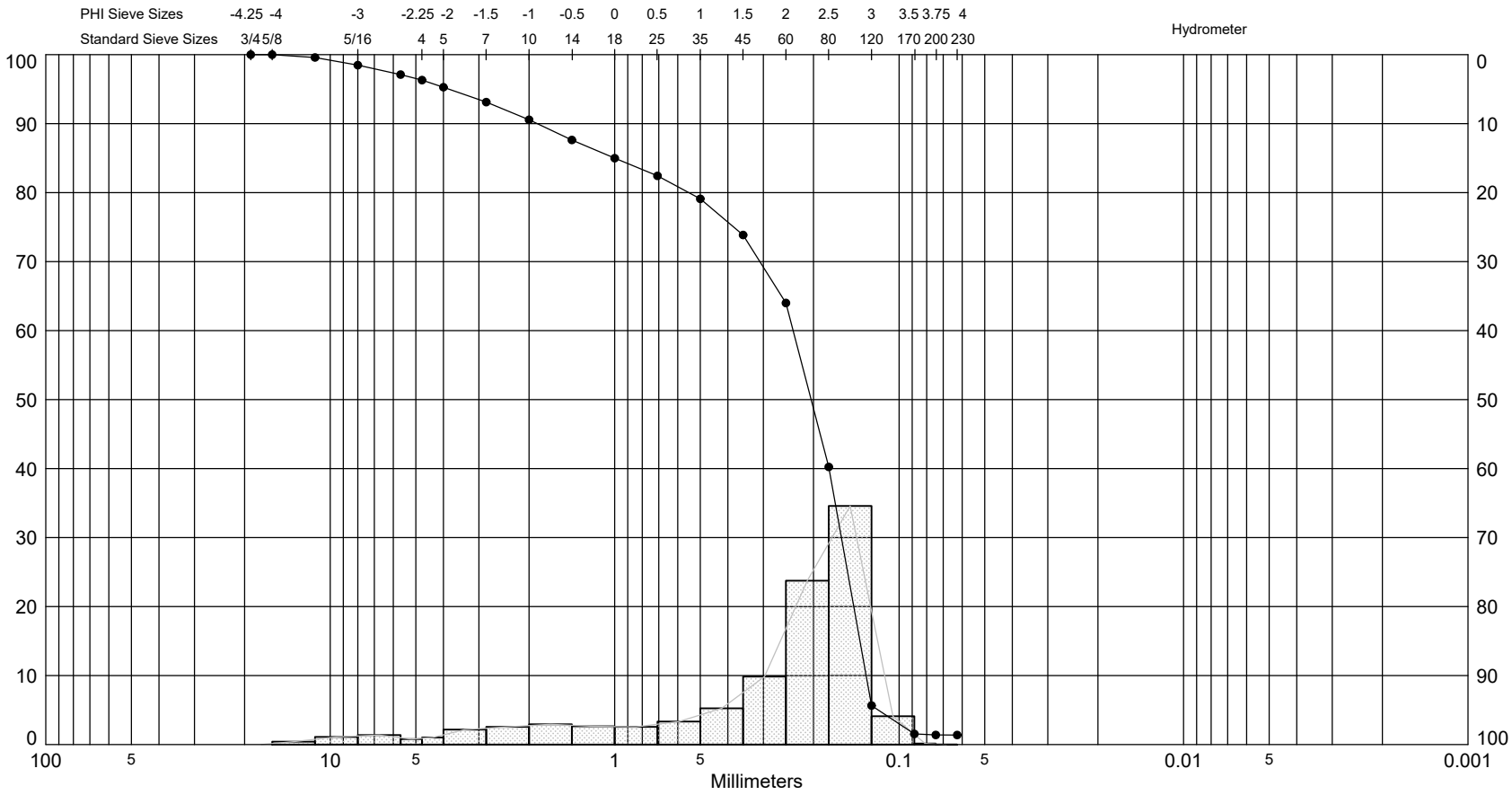
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-8.7**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-10**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.36	
	179.50	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.52	99.59	100	0.52
5/16	7.938	1.42	98.49	100	1.42
#3.5	5.600	1.76	97.11	100	1.76
#4	4.750	1.02	96.32	100	1.02
#5	4.000	1.32	95.29	100	1.32
#7	2.800	2.77	93.12	100	2.77
#10	2.000	3.28	90.57	100	3.28
#14	1.400	3.76	87.63	100	3.76
#18	1.000	3.38	84.99	100	3.38
#25	0.710	3.28	82.43	90	2.95
#35	0.500	4.27	79.10	60	2.56
#45	0.355	6.72	73.86	30	2.02
#60	0.250	12.64	63.99	10	1.26
#80	0.180	30.44	40.24	0	0.00
#120	0.125	44.32	5.65	0	0.00
#170	0.090	5.27	1.54	0	0.00
#200	0.075	0.19	1.39	0	0.00
#230	0.063	0.01	1.38	0	0.00
Total Shell Content:		**22**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-10 #C-1	—●—	-5.5	SP	#200 - 1.39 #230 - 1.38		23.30	2.29	1.69	-1.63	4.81	1.55

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,862
Northing (Y, ft):	2,245,878
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

Terracon
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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

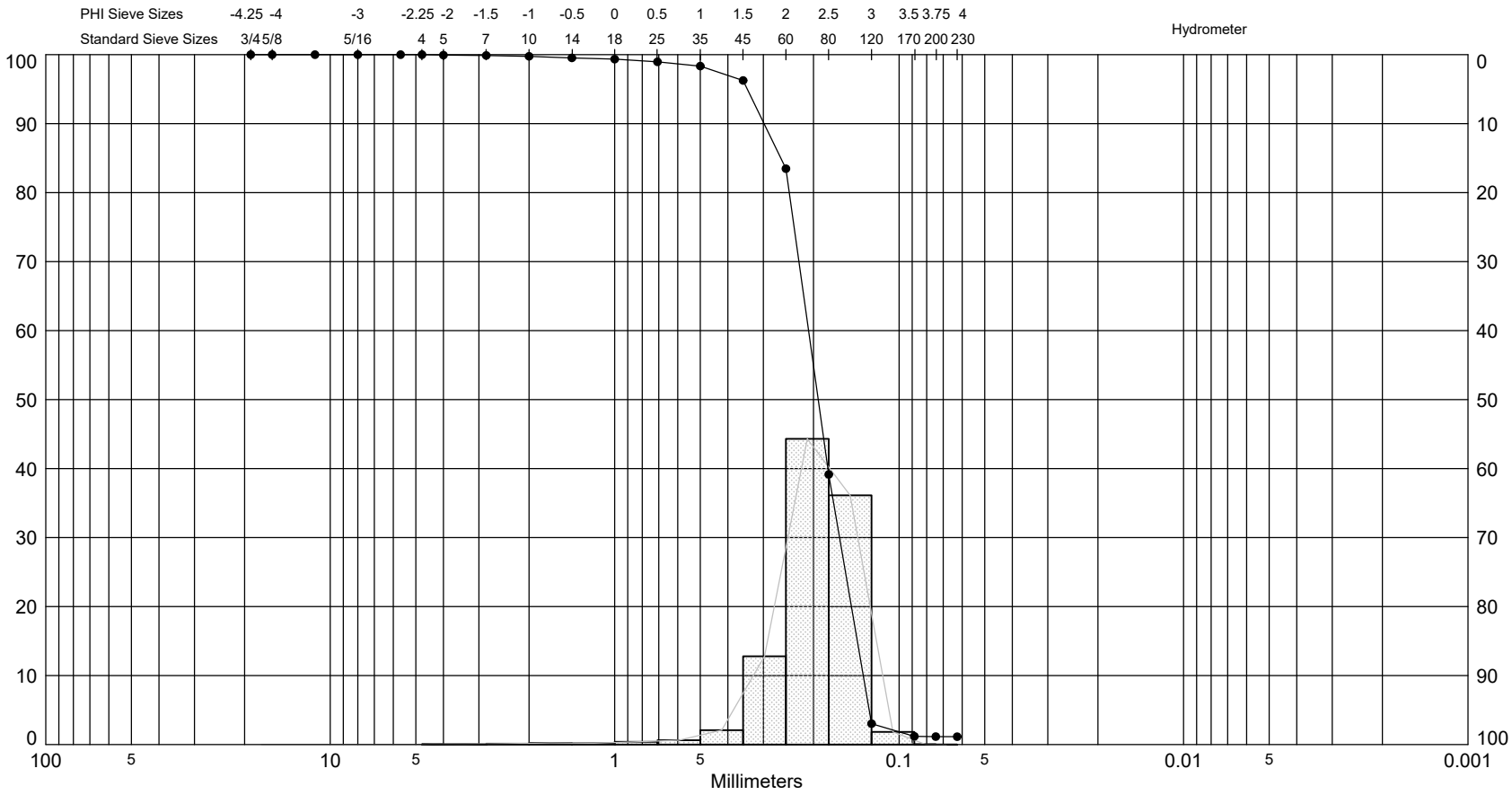
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-10**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace medium to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.19	
	179.05	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.09	99.93	100	0.09
#7	2.800	0.06	99.88	100	0.06
#10	2.000	0.15	99.77	100	0.15
#14	1.400	0.30	99.54	100	0.30
#18	1.000	0.23	99.36	100	0.23
#25	0.710	0.50	98.98	90	0.45
#35	0.500	0.80	98.36	50	0.40
#45	0.355	2.70	96.28	30	0.81
#60	0.250	16.61	83.49	5	0.83
#80	0.180	57.55	39.17	0	0.00
#120	0.125	46.91	3.05	0	0.00
#170	0.090	2.39	1.21	0	0.00
#200	0.075	0.05	1.17	0	0.00
#230	0.063	0.01	1.16	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-10 #S-1	—●—	-6.3	SP	#200 - 1.15 #230 - 1.14			2.38	2.33	-2.44	16.38	0.51

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,862
Northing (Y, ft):	2,245,878
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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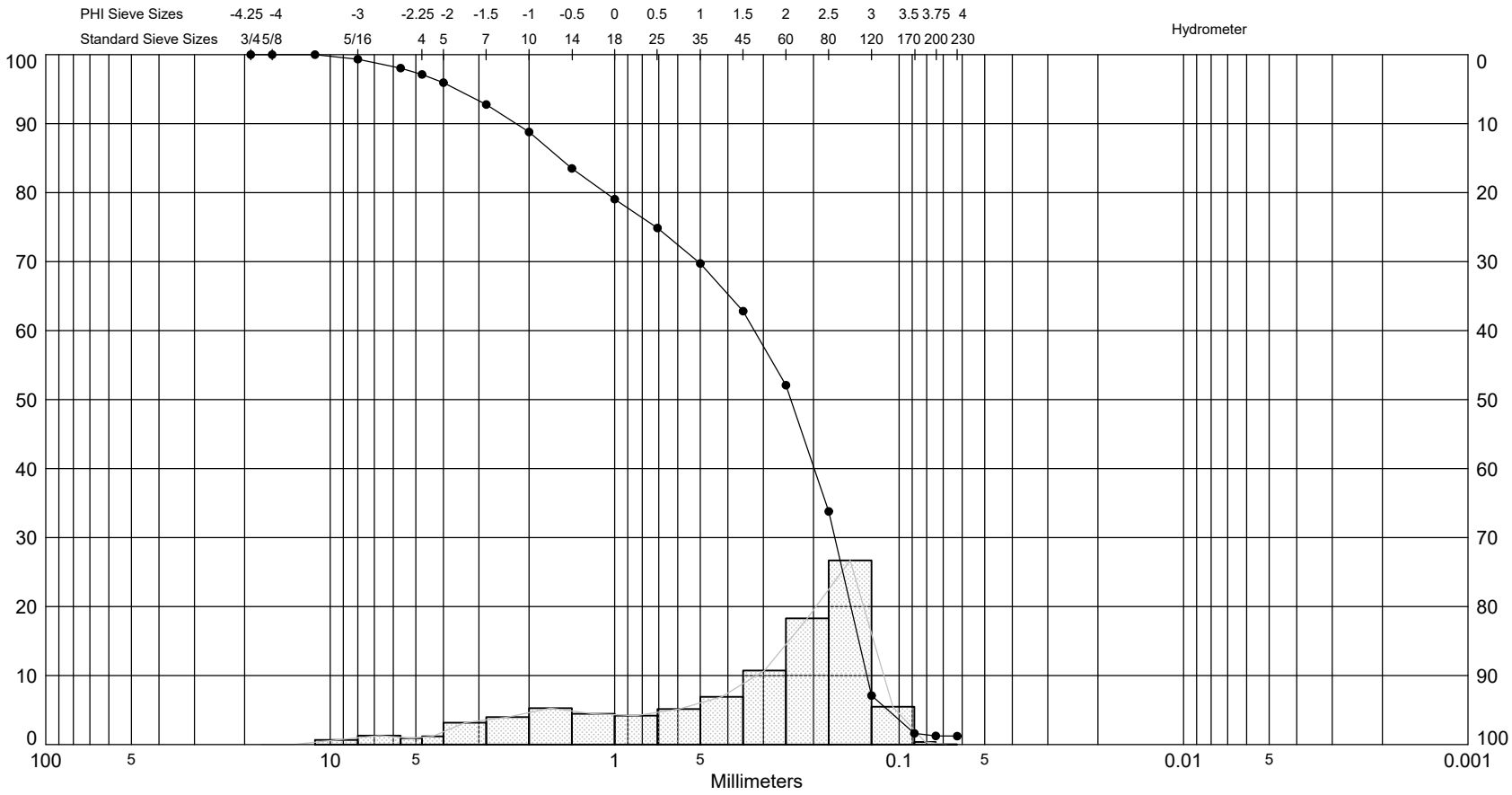
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-10.9**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-11**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.38	
	203.53	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	1.01	99.34	100	1.01
#3.5	5.600	1.96	98.05	100	1.96
#4	4.750	1.40	97.13	100	1.40
#5	4.000	1.81	95.94	100	1.81
#7	2.800	4.82	92.77	100	4.82
#10	2.000	6.06	88.79	100	6.06
#14	1.400	8.04	83.50	100	8.04
#18	1.000	6.79	79.04	100	6.79
#25	0.710	6.36	74.86	90	5.72
#35	0.500	7.82	69.72	50	3.91
#45	0.355	10.52	62.81	30	3.16
#60	0.250	16.33	52.07	5	0.82
#80	0.180	27.85	33.77	0	0.00
#120	0.125	40.61	7.08	0	0.00
#170	0.090	8.34	1.60	0	0.00
#200	0.075	0.57	1.22	0	0.00
#230	0.063	0.04	1.20	0	0.00
Total Shell Content:		**30**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-11 #C-1	—●—	-8.4	SP	#200 - 1.25 #230 - 1.22		28.90	2.06	1.42	-1.02	3	1.6

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	522,289
Northing (Y, ft):	2,247,153
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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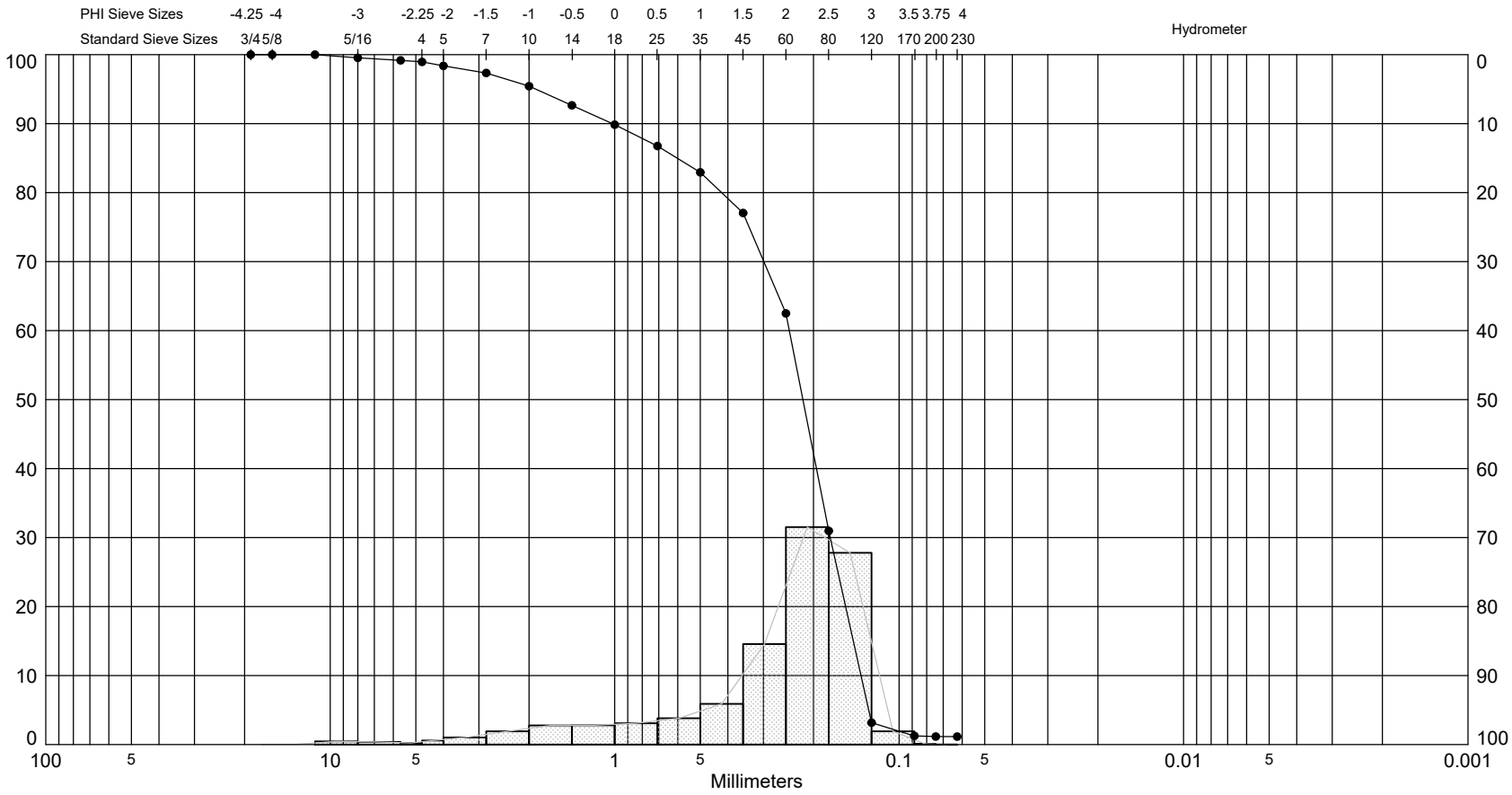
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-11**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.68	
	206.46	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.71	99.54	100	0.71
#3.5	5.600	0.58	99.17	100	0.58
#4	4.750	0.34	98.95	100	0.34
#5	4.000	0.90	98.37	100	0.90
#7	2.800	1.59	97.34	100	1.59
#10	2.000	2.95	95.43	100	2.95
#14	1.400	4.30	92.65	100	4.30
#18	1.000	4.33	89.86	100	4.33
#25	0.710	4.78	86.77	90	4.30
#35	0.500	5.91	82.95	50	2.96
#45	0.355	9.11	77.06	30	2.73
#60	0.250	22.53	62.51	5	1.13
#80	0.180	48.79	30.99	0	0.00
#120	0.125	43.03	3.19	0	0.00
#170	0.090	2.96	1.27	0	0.00
#200	0.075	0.16	1.17	0	0.00
#230	0.063	0.01	1.16	0	0.00
Total Shell Content:		**17**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-11 #S-1	—●—	-9.2	SP	#200 - 1.16 #230 - 1.15			2.2	1.81	-1.79	6.03	1.2

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	522,289
Northing (Y, ft):	2,247,153
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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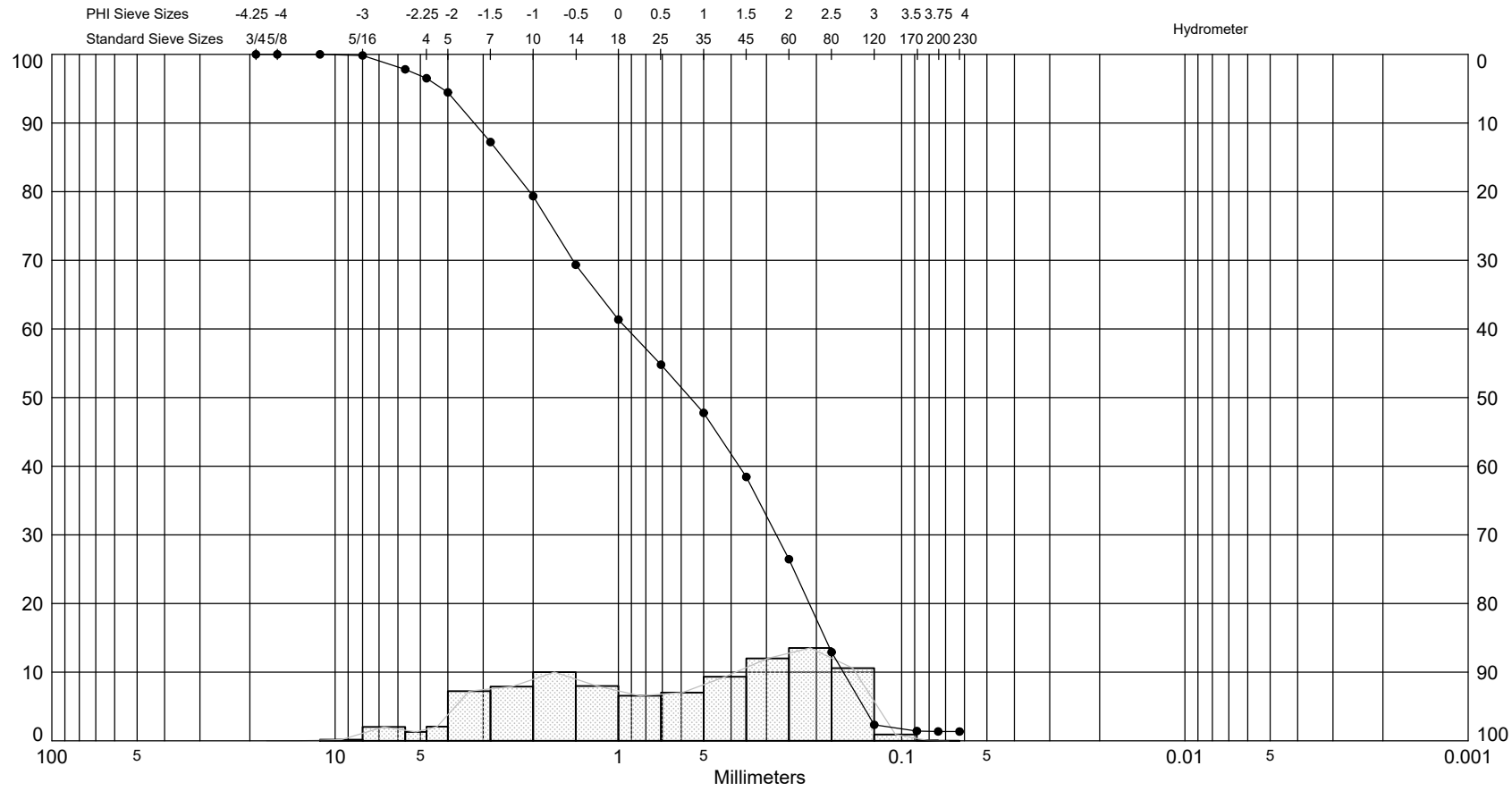
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**9.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-11**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grained quartz, trace fine gravel-size shell fragments, trace silt (SP) 10YR 7/2**		

Tare Weight, (g):	51.89	
	194.73	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.23	99.84	100	0.23
#3.5	5.600	2.89	97.82	100	2.89
#4	4.750	1.85	96.52	100	1.85
#5	4.000	2.94	94.46	100	2.94
#7	2.800	10.33	87.23	100	10.33
#10	2.000	11.27	79.34	100	11.27
#14	1.400	14.28	69.34	100	14.28
#18	1.000	11.40	61.36	100	11.40
#25	0.710	9.39	54.79	90	8.45
#35	0.500	10.03	47.77	50	5.02
#45	0.355	13.32	38.44	30	4.00
#60	0.250	17.13	26.45	10	1.71
#80	0.180	19.33	12.92	5	0.97
#120	0.125	15.12	2.33	0	0.00
#170	0.090	1.30	1.42	0	0.00
#200	0.075	0.08	1.37	0	0.00
#230	0.063	0.01	1.36	0	0.00
Total Shell Content:		**53**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-11 #S-2	—●—	-17.2	SP	#200 - 1.36 #230 - 1.35			0.84	0.58	-0.27	1.87	1.61

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	522,289
Northing (Y, ft):	2,247,153
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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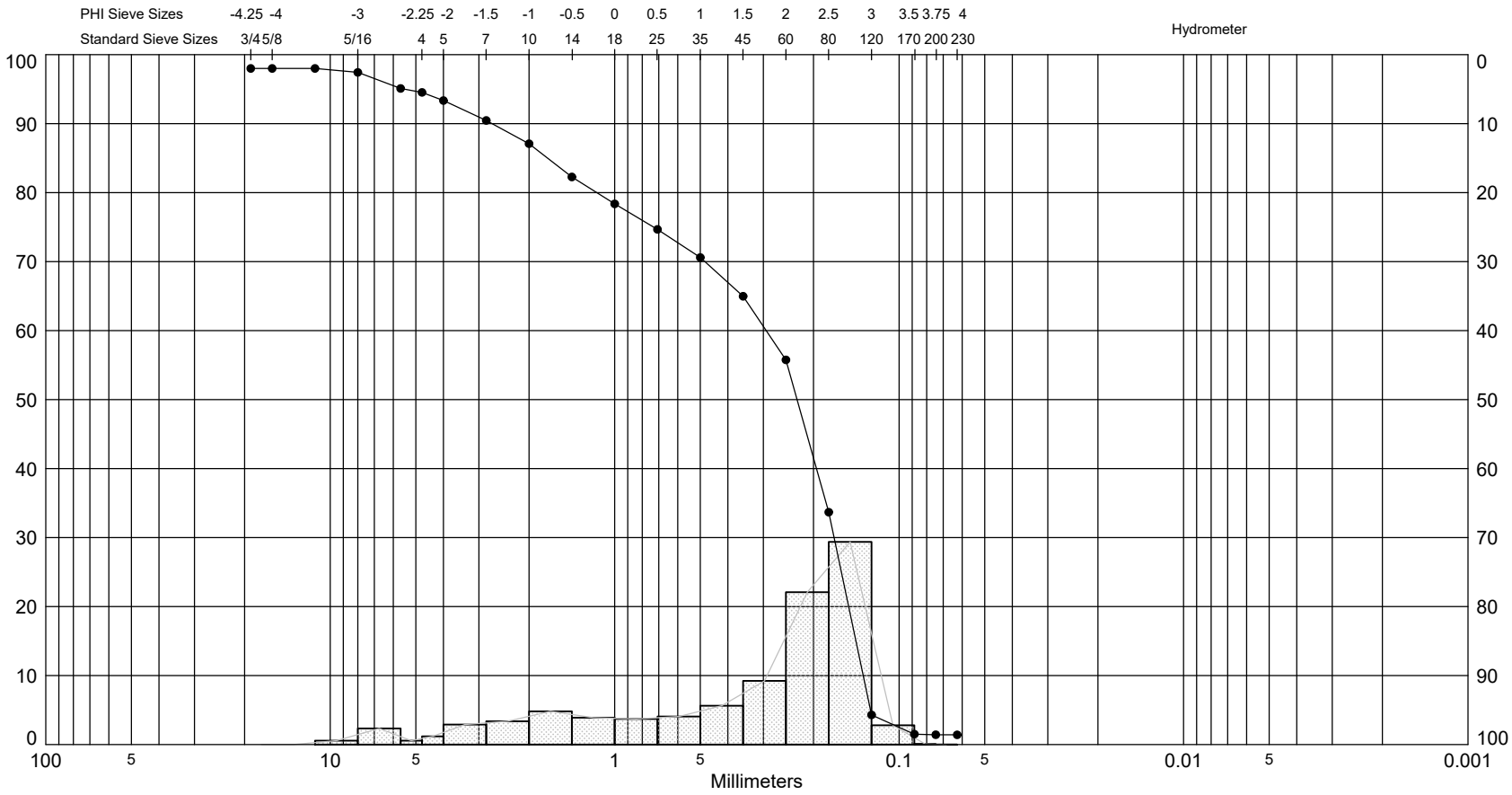
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-8.2**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-12**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, few coarse to fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	49.28	
	187.74	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	2.77	98.00	100	2.77
5/8"	16.000	0.00	98.00	0	0.00
7/16	11.112	0.00	98.00	0	0.00
5/16	7.938	0.79	97.43	100	0.79
#3.5	5.600	3.23	95.10	100	3.23
#4	4.750	0.79	94.53	100	0.79
#5	4.000	1.63	93.35	100	1.63
#7	2.800	4.00	90.46	100	4.00
#10	2.000	4.67	87.09	100	4.67
#14	1.400	6.67	82.27	100	6.67
#18	1.000	5.40	78.37	100	5.40
#25	0.710	5.12	74.67	90	4.61
#35	0.500	5.63	70.61	50	2.82
#45	0.355	7.78	64.99	30	2.33
#60	0.250	12.77	55.76	10	1.28
#80	0.180	30.57	33.68	0	0.00
#120	0.125	40.68	4.30	0	0.00
#170	0.090	3.86	1.52	0	0.00
#200	0.075	0.12	1.43	0	0.00
#230	0.063	0.01	1.42	0	0.00
Total Shell Content:		**30**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-12 #C-1	—●—	-6.0	SP	#200 - 1.42 #230 - 1.41		27.40	2.13	1.34	-0.97	3.02	1.59

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	522,439
Northing (Y, ft):	2,246,590
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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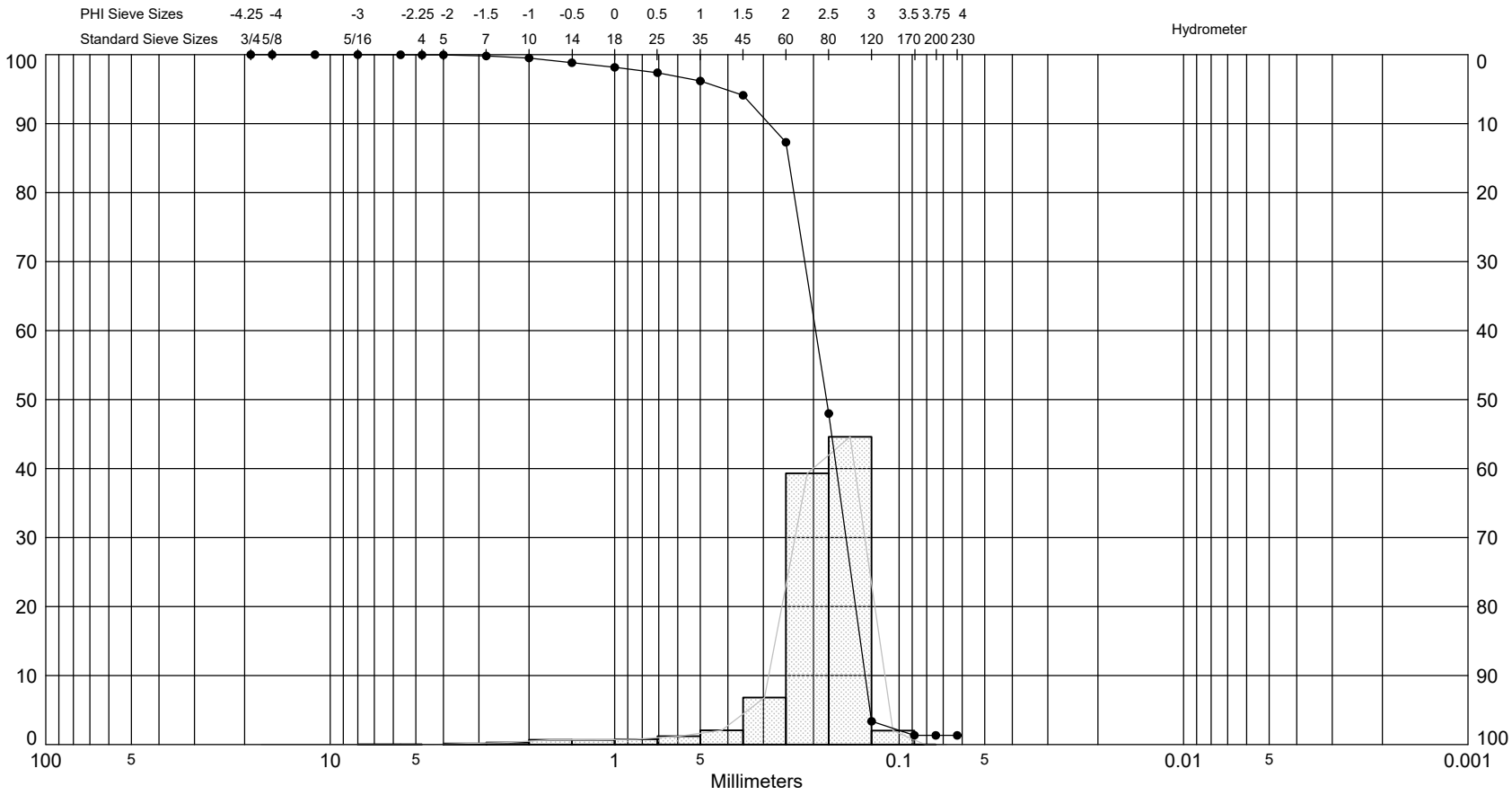
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-12**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace medium to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	48.45	
	183.27	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.03	99.98	100	0.03
#4	4.750	0.03	99.96	100	0.03
#5	4.000	0.00	99.96	0	0.00
#7	2.800	0.20	99.81	100	0.20
#10	2.000	0.41	99.50	100	0.41
#14	1.400	0.92	98.82	100	0.92
#18	1.000	0.90	98.15	100	0.90
#25	0.710	1.05	97.37	90	0.95
#35	0.500	1.62	96.17	50	0.81
#45	0.355	2.79	94.10	20	0.56
#60	0.250	9.18	87.29	5	0.46
#80	0.180	53.01	47.98	0	0.00
#120	0.125	60.14	3.37	0	0.00
#170	0.090	2.74	1.34	0	0.00
#200	0.075	0.02	1.32	0	0.00
#230	0.063	0.00	1.32	0	0.00
Total Shell Content:		**4**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-12 #S-1	—●—	-6.8	SP	#200 - 1.33 #230 - 1.33			2.47	2.35	-2.99	15.52	0.63

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	522,439
Northing (Y, ft):	2,246,590
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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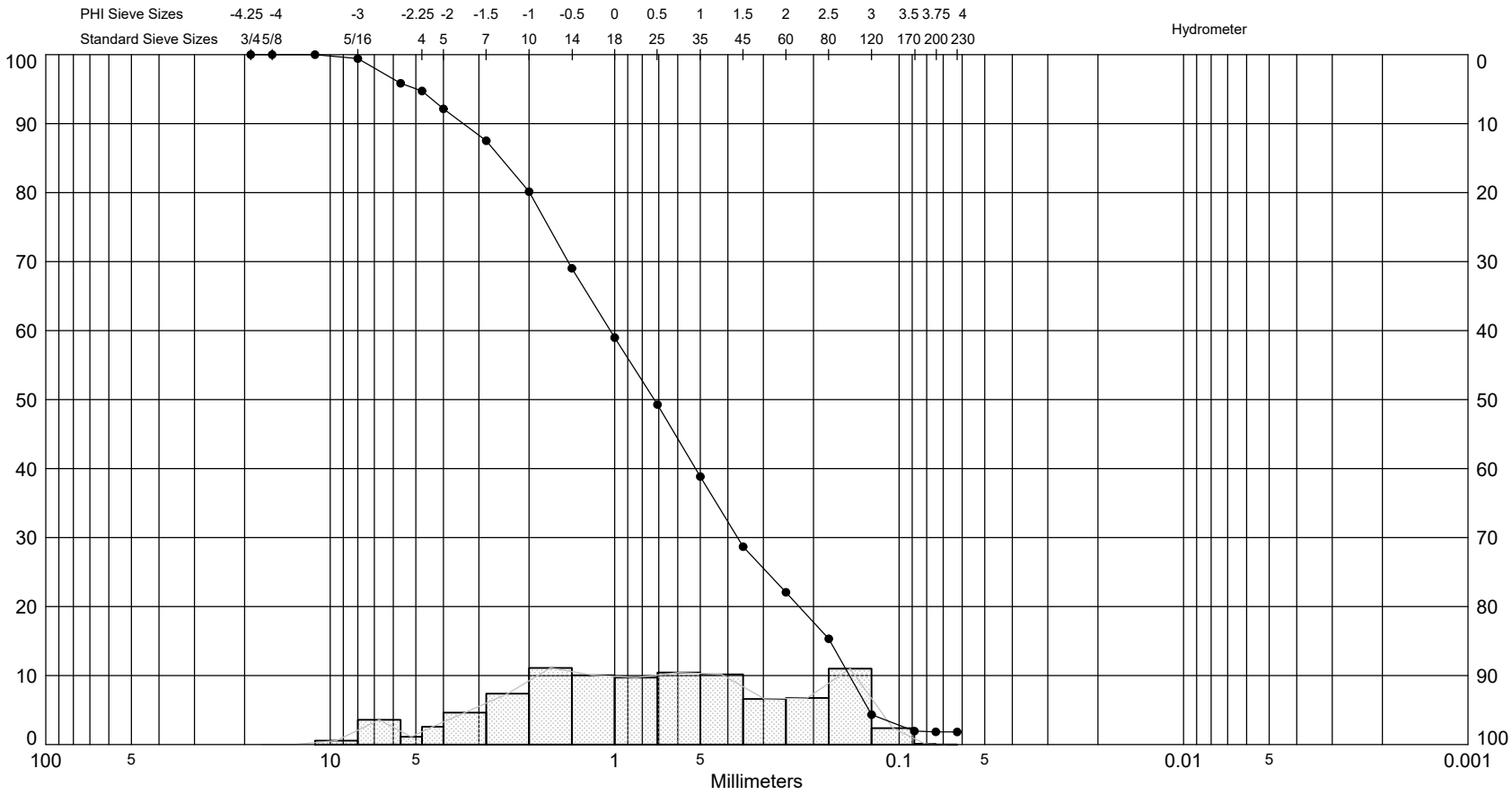
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**6.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-12**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly coarse to fine sand-size shell fragments, some medium to fine-grained quartz, few fine gravel-size shell fragments, trace silt (SP) 10YR 8/2**		

Tare Weight, (g):	49.38	
	181.97	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.75	99.43	100	0.75
#3.5	5.600	4.75	95.85	100	4.75
#4	4.750	1.49	94.73	100	1.49
#5	4.000	3.44	92.13	100	3.44
#7	2.800	6.12	87.52	100	6.12
#10	2.000	9.78	80.14	100	9.78
#14	1.400	14.73	69.03	100	14.73
#18	1.000	13.32	58.99	100	13.32
#25	0.710	12.86	49.29	90	11.57
#35	0.500	13.84	38.85	50	6.92
#45	0.355	13.47	28.69	20	2.69
#60	0.250	8.77	22.08	5	0.44
#80	0.180	8.94	15.33	0	0.00
#120	0.125	14.58	4.34	0	0.00
#170	0.090	3.16	1.95	0	0.00
#200	0.075	0.15	1.84	0	0.00
#230	0.063	0.01	1.83	0	0.00
Total Shell Content:		**57**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-12 #S-2	—●—	-11.8	SP	#200 - 1.84 #230 - 1.83			0.46	0.41	-0.1	2.15	1.61

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	522,439
Northing (Y, ft):	2,246,590
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
Office: 843-887-3800

SIEVE ANALYSIS OAI, NASSAU SOUND (S. AMELIA ISLAND), 2018.GPJ FL DEP ROSS.GDT 11/16/18

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

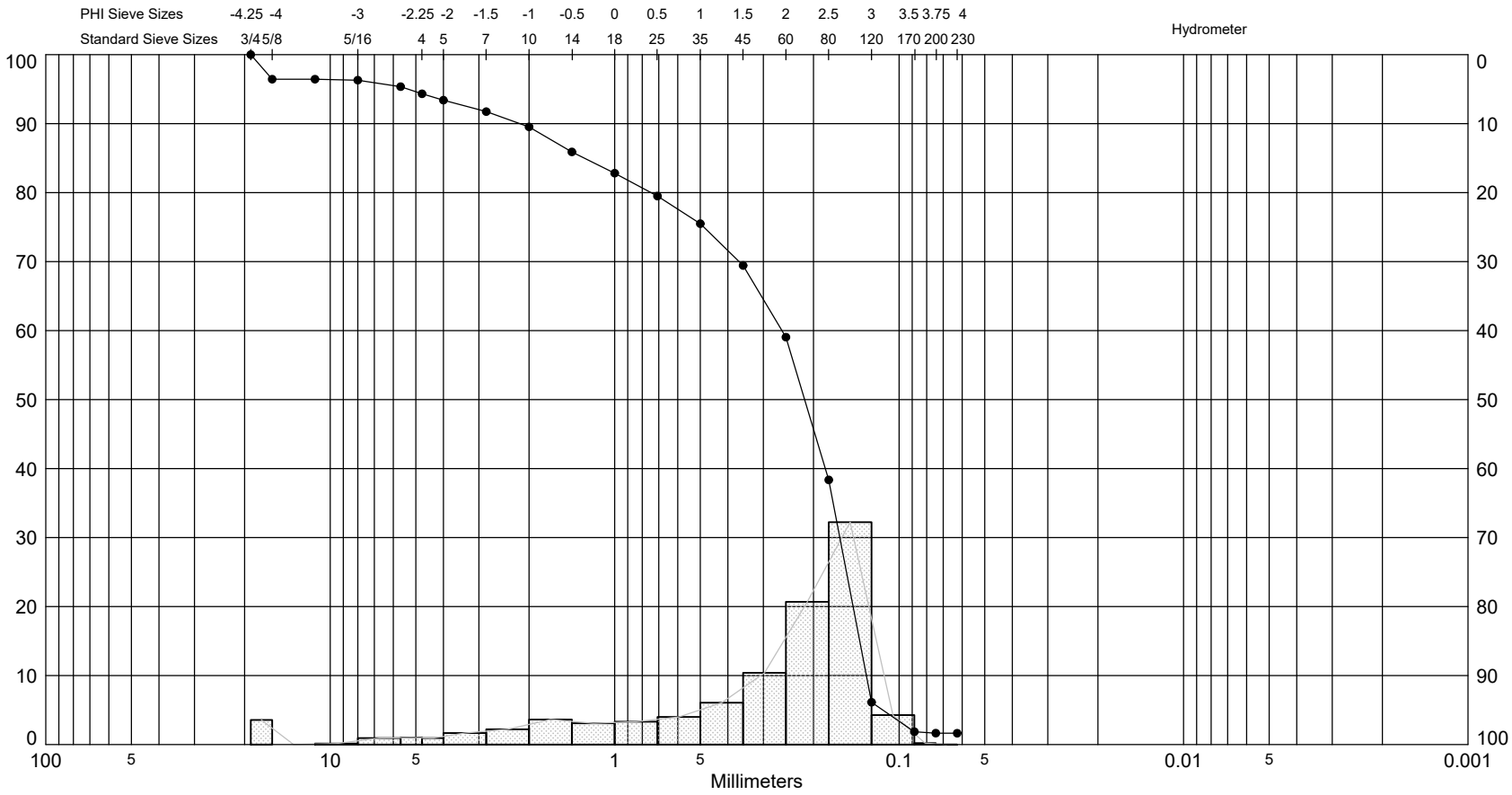
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**0-13.4**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-13**		
Sample No.:	**C-1**		
Description:	**SAND, poorly-graded, mostly medum to fine-grained quartz, little coarse to fine sand-sized shell fragments, few fine gravel-size shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.50	
	191.60	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	4.99	96.44	100	4.99
7/16	11.112	0.00	96.44	0	0.00
5/16	7.938	0.20	96.30	100	0.20
#3.5	5.600	1.31	95.36	100	1.31
#4	4.750	1.44	94.33	100	1.44
#5	4.000	1.30	93.40	100	1.30
#7	2.800	2.32	91.75	100	2.32
#10	2.000	3.09	89.54	100	3.09
#14	1.400	5.08	85.92	100	5.08
#18	1.000	4.31	82.84	100	4.31
#25	0.710	4.65	79.52	90	4.19
#35	0.500	5.61	75.52	50	2.81
#45	0.355	8.49	69.46	30	2.55
#60	0.250	14.56	59.06	10	1.46
#80	0.180	28.98	38.38	5	1.45
#120	0.125	45.16	6.15	0	0.00
#170	0.090	5.98	1.88	0	0.00
#200	0.075	0.29	1.67	0	0.00
#230	0.063	0.01	1.66	0	0.00
Total Shell Content:		**26**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-13 #C-1	—●—	-7.6	SP	#200 - 1.65 #230 - 1.64		22.80	2.22	1.51	-1.67	5.15	1.77

Comments:

Depths and elevations based on measured values

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Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,574
Northing (Y, ft):	2,245,885
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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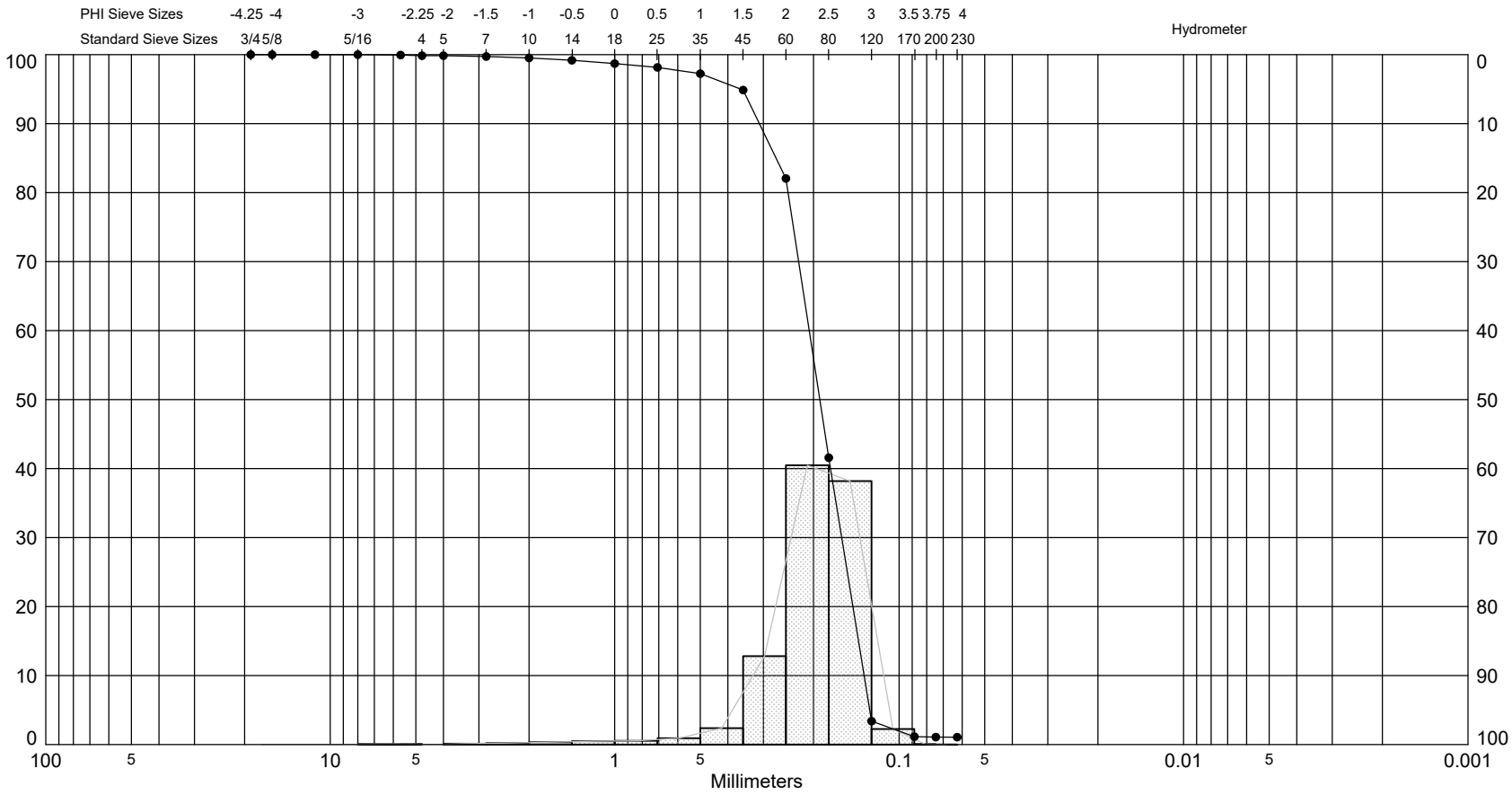
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**1.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-13**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly mediumk to fine-grained quartz, little coarse to fine sand-sized shell fragments, trace silt (SP) 10YR 8/1**		

Tare Weight, (g):	51.38	
	189.65	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.08	99.94	100	0.08
#4	4.750	0.12	99.86	100	0.12
#5	4.000	0.00	99.86	0	0.00
#7	2.800	0.17	99.73	100	0.17
#10	2.000	0.29	99.52	100	0.29
#14	1.400	0.47	99.18	100	0.47
#18	1.000	0.67	98.70	100	0.67
#25	0.710	0.76	98.15	90	0.68
#35	0.500	1.26	97.24	70	0.88
#45	0.355	3.28	94.87	40	1.31
#60	0.250	17.72	82.05	20	3.54
#80	0.180	55.96	41.58	5	2.80
#120	0.125	52.80	3.39	0	0.00
#170	0.090	3.11	1.14	0	0.00
#200	0.075	0.08	1.08	0	0.00
#230	0.063	0.01	1.08	0	0.00
Total Shell Content:		**8**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-13 #S-1	—●—	-8.4	SP	#200 - 1.08 #230 - 1.07			2.4	2.31	-2.85	17.51	0.6

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,574
Northing (Y, ft):	2,245,885
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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Jacksonville, Florida 32257
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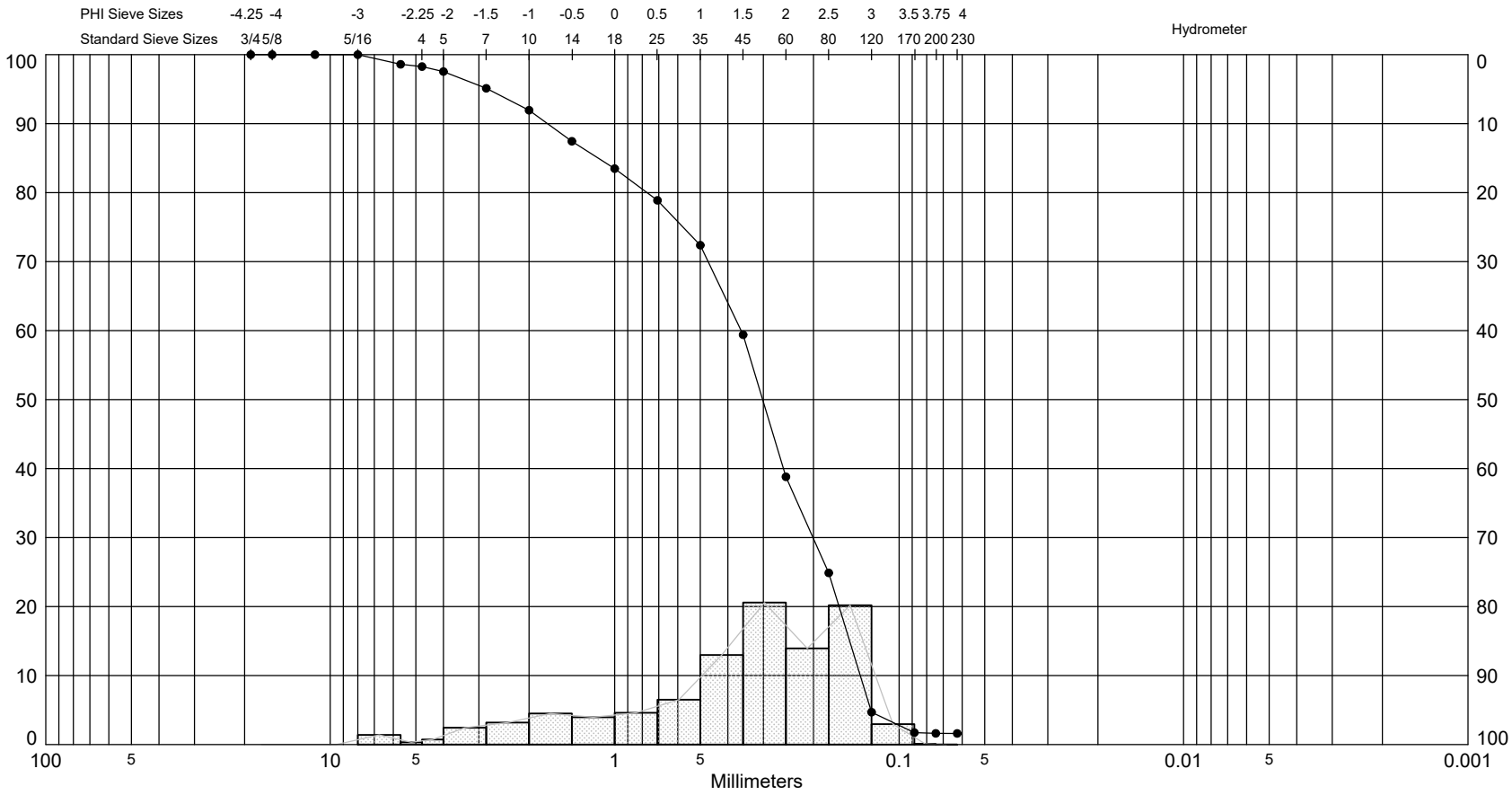
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound Geotechnical Evaluation**	**Depth:**	**9.0**
Project No.:	**EQ181189**	**Date:**	**10/19/2018**
Boring No.:	**D-13**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, some coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, trace silt (SP) 10YR 7/1**		

Tare Weight, (g):	49.09	
	180.29	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	1.84	98.60	100	1.84
#4	4.750	0.43	98.27	100	0.43
#5	4.000	0.95	97.55	100	0.95
#7	2.800	3.19	95.11	100	3.19
#10	2.000	4.17	91.94	100	4.17
#14	1.400	5.91	87.43	100	5.91
#18	1.000	5.19	83.48	100	5.19
#25	0.710	6.04	78.87	90	5.44
#35	0.500	8.53	72.37	50	4.27
#45	0.355	17.03	59.39	30	5.11
#60	0.250	27.02	38.80	10	2.70
#80	0.180	18.27	24.87	5	0.91
#120	0.125	26.49	4.68	0	0.00
#170	0.090	3.89	1.71	0	0.00
#200	0.075	0.14	1.61	0	0.00
#230	0.063	0.01	1.60	0	0.00
Total Shell Content:		**31**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
D-13 #S-2	—●—	-16.4	SP	#200 - 1.62 #230 - 1.61			1.73	1.39	-1.06	3.51	1.37

Comments:

Depths and elevations based on measured values

Sample Information	
Project Name:	2018 Geotechnical Evaluation
Analysis Date:	10-19-18
Analyzed By:	CRM, Sr.
Easting (X, ft):	521,574
Northing (Y, ft):	2,245,885
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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APPENDIX C – Project Data
BID NO. NC21-008
South Amelia Island Dredging & Beach Nourishment Project

Geotechnical data:

Appendix C-1:
2018 Vibracores and geotechnical laboratory analyses (Athena Technologies, Inc.)

Appendix C-2:
2017 Vibracores and geotechnical laboratory analyses (Athena Technologies, Inc.)

Geotechnical Vibracore Report
Nassau Sound (Amelia Island), Florida
June 2017

Prepared for:

Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, Florida 32204

Prepared by:

Athena Technologies, Inc.
1293 Graham Farm Road, PO Box 68
McClellanville, South Carolina 29458

Table of Contents

Section 1: Methodology

Athena Technologies, Inc. (Athena) was contracted by Olsen Associates, Inc. (OAI) of Jacksonville, Florida to collect geotechnical vibracore samples in Nassau Sound, which is located south of Amelia Island in northeast Florida. The purpose of the project was to determine suitability of sediment for beach placement and the area of focus was an ebb-tidal delta positioned at the entrance to Nassau Sound (Figure 1). A total of 49 vibracores of varying lengths were collected between July 2016 and April 2017, in accordance with the following methodology.

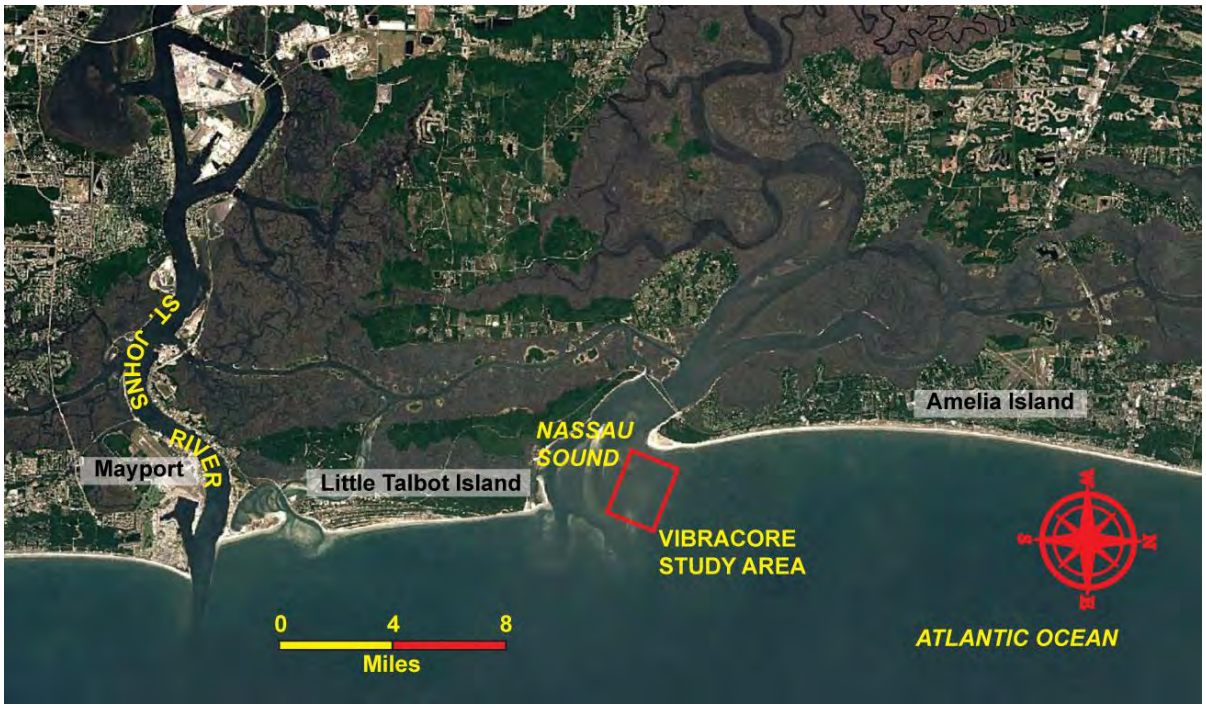

Figure 1: Vibracore Study Area, Nassau Sound, Amelia Island, Florida. (Image Source: GoogleEarth)

Athena utilized the 35-foot research vessel, *Artemis* (Figure 2), to act as the sampling platform for this project. *Artemis* was equipped with all required US Coast Guard (USCG) safety gear and was operated by a USCG-certified, 100 Ton Master Captain. A Trimble Differential Global Positioning System (sub-meter accuracy) interfaced with HYPACK was utilized for primary navigation. Horizontal coordinates were recorded in North American Datum of 1983 State Plane, Florida East (Zone 0901), U.S. Survey Feet. Real-time tide elevations were obtained using a Champion TKO Global Navigation Satellite System (GNSS) receiver interfaced with the Florida Permanent Reference Network, which served as the base station.

Figure 2: Research Vessel Artemis offshore of Mobile Bay, Alabama.

During field operations, *Artemis* was immobilized over the desired sample sites (provided by OAI) using a triple-point anchor system. Once on station, the coordinates at the vessel location were checked against the coordinates for the desired sample location to ensure accurate vessel positioning. Upon satisfactory positioning, a water depth was collected via lead line (at locations with low current velocities) or fathometer. The water level elevation data was recorded with the Champion TKO GNSS receiver in relation to North American Vertical Datum of 1988 (NAVD 88) and was utilized to determine the sediment surface elevation at each sample location.

A custom-designed and fabricated vibracore system was utilized to collect the geotechnical cores. The system consists of a generator with a mechanical vibrator attached via cable. The vibrator is attached directly to a 3-inch diameter, galvanized sample barrel. The sample barrel was lowered until the bottom of the barrel was directly above the sediment surface. The vibracore machine was turned on and the sample barrel was allowed to penetrate to a depth of 20 feet below sediment surface, or to refusal. Vibracore penetration was recorded from the deck using marked drill stems. Once the sample barrel reached the desired depth, the machine was turned off and the sample barrel was retrieved using an electric winch.[1] The recovered core length was measured following core retrieval, and percent recovery was verified. The cores were then capped, labeled, and cut into 5-foot sections. A vibracore summary table containing final coordinates, elevation data, and penetration and recovery lengths has been included as Table 1. Sample locations are depicted on Figure 3.

[1] Jetting was required at the following locations to increase penetration and recovery: C-14, C-15, C-31, C-38, C-39, and C-43.

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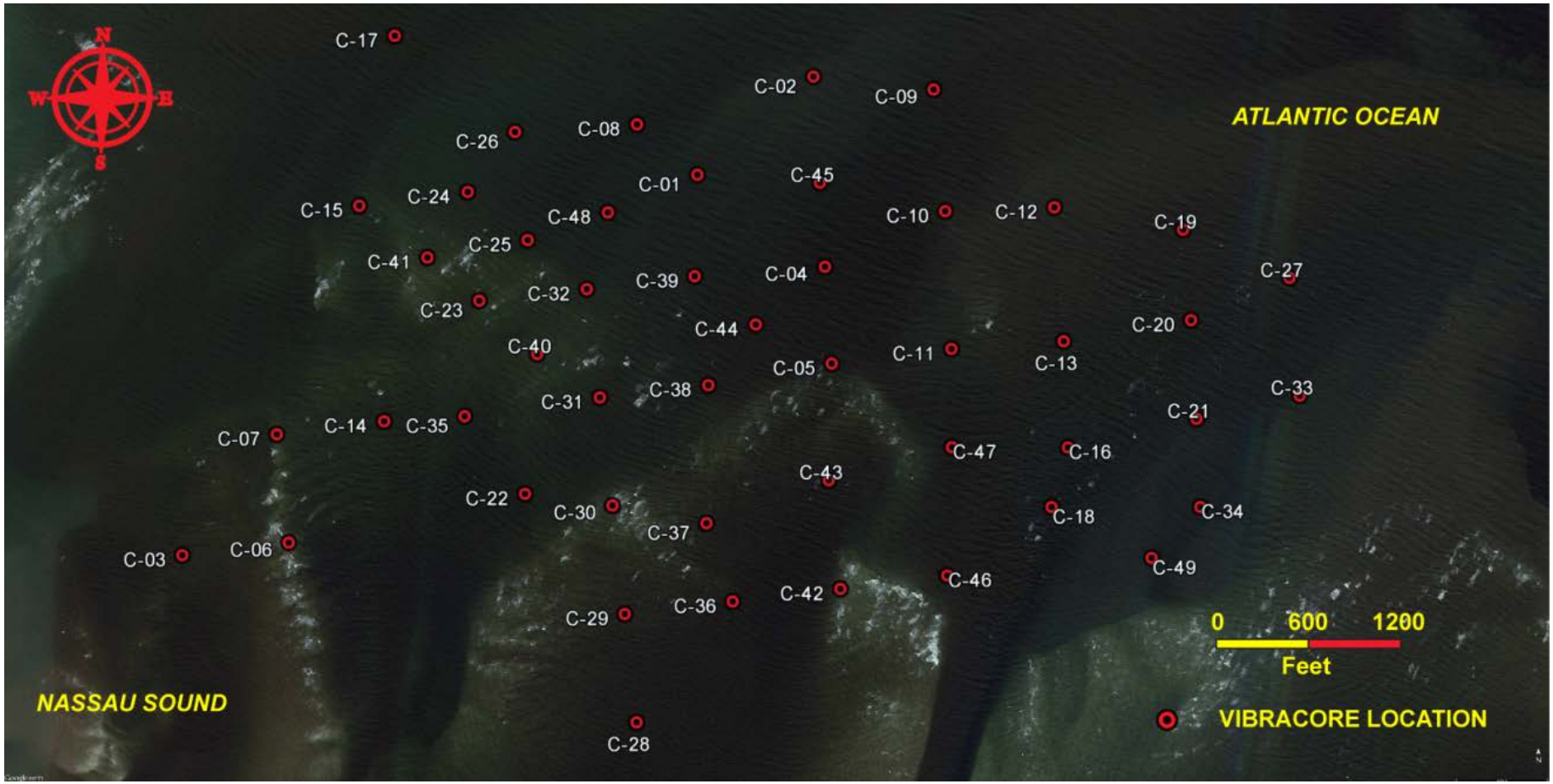

Figure 3: Vibracore Location Map, Nassau Sound, Amelia Island, Florida. (Image Source: GoogleEarth)

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The completed cores were opened longitudinally at Athena's core processing facility in McClellanville, South Carolina. The cores were logged in accordance with ASTM D 2487 (the Unified Soil Classification System) and were photographed after opening. Draft logs and photo-mosaic images of each core were provided to OAI for selection of sub-sample intervals for laboratory analysis. Once sample selections were received from OAI, Athena extracted and shipped the sub-samples to Terracon Consultants, Inc. (Terracon) in Jacksonville, Florida; Terracon is a USACE-certified geotechnical laboratory. One composite sample and a varying number of discrete samples were collected from each core. The composite and discrete sub-samples were analyzed in accordance with ASTM D 422 to determine grain size and soil classification, using the following sieve sizes: ¾ in., ⅜ in., No. 4, No. 5, No. 10, No. 18, No. 20, No. 35, No. 40, No. 60, No. 120, No. 200, and No. 230. The sub-samples were also visually inspected for shell content using the Terry and Chilingar method (1955). Composite samples were also analyzed in accordance with the Twenhofel and Tyler (1941) acid digestion method to determine carbonate content percentages for each core.

Vibracore logs were developed using gINT (Version 8), and laboratory analytical data were incorporated into the gINT project file for statistical evaluation. A summary of grain size data is presented in Table 2. Core logs, photographs, sieve analysis curves, and grain size data are included in Appendix A. Core penetration logs are included in Appendix B.

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Section 2: Discussion

The vibracore study area (depicted on Figure 1) was located at the entrance to Nassau Sound, which is a tidal inlet bounded by two barrier islands: Amelia Island to the north and Little Talbot Island to the south. More specifically, the vibracores were positioned primarily on and around an ebb-tidal delta located seaward of Nassau Sound. The mean tidal range at the study area is approximately five (5) feet, and tidal current velocities range from 1.5 to greater than 2 knots during peak tidal exchange periods (National Oceanic and Atmospheric Administration).

Sediment surface elevations in the project area ranged from approximately -5 to -22.5 feet NAVD 88 and core termination depths ranged from -17.2 to -43.4 feet NAVD 88. Water depths at the sample locations within the study area ranged from approximately 3 to 24 feet; the average water depth was approximately 12 feet. The relatively shallow nature of the study area, in conjunction with study area's exposure to open ocean processes (e.g., wave refraction), resulted in amplified wave heights and variable wave directions on the ebb tidal delta. The wave action within the study area caused the vessel to pitch in a non-uniform manner, which limited the effectiveness of the vibracore system and made safety an overriding concern during vibracore operations. All reasonable efforts were made to collect vibracores from the desired locations while minimizing risk to crew and equipment.

The clastic (i.e., non-shell) fraction in each core was predominantly fine-grained, poorly graded quartz sand. The average mean grain size for all samples (composite and discrete) reporting less than 20 percent shell or carbonate material was 0.18 millimeters (mm). Conversely, the average mean grain size for samples reporting greater than 20 percent shell or carbonate material was 0.51 mm, which indicates that shell material in the cores are generally fine to medium sand-size. Based on review of the data set, mean grain size and carbonate content percentages decrease from west to east in the project area, with carbonate content less than 5 percent in the easternmost cores (C-19 through C-21, C-27, C-33, C-34, and C-49). A summary of the carbonate percentages for each composite sample, as reported by Terracon, are included in Appendix C.

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In general, the fine-grained content (i.e., silt and clay-sized sediment) was less than 5 percent in each of the composite samples collected from site wide cores, except for the composite sample from C-01, which reported 5.7 percent material passing the #200 sieve. For many of the cores, the fine-grained sediment within the composite intervals was limited to thin layers (i.e., less than 1 inch) interbedded with fine sand, which is characteristic of tidal bedding. A number of the cores positioned in deeper water (i.e., sediment surface elevations below -15 feet NAVD 88) terminated in sediment intervals with higher percentages of fine-grained material. More specifically, the following cores terminated in a finer-grained sediment interval: C-04, C-09, C-10, C-12, C-18, C-19, C-20, C-21, C-27, C-33, and C-45. In general, the surface elevation of the fine-grained interval discussed above ranges from approximately -23 to -39 feet NAVD 88, and increases in depth to the northeast.

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Section 3: References

ASTM D422-63 (1998). Standard Test Method for Particle-Size Analysis of Soils, ASTM International, West Conshohocken, PA.

ASTM D2487-11 (2011). Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM International, West Conshohocken, PA.

National Oceanic and Atmospheric Administration. Tide Station: Nassau River Entrance, FL (Station ID: 8720135).

Terry, R. D. and Chilingar, C. V. (1955). Summary of "Concerning some additional aids in studying sedimentary formations" by M. S. Shvetsov. *Journal of Sedimentary Petrology*, Volume 25, pp. 229-214.

Twenhofel, W.H. and Tyler S.A. (1941). Methods of Study of Sediments, McGraw-Hill, New York, p. 183

Tables

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Table 1
Vibracore Summary
Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Boring ID	Collection Date	Time	East (x)	North (y)	Water Depth (ft)	Tide Elevation (ft NAVD 88)	Top of Core Elevation (ft NAVD 88)	Bottom of Core Elevation (ft NAVD 88)	Penetration (ft)	Recovery (ft)	Notes
C-01	3/18/2017	11:46	524294	2249289	19.5	-0.1	-19.6	-31.1	11.5	9.8	Made 3 attempts; third core retained.
C-02	2/21/2017	12:06	525076	2249893	20.8	-1.7	-22.5	-42.5	20.0	17.8	
C-03	7/11/2016	7:27	520837	2246964	5.8	-3.2	-9.0	-29.0	20.0	16.3	
C-04	3/18/2017	9:22	525101	2248660	16.5	-2.4	-18.9	-38.9	20.0	17.2	
C-05	3/18/2017	9:57	525119	2248032	10.2	-1.8	-12.0	-32.0	20.0	19.6	
C-06	7/11/2016	9:38	521534	2247017	6.5	-2.5	-9.0	-19.0	10.0	8.8	Made 2 attempts; refusal encountered at ~10'.
C-07	7/11/2016	10:32	521485	2247721	8.8	0.1	-8.7	-25.7	17.0	14.5	Made 2 attempts; refusal encountered at ~17'.
C-08	8/22/2016	9:36	523915	2249632	24.2	-2.2[1]	-22.7[2]	-42.7	20.0	16.5	
C-09	2/21/2017	11:30	525856	2249778	20.3	-2.1	-22.4	-43.4	21.0	20.9	
C-10	2/21/2017	12:43	525899	2248988	16.7	-0.9	-17.6	-37.6	20.0	18.5	
C-11	3/17/2017	15:18	525903	2248095	10.9	-1.5	-12.4	-27.9	15.5	14.8	Surging waves at sample location resulted in bent core barrel. Additional coring attempt not made, due to safety concerns.
C-12	2/21/2017	10:13	526611	2248984	14.8	-2.6	-17.4	-37.4	20.0	19.8	Made 2 coring attempts; second core retained.
C-13	2/21/2017	14:12	526637	2248115	12.9	0.9	-12.0	-33.0	21.0	20.2	
C-14	7/24/2016	12:44	522188	2247777	11.7	2.2	-9.5	-29.3	19.8	17.3	Made 3 coring attempts. Jetted.
C-15	7/27/2016	10:19	522083	2249178	5.6	-2.7	-8.3	-28.3	20.0	16.0	
C-16	3/17/2017	13:59	526636	2247427	13.6	-0.6	-14.1	-34.1	20.0	15.0	Made 2 coring attempts; second core retained. Lost ~2.5' from bottom of core; material at bottom of core comprised of medium sand with fine gravel-size shell.
C-17	7/23/2016	9:36	522359	2250268	12.8	-2.7	-15.5	-33.5	18.0	16.5	Jetted.
C-18	3/18/2017	11:13	526514	2247046	12.1	-0.8	-12.9	-27.9	15.0	13.0	Surging waves at sample location resulted in bent core barrel. Additional coring attempt not made, due to safety concerns.
C-19	2/21/2017	9:40	527444	2248805	15.3	-3.1	-18.4	-39.4	21.0	20.5	
C-20	2/21/2017	13:42	527472	2248218	15.9	0.3	-15.7	-36.7	21.0	20.5	
C-21	3/18/2017	8:41	527481	2247578	10.9	-3.5	-14.4	-34.4	20.0	17.6	

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Table 1
Vibracore Summary
Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Boring ID	Collection Date	Time	East (x)	North (y)	Water Depth (ft)	Tide Elevation (ft NAVD 88)	Top of Core Elevation (ft NAVD 88)	Bottom of Core Elevation (ft NAVD 88)	Penetration (ft)	Recovery (ft)	Notes
C-22	3/18/2017	12:45	523087	2247270	9.7	0.1	-9.5	-20.5	11.0	10.1	Surging waves at sample location resulted in bent core barrel. Additional coring attempt not made, due to safety concerns.
C-23	7/25/2016	7:28	522840	2248532	7.5	-3.5	-11.0	-26.0	15.0	12.0	Made 1 vibracore attempt and 3 jetting attempts; no cores retained due to poor recovery during each attempt.
C-24	7/26/2016	8:17	522793	2249238	9.5	-4.0	-13.5	-26.0	12.5	10.2	Made 1 vibracore attempt; refusal encountered at ~12.5'. Made 2 subsequent jetting attempts, with minimal penetration observed (i.e., < 1.5' additional penetration). Refusal presumed to be comprised of gravel-sized shells and silt (plume present after jetting attempts).
C-25	7/26/2016	9:42	523171	2248911	7.3	-2.8	-10.1	-29.6	19.5	9.2	Made 2 vibracore attempts, followed by 1 jetting attempt. Poor recovery (33%, measured in situ.) observed during each attempt.
C-26	7/26/2016	7:22	523117	2249614	9.8	-4.2	-14.0	-24.2	10.2	9.1	Made 1 vibracore attempt and 1 jetting attempt; refusal encountered at ~10'.
C-27	2/21/2017	9:06	528125	2248465	15.5	-2.8	-18.3	-39.3	21.0	19.9	
C-28	7/12/2016	11:47	523753	2245763	7.2	-0.5	-7.7	-17.2	9.5	8.7	Refusal encountered at ~9.5'.
C-29	8/23/2016	7:20	523705	2246469	3.3	-3.7[1]	-6.1[2]	-23.4	17.3	14.5	
C-30	8/22/2016	10:36	523649	2247172	10.3	2.3[1]	-8.0[2]	-28.0	20.0	15.1	
C-31	7/27/2016	7:31	523600	2247874	5.6	-3.9	-9.5	-28.2	18.7	17.5	Jetted.
C-32	7/12/2016	8:52	523543	2248578	9.1	-3.1	-12.2	-24.3	12.1	10.5	Refusal encountered at ~12.1'.
C-33	2/21/2017	8:04	528160	2247701	12.5	-1.7	-14.2	-29.3	15.1	12.5	Made 2 coring attempts; second core retained. Refusal encountered at ~15.5'.
C-34	3/17/2017	14:45	527483	2247007	10.3	-0.8	-11.1	-24.1	13.0	12.4	Surging waves at sample location resulted in bent core barrel. Additional coring attempt not made, due to safety concerns.
C-35	3/18/2017	10:34	522714	2247788	7.3	-1.4	-8.7	-23.7	15.0	12.0	Surging waves at sample location resulted in bent core barrel. Additional coring attempt not made, due to safety concerns.
C-36	8/22/2016	11:23	524413	2246520	11.2	2.8[1]	-7.1[2]	-27.1	20.0	19.0	
C-37	7/27/2016	13:09	524261	2247032	6.2	1.1	-5.1	-25.1	20.0	16.2	
C-38	7/26/2016	13:15	524310	2247925	12.4	1.6	-10.8	-30.6	19.8	17.2	Jetted.
C-39	7/25/2016	8:10	524250	2248633	14.8	-1.1	-15.9	-35.9	20.0	17.8	Jetted.
C-40	3/17/2017	11:33	523203	2248171	9.7	0.6	-9.1	-29.1	20.0	15.0	Lost 1' from bottom of core; material at bottom of core comprised of medium sand with fine gravel-size shell.
C-41	3/17/2017	10:10	522513	2248825	11.1	-0.4	-11.4	-31.4	20.0	12.4	Made 3 coring attempts; third core retained.
C-42	8/22/2016	7:31	525117	2246569	3.5	-3.4[1]	-7.1[2]	-20.1	13.0	10.6	Refusal encountered at ~13.0'.

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Table 1
Vibracore Summary
Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Boring ID	Collection Date	Time	East (x)	North (y)	Water Depth (ft)	Tide Elevation (ft NAVD 88)	Top of Core Elevation (ft NAVD 88)	Bottom of Core Elevation (ft NAVD 88)	Penetration (ft)	Recovery (ft)	Notes
C-43	7/24/2016	11:10	525069	2247278	12.9	2.2	-10.8	-28.0	17.2	16.0	Jetted.
C-44	7/24/2016	9:33	524635	2248305	14.0	0.9	-13.1	-32.6	19.5	16.1	
C-45	7/25/2016	7:29	525090	2249205	19.6	-1.4	-21.0	-43.0	22.0	21.8	
C-46	3/17/2017	12:17	525816	2246630	12.2	0.7	-11.5	-29.5	18.0	15.6	Made 3 coring attempts; third core retained.
C-47	7/12/2016	12:48	525880	2247459	11.3	0.2	-11.1	-20.4	9.3	8.7	Refusal encountered at ~9.3'.
C-48	3/17/2017	8:51	523701	2249069	13.5	-1.7	-15.2	-33.2	18.0	14.3	Made 2 coring attempts; second core retained. Refusal encountered at 18'.
C-49	3/18/2017	13:19	527152	2246690	10.1	-0.1	-10.2	-30.2	20.0	17.0	

Notes

ft = feet

NAVD 88 = North American Vertical Datum of 1988

Coordinates were recorded in North American Datum of 1983, State Plane Coordinate System, Florida East (Zone 0901), US Survey Feet.

Elevation data collected using a Champion TKO GNSS System interfaced with the Florida Permanent Reference Network.

[1] = Tide elevation estimated based on tide predictions obtained from National Oceanic and Atmospheric Administration Tide Station ID: 8720135 (Nassau River Entrance, FL). The Florida Permanent Reference Network was inoperable and real-time elevation data could not be collected in the field.

[2] = Top of core elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

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Table 2
Grain Size Data Summary
Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Core ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #200 Sieve	Percent Passing #230 Sieve	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
C-01	Comp	0.0	9.5	SP-SM	5.70	5.63	54.41	49.1	0.33	0.80	0.57	0.67	1.94	-0.20	2.11
C-01	A	0.8	1.3	SP	1.71	1.29	2.67		2.77	0.15	2.82	0.14	0.51	-1.26	6.19
C-01	B	5.3	5.8	SP	1.75	1.73	68.98		-0.23	1.17	-0.12	1.09	1.85	-0.10	2.08
C-02	COMP	0.0	17.8	SP	1.61	1.46	**NR**	13.4	1.97	0.26	2.38	0.19	1.34	-2.17	7.73
C-02	A	0.8	1.3	SP	2.42	1.62	3.07		2.83	0.14	2.97	0.13	0.71	-2.85	14.95
C-02	B	8.8	9.3	SP	1.00	0.97	0.44		2.58	0.17	2.63	0.16	0.34	-2.18	23.44
C-02	C	15.8	16.3	SP	1.38	1.32	11.75		2.13	0.23	2.21	0.22	0.65	-1.69	10.72
C-03	COMP	0.0	16.3	SP	1.49	1.33	24.32	17.8	1.89	0.27	2.44	0.18	1.45	-1.61	5.06
C-03	A	0.8	1.3	SP	0.80	0.77	31.83		1.29	0.41	1.69	0.31	1.39	-1.23	4.15
C-03	B	8.8	9.3	SP	1.18	1.08	3.35		2.78	0.15	2.79	0.14	0.43	-6.57	88.53
C-04	COMP	0.0	13.0	SP	2.98	2.69	29.34	29.2	1.52	0.35	2.58	0.17	1.99	-1.13	3.04
C-04	A	1.8	2.3	SP	2.12	1.82	1.45		2.89	0.13	2.88	0.14	0.35	-1.82	20.40
C-04	B	12.8	13.3	SP	1.69	1.62	82.93		-1.02	2.03	-0.92	1.89	1.79	0.11	2.33
C-05	COMP	0.0	19.5	SP	2.70	2.41	6.77	4.8	2.53	0.17	2.77	0.15	1.05	-3.21	14.60
C-05	A	0.8	1.3	SP	1.31	1.31	2.65		2.45	0.18	2.56	0.17	0.57	-3.29	22.45
C-05	B	8.8	9.3	SP	1.83	1.72	1.35		2.81	0.14	2.80	0.14	0.29	-0.57	11.84
C-05	C	16.8	17.3	SP	1.46	1.14	10.04		2.50	0.18	2.80	0.14	1.08	-2.43	9.97
C-06	COMP	0.0	8.5	SP	1.16	1.10	34.88	32.6	1.10	0.47	1.68	0.31	1.75	-0.92	2.91
C-06	A	0.8	1.3	SP	0.78	0.76	46.07		0.74	0.60	1.20	0.44	1.80	-0.51	2.11
C-06	B	4.8	5.3	SP	2.13	1.49	18.24		2.04	0.24	2.78	0.15	1.83	-1.65	4.63
C-07	COMP	0.0	14.5	SP	1.15	1.04	17.11	11.0	2.19	0.22	2.54	0.17	1.17	-2.15	7.96
C-07	A	0.8	1.3	SP	0.98	0.84	15.19		2.11	0.23	2.53	0.17	1.17	-1.65	5.80
C-07	B	10.8	11.3	SP	0.86	0.86	2.48		2.44	0.18	2.51	0.18	0.51	-4.82	46.26
C-08	COMP	0.0	14.5	SP	1.32	1.24	26.65	22.8	1.49	0.36	1.95	0.26	1.46	-1.21	3.88
C-08	A	0.8	1.3	SP	1.04	0.98	56.08		0.24	0.85	0.61	0.66	1.63	-0.42	2.36
C-08	B	9.8	10.3	SP	0.96	0.93	2.24		2.16	0.22	2.18	0.22	0.42	-0.63	6.36
C-09	COMP	0.0	15.0	SP	1.91	1.60	9.34	7.1	2.46	0.18	2.68	0.16	0.96	-3.08	14.50
C-09	A	0.8	1.3	SP	1.40	1.11	22.44		1.93	0.26	2.54	0.17	1.42	-1.24	3.73
C-09	B	9.8	10.3	SP	1.05	0.99	10.43		2.34	0.20	2.43	0.19	0.72	-4.20	29.99

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Table 2
Grain Size Data Summary
Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Core ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #200 Sieve	Percent Passing #230 Sieve	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
C-10	COMP	0.0	14.5	SP	2.12	1.76	11.47	11.6	2.26	0.21	2.65	0.16	1.27	-2.26	8.05
C-10	A	0.8	1.3	SP	2.35	1.95	2.50		2.74	0.15	2.80	0.14	0.56	-2.80	17.09
C-10	B	6.8	7.3	SP	1.63	1.34	46.02		1.30	0.41	1.57	0.34	1.48	-0.63	2.81
C-10	C	12.8	13.3	SP-SM	10.43	10.25	2.10		2.55	0.17	2.67	0.16	0.53	-6.24	63.51
C-11	COMP	0.0	14.5	SP	3.97	3.76	8.28	9.4	2.37	0.19	2.65	0.16	0.96	-2.21	8.15
C-11	A	0.8	1.3	SP	0.80	0.78	12.79		1.99	0.25	2.39	0.19	1.19	-1.73	5.49
C-11	B	6.8	7.3	SP	1.65	1.47	22.82		1.72	0.30	2.51	0.18	1.68	-1.40	3.79
C-11	C	12.8	13.3	SP	1.32	1.11	3.76		2.63	0.16	2.77	0.15	0.84	-3.60	19.75
C-12	COMP	0.0	18.0	SP	1.55	1.21	14.28	12.1	2.23	0.21	2.67	0.16	1.33	-2.13	7.56
C-12	A	0.8	1.3	SP	1.23	0.96	2.00		2.82	0.14	2.84	0.14	0.45	-3.13	25.36
C-12	B	6.8	7.3	SP	1.35	0.95	3.13		2.80	0.14	2.84	0.14	0.57	-3.70	26.59
C-12	C	13.8	14.3	SP	1.31	1.26	43.36		0.99	0.50	1.44	0.37	1.41	-1.06	3.61
C-13	COMP	0.0	20.2	SP	2.68	2.09	7.26	6.6	2.51	0.18	2.75	0.15	1.10	-3.20	14.96
C-13	A	1.8	2.3	SP	0.91	0.87	0.86		2.71	0.15	2.74	0.15	0.41	-3.94	36.91
C-13	B	9.8	10.3	SP	1.43	0.99	2.98		2.88	0.14	2.91	0.13	0.50	-4.15	38.15
C-13	C	16.8	17.3	SP	1.73	1.38	5.17		2.32	0.20	2.66	0.16	1.22	-2.79	10.95
C-14	COMP	0.0	17.3	SP	1.14	0.92	29.25	23.9	1.62	0.33	2.50	0.18	1.86	-1.36	3.84
C-14	A	0.8	1.3	SP	0.71	0.69	30.31		1.39	0.38	1.61	0.33	1.07	-1.32	5.41
C-14	B	8.8	9.3	SP	2.08	1.36	3.64		2.70	0.15	2.81	0.14	0.83	-3.65	21.16
C-14	C	15.8	16.3	SP	1.19	1.12	51.78		0.62	0.65	1.15	0.45	1.73	-0.58	2.27
C-15	COMP	0.0	15.0	SP	1.21	1.12	11.24	10.2	2.27	0.21	2.64	0.16	1.18	-2.60	9.94
C-15	A	0.8	1.3	SP	0.64	0.60	18.05		1.92	0.26	2.11	0.23	0.87	-1.72	6.99
C-15	B	12.8	13.3	SP	0.93	0.82	2.68		2.76	0.15	2.78	0.15	0.51	-7.20	77.24
C-16	COMP	0.0	15.0	SP	3.48	3.48	11.32	12.1	2.22	0.21	2.69	0.15	1.39	-2.22	7.30
C-16	A	0.8	1.3	SP	0.72	0.70	5.82		2.38	0.19	2.59	0.17	0.87	-2.96	13.22
C-16	B	8.3	8.8	SP	2.26	1.88	0.59		2.88	0.14	2.88	0.14	0.40	-3.19	36.22
C-16	C	13.8	14.3	SP	1.12	1.01	56.39		-0.11	1.08	-0.29	1.22	2.12	0.19	1.88

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Core ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #200 Sieve	Percent Passing #230 Sieve	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
C-17	COMP	0.0	16.5	SP	1.44	1.30	29.88	18.6	1.72	0.30	2.29	0.20	1.51	-1.63	5.03
C-17	A	0.8	1.3	SP	1.27	0.81	29.44		1.84	0.28	2.09	0.23	1.31	-1.24	4.74
C-17	B	6.8	7.3	SP	1.14	1.10	45.58		1.12	0.46	1.56	0.34	1.61	-0.96	3.46
C-17	C	13.8	14.3	SP	0.76	0.73	4.40		2.56	0.17	2.62	0.16	0.41	-4.56	52.67
C-18	COMP	0.0	11.0	SP	1.60	1.47	7.87	8.2	2.32	0.20	2.62	0.16	1.13	-3.12	13.47
C-18	A	0.8	1.3	SP	0.97	0.89	3.44		2.56	0.17	2.70	0.15	0.73	-4.40	27.20
C-18	B	8.8	9.3	SP	2.86	2.58	7.55		2.55	0.17	2.82	0.14	1.22	-3.43	14.86
C-19	COMP	0.0	19.0	SP	3.41	2.52	2.82	3.8	2.78	0.15	2.97	0.13	0.94	-3.60	18.32
C-19	A	1.8	2.3	SP	0.97	0.84	5.20		2.57	0.17	2.68	0.16	0.60	-2.36	12.95
C-19	B	7.8	8.3	SP	1.61	1.29	0.49		2.85	0.14	2.85	0.14	0.40	-1.88	15.92
C-19	C	15.8	16.3	SP	4.17	2.44	0.94		3.16	0.11	3.22	0.11	0.43	-5.27	58.82
C-20	COMP	0.0	12.5	SP	2.64	2.12	2.64	3.5	2.81	0.14	2.86	0.14	0.58	-3.51	26.85
C-20	A	1.8	2.3	SP	1.05	0.95	1.45		2.70	0.15	2.73	0.15	0.40	-1.50	12.97
C-20	B	8.8	9.3	SP	1.59	1.00	0.37		2.95	0.13	2.95	0.13	0.37	-1.52	14.68
C-20	C	16.8	17.3	SM	16.59	9.93	1.55		3.28	0.10	3.41	0.09	0.64	-6.27	56.37
C-21	COMP	0.0	14.5	SP	2.70	2.38	1.83	3.1	2.72	0.15	2.79	0.14	0.56	-2.41	15.04
C-21	A	0.8	1.3	SP	0.90	0.78	1.08		2.75	0.15	2.77	0.15	0.42	-2.79	24.20
C-21	B	7.8	8.3	SP	0.72	0.65	4.60		2.50	0.18	2.59	0.17	0.53	-2.22	13.98
C-21	C	13.8	14.3	SP	3.60	2.59	1.21		3.11	0.12	3.17	0.11	0.36	-2.51	24.68
C-22	COMP	0.0	10.1	SP	2.62	2.34	24.61	23.8	1.78	0.29	2.30	0.20	1.37	-1.16	3.69
C-22	A	0.8	1.3	SP	3.04	2.88	28.46		1.59	0.33	1.93	0.26	1.22	-1.32	4.99
C-22	B	8.8	9.3	SP	2.62	2.34	24.61		1.78	0.29	2.30	0.20	1.37	-1.16	3.69
C-23	COMP	0.0	12.0	SP	0.93	0.86	24.54	21.3	1.71	0.31	2.44	0.18	1.63	-1.47	4.27
C-23	A	0.8	1.3	SP	2.63	2.29	4.98		2.59	0.17	2.75	0.15	0.72	-2.13	8.93
C-23	B	9.8	10.3	SP	0.96	0.89	72.25		-0.37	1.29	-0.34	1.27	2.00	-0.09	1.92
C-24	COMP	0.0	10.0	SP	0.86	0.78	27.78	24.2	1.51	0.35	2.02	0.25	1.60	-1.20	3.79
C-24	A	0.8	1.3	SP	0.79	0.70	8.43		2.42	0.19	2.69	0.15	0.90	-2.03	7.32
C-24	B	8.8	9.3	SP	0.91	0.86	27.01		1.37	0.39	1.67	0.31	1.16	-1.66	6.27
C-25	COMP	0.0	9.0	SP	0.68	0.62	24.85	22.6	1.68	0.31	2.44	0.18	1.61	-1.36	4.08
C-25	A	0.8	1.3	SP	0.64	0.60	2.00		2.61	0.16	2.69	0.15	0.48	-3.15	22.09
C-25	B	6.8	7.3	SP	0.71	0.65	55.68		0.28	0.82	0.50	0.71	1.93	-0.34	2.09

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Core ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #200 Sieve	Percent Passing #230 Sieve	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
C-26	COMP	0.0	9.0	SP	0.76	0.72	31.56	25.0	1.36	0.39	1.72	0.30	1.51	-1.21	4.12
C-26	A	0.8	1.3	SP	0.50	0.48	26.17		1.59	0.33	1.65	0.32	1.08	-0.73	3.52
C-26	B	7.8	8.3	SP	0.69	0.64	26.89		1.49	0.36	2.21	0.22	1.77	-1.45	4.02
C-27	COMP	0.0	13.5	SP	2.53	2.13	0.84	2.6	2.83	0.14	2.85	0.14	0.51	-4.32	41.71
C-27	A	1.8	2.3	SP	1.02	0.92	6.30		2.73	0.15	2.75	0.15	0.37	-0.96	9.08
C-27	B	8.8	9.3	SP	1.47	1.03	4.19		2.64	0.16	2.80	0.14	0.93	-3.62	18.41
C-28	COMP	0.0	8.5	SP	0.96	0.87	18.64	16.5	1.87	0.27	2.47	0.18	1.53	-1.79	5.57
C-28	A	0.8	1.3	SP	1.47	1.44	12.15		2.03	0.24	2.40	0.19	1.28	-2.51	9.19
C-28	B	4.8	5.3	SP	0.55	0.54	21.53		1.63	0.32	2.09	0.23	1.50	-1.65	5.19
C-29	COMP	0.0	14.5	SP	1.13	1.03	21.76	19.2	1.76	0.30	2.41	0.19	1.63	-1.69	4.85
C-29	A	0.8	1.3	SP	0.22	0.18	12.83		2.30	0.20	2.41	0.19	0.68	-2.68	13.60
C-29	B	8.8	9.3	SP	1.17	1.03	14.34		2.19	0.22	2.71	0.15	1.49	-2.20	6.79
C-30	COMP	0.0	15.1	SP	1.11	1.06	25.84	22.6	1.64	0.32	2.33	0.20	1.59	-1.34	3.84
C-30	A	0.8	1.3	SP	0.77	0.77	10.80		2.07	0.24	2.29	0.20	0.87	-1.88	6.79
C-30	B	8.8	9.3	SP	2.80	2.48	11.28		2.47	0.18	2.79	0.14	1.18	-2.57	9.03
C-31	COMP	0.0	17.5	SP	0.89	0.79	17.16	12.9	2.11	0.23	2.61	0.16	1.38	-2.18	7.49
C-31	A	0.8	1.3	SP	0.98	0.97	12.91		2.17	0.22	2.32	0.20	0.76	-1.82	10.56
C-31	B	8.8	9.3	SP	1.56	1.45	18.24		1.98	0.25	2.67	0.16	1.65	-1.80	5.24
C-31	C	12.8	13.3	SP	1.09	1.04	7.27		2.53	0.17	2.64	0.16	0.62	-4.19	32.01
C-32	COMP	0.0	10.5	SP	1.10	0.97	24.68	22.6	1.66	0.32	2.51	0.18	1.70	-1.33	3.94
C-32	A	0.8	1.3	SP	1.65	1.54	2.42		2.63	0.16	2.73	0.15	0.60	-4.00	30.56
C-32	B	8.3	8.8	SP	0.85	0.80	52.30		0.44	0.74	0.76	0.59	2.09	-0.34	1.79
C-33	COMP	0.0	12.5	SP	1.63	1.38	2.33	2.5	2.72	0.15	2.76	0.15	0.48	-2.24	16.11
C-33	A	0.8	1.3	SP	1.03	0.99	0.85		2.68	0.16	2.72	0.15	0.38	-2.23	20.95
C-33	B	9.8	10.3	SP	1.48	1.18	5.83		2.68	0.16	2.86	0.14	1.01	-3.91	20.21
C-34	COMP	0.0	12.0	SP	2.87	2.74	4.75	3.1	2.60	0.16	2.72	0.15	0.58	-2.84	15.31
C-34	A	0.8	1.3	SP	1.27	1.16	2.31		2.60	0.16	2.69	0.15	0.51	-3.89	28.97
C-34	B	10.8	11.3	SP	0.35	0.29	30.00		1.36	0.39	1.35	0.39	1.24	-0.67	3.66

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Table 2
Grain Size Data Summary
Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Core ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #200 Sieve	Percent Passing #230 Sieve	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
C-35	COMP	0.0	12.0	SP	1.52	1.46	27.10	23.3	1.55	0.34	2.08	0.24	1.47	-1.31	4.04
C-35	A	0.8	1.3	SP	4.68	4.67	3.87		2.30	0.20	2.49	0.18	0.77	-3.53	21.00
C-35	B	10.3	10.8	SP	1.74	1.70	52.78		0.50	0.71	0.67	0.63	1.75	-0.39	2.30
C-36	COMP	0.0	19.0	SP	1.13	1.02	9.38	9.4	2.26	0.21	2.59	0.17	1.08	-2.43	9.39
C-36	A	0.8	1.3	SP	0.75	0.69	4.04		2.41	0.19	2.54	0.17	0.62	-2.24	11.63
C-36	B	6.8	7.3	SP	1.48	1.09	9.01		2.60	0.16	2.86	0.14	1.15	-3.05	12.48
C-36	C	17.8	18.3	SP	0.76	0.72	2.20		2.49	0.18	2.51	0.18	0.38	-1.83	20.96
C-37	COMP	0.0	16.2	SP	1.23	1.14	5.99	7.2	2.37	0.19	2.63	0.16	0.94	-2.85	12.91
C-37	A	0.8	1.3	SP	0.88	0.81	1.55		2.61	0.16	2.67	0.16	0.40	-3.76	36.78
C-37	B	7.8	8.3	SP	1.89	1.73	26.62		1.53	0.35	2.25	0.21	1.67	-1.19	3.52
C-37	C	13.8	14.3	SP	1.97	1.77	0.40		2.72	0.15	2.74	0.15	0.32	-1.24	15.06
C-38	COMP	0.0	17.2	SP	2.15	2.06	10.35	10.4	2.21	0.22	2.63	0.16	1.31	-2.65	9.75
C-38	A	0.8	1.3	SP	0.91	0.87	3.83		2.54	0.17	2.66	0.16	0.60	-3.32	20.19
C-38	B	8.3	8.8	SP	1.17	1.10	25.74		1.03	0.49	1.94	0.26	1.98	-0.66	2.15
C-38	C	13.8	14.3	SP	2.54	2.38	2.52		2.43	0.19	2.60	0.16	0.74	-3.24	17.49
C-39	COMP	0.0	17.8	SP	1.39	1.24	20.36	21.3	1.80	0.29	2.60	0.16	1.73	-1.50	4.18
C-39	A	0.8	1.3	SP	1.17	1.07	4.62		2.54	0.17	2.73	0.15	0.80	-2.96	13.84
C-39	B	7.8	8.3	SP	2.87	1.85	0.35		3.03	0.12	3.07	0.12	0.37	-1.93	17.56
C-39	C	15.8	16.3	SP	1.37	1.26	1.77		2.60	0.16	2.67	0.16	0.48	-2.57	21.02
C-40	COMP	0.0	15.0	SP	1.72	1.57	17.78	17.0	2.00	0.25	2.58	0.17	1.37	-1.60	4.84
C-40	A	0.8	1.3	SP	1.15	1.09	2.75		2.53	0.17	2.68	0.16	0.65	-3.28	20.05
C-40	B	8.8	9.3	SP	1.70	1.25	8.43		2.38	0.19	2.71	0.15	1.20	-2.49	9.65
C-40	C	12.3	12.8	SP	1.18	1.16	27.20		1.53	0.35	2.30	0.20	1.82	-1.54	4.15
C-41	COMP	0.0	12.5	SP	1.48	1.39	33.26	30.0	1.39	0.38	2.13	0.23	1.76	-1.00	2.98
C-41	A	0.8	1.3	SP	0.99	0.93	4.30		2.54	0.17	2.70	0.15	0.68	-2.78	12.97
C-41	B	8.8	9.3	SP	1.24	1.20	55.19		0.44	0.74	0.73	0.60	1.69	-0.43	2.31
C-42	COMP	0.0	10.5	SP	1.08	1.04	12.23	10.9	2.11	0.23	2.51	0.18	1.15	-2.13	7.29
C-42	A	0.8	1.3	SP	0.47	0.47	1.04		2.60	0.16	2.65	0.16	0.35	-1.86	15.47
C-42	B	8.8	9.3	SP	1.82	1.71	45.75		0.70	0.62	1.16	0.45	2.00	-0.47	1.98

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Olsen Associates, Inc.
Nassau Sound (Amelia Island), Florida
2016 - 2017

Core ID	Sample ID	Top of Sample Interval (ft bss)	Bottom of Sample Interval (ft bss)	USCS Classification	Percent Passing #200 Sieve	Percent Passing #230 Sieve	Percent Shell Fragments[1]	Percent Carbonate[2]	Mean Size (phi)	Mean Size (mm)	Median Size (phi)	Median Size (mm)	Sorting	Skewness	Kurtosis
C-43	COMP	0.0	16.0	SP	1.15	1.09	18.16	17.0	1.86	0.28	2.48	0.18	1.53	-1.76	5.14
C-43	A	0.8	1.3	SP	0.95	0.88	1.09		2.64	0.16	2.71	0.15	0.50	-3.18	22.86
C-43	B	7.8	8.3	SP	0.63	0.63	4.22		2.15	0.23	2.24	0.21	0.70	-3.16	19.08
C-43	C	13.8	14.3	SP	1.17	1.08	0.07		2.71	0.15	2.75	0.15	0.51	-4.47	37.54
C-44	COMP	0.0	16.1	SP	2.36	2.16	4.56	6.0	2.47	0.18	2.69	0.15	0.91	-3.31	16.78
C-44	A	0.8	1.3	SP	0.97	0.91	5.15		2.58	0.17	2.67	0.16	0.54	-3.22	22.51
C-44	B	7.8	8.3	SP	1.00	0.84	0.36		2.81	0.14	2.80	0.14	0.34	-5.17	91.99
C-44	C	12.8	13.3	SP	1.06	1.01	1.67		2.50	0.18	2.58	0.17	0.58	-5.48	52.98
C-45	COMP	0.0	13.0	SP	2.46	2.08	2.62	3.9	2.66	0.16	2.75	0.15	0.65	-3.41	21.00
C-45	A	0.8	1.3	SP	4.06	3.58	0.41		2.86	0.14	2.89	0.13	0.47	-3.22	25.83
C-45	B	9.8	10.3	SP	0.86	0.85	0.44		2.65	0.16	2.69	0.15	0.30	-2.74	32.56
C-46	COMP	0.0	12.0	SP	1.45	1.40	17.08	15.9	1.92	0.26	2.51	0.18	1.49	-1.93	6.06
C-46	A	0.8	1.3	SP	0.86	0.78	3.30		2.57	0.17	2.69	0.15	0.61	-2.68	14.15
C-46	B	9.8	10.3	SP	1.35	1.29	10.01		2.20	0.22	2.55	0.17	1.17	-2.71	10.56
C-47	COMP	0.0	8.5	SP	1.22	1.14	13.13	13.1	2.07	0.24	2.62	0.16	1.59	-2.51	8.76
C-47	A	0.8	1.3	SP	1.11	0.99	1.10		2.71	0.15	2.75	0.15	0.43	-3.71	32.34
C-47	B	6.8	7.3	SP	3.04	2.85	8.42		2.61	0.16	2.76	0.15	0.78	-3.78	20.50
C-48	COMP	0.0	14.0	SP	1.64	1.53	30.32	24.1	1.68	0.31	2.46	0.18	1.57	-1.22	3.57
C-48	A	0.8	1.3	SP	0.95	0.87	6.05		2.54	0.17	2.69	0.15	0.65	-1.80	7.36
C-48	B	6.8	7.3	SP	2.15	2.03	57.60		0.17	0.89	0.55	0.68	1.94	-0.38	2.04
C-48	C	13.3	13.8	SP	1.51	1.37	0.25		2.77	0.15	2.77	0.15	0.29	-0.39	9.52
C-49	COMP	0.0	13.5	SP	1.36	1.27	3.38	4.1	2.56	0.17	2.70	0.15	0.70	-3.83	22.17
C-49	A	0.8	1.3	SP	1.05	1.02	1.98		2.46	0.18	2.58	0.17	0.52	-2.64	16.11
C-49	B	10.8	11.3	SP	1.10	0.96	1.83		2.69	0.15	2.74	0.15	0.53	-4.81	44.21

Notes

[1] = Percent shell fragments determined visually using the Terry and Chilingar method (1955).

[2] = Percent carbonate determined using the Twenhofel and Tyler (1941) acid digestion method.

ft bss = feet below sediment surface

USCS = Unified Soil Classification System

mm = millimeters

NR = Not recorded during laboratory analysis; refer to analyzed percent carbonate content for additional information.

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Appendix A:
Core Logs, Photographs, Sieve Analysis Curves, and Grain Size Data

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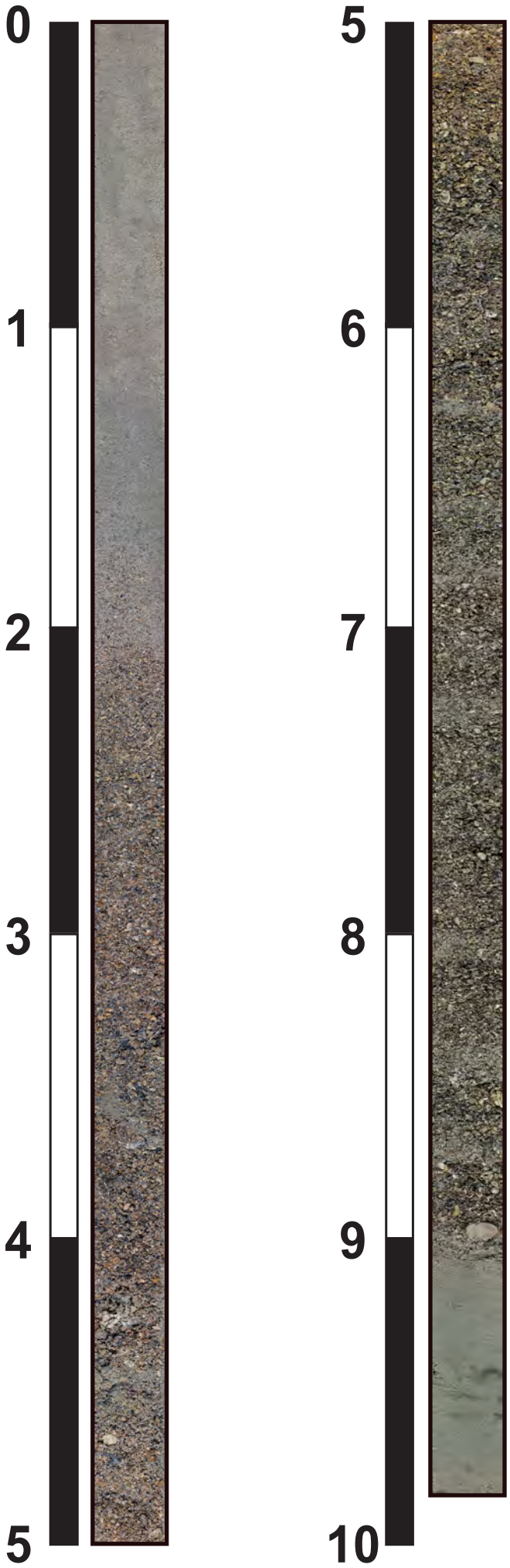

Nassau Sound
Florida
2016 - 2017

C-01

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-01

DRILLING LOG

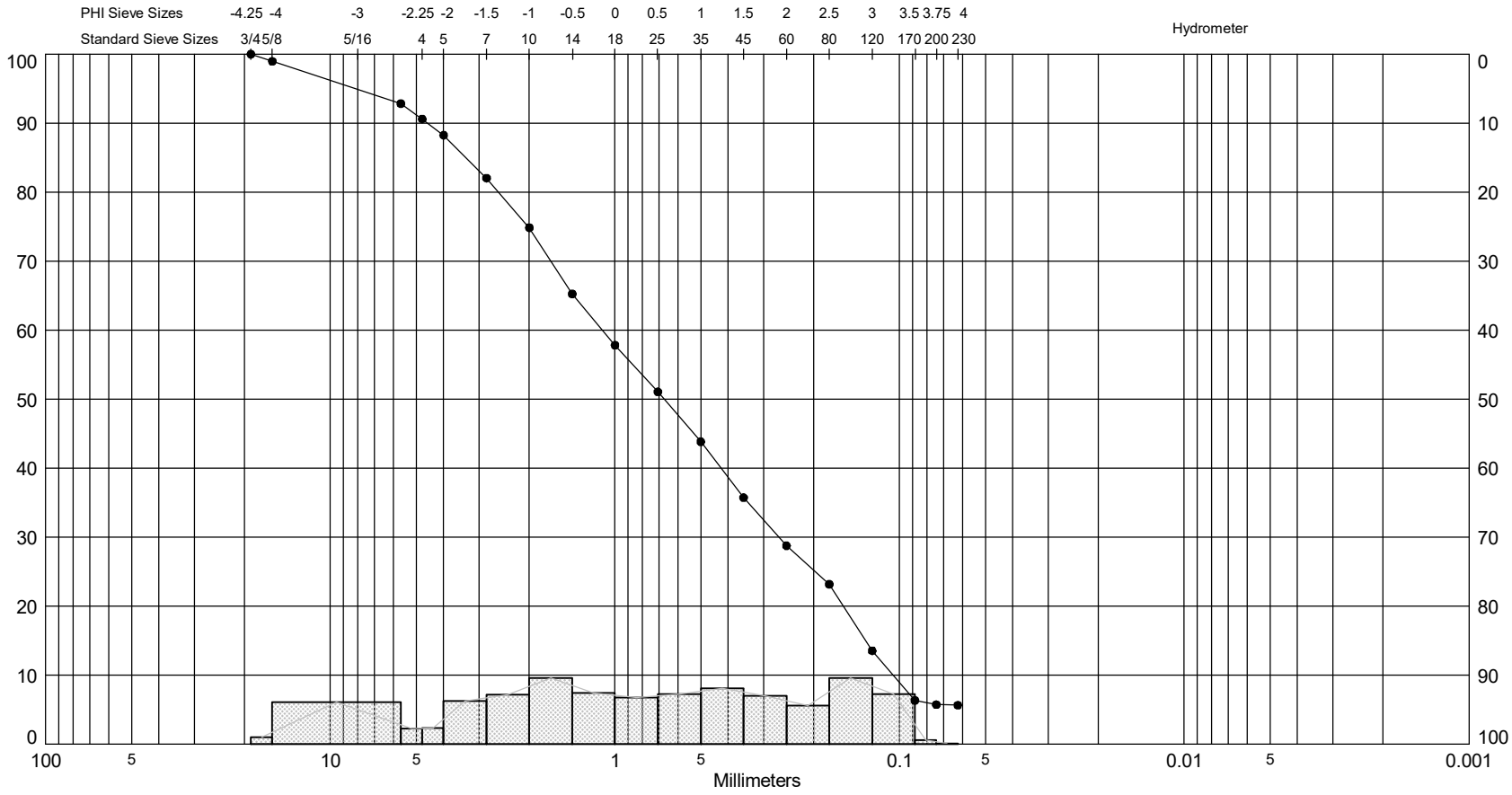
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-01
LOCATION COORDINATES	X = 524,294 Y = 2,249,289
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	19.5 Ft.
15. DATE BORING	STARTED: 03-18-17 11:46 / COMPLETED: 03-18-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-19.6 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	9.8 Ft.
8. TOTAL DEPTH OF BORING	11.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-19.6	0.0					
			Fine quartz SAND, trace fine sand-size shell fragments, poorly graded, loose, subangular, grain size and shell percentage increases slightly at 1.7', light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.15, Phi Sorting: 0.51 Shell: 3%, Fines (#200) - 1.70 (SP)
-21.7	2.1					
			Fine gravel-size SHELL, some medium quartz sand, poorly graded, subangular, very loose, 5.5' = color grades from grayish brown (2.5Y 5/2) to, gray (5Y-5/1), (GP).		COMP	Sample #COMP, Depth = 0.0' - 9.5' Mean (mm): 0.80, Phi Sorting: 1.94 Shell: 54%, Carbonate: 49.1%, Fines (#200) - 5.71 (SP-SM)
					B	Sample #B, Depth = 5.3' - 5.8' Mean (mm): 1.17, Phi Sorting: 1.85 Shell: 69%, Fines (#200) - 1.76 (SP)
-28.6	9.0					
			Fine quartz SAND, trace silt in burrows, poorly graded, loose, subangular, gray (5Y-6/1), (SP).			
-29.4	9.8					
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-01 #COMP	—●—	-19.6	SP-SM	#200 - 5.71 #230 - 5.63		49.10	0.57	0.33	-0.2	2.11	1.94

Comments: Sample Interval = 0 - 9.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	524,294
Northing (Y, ft):	2,249,289
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

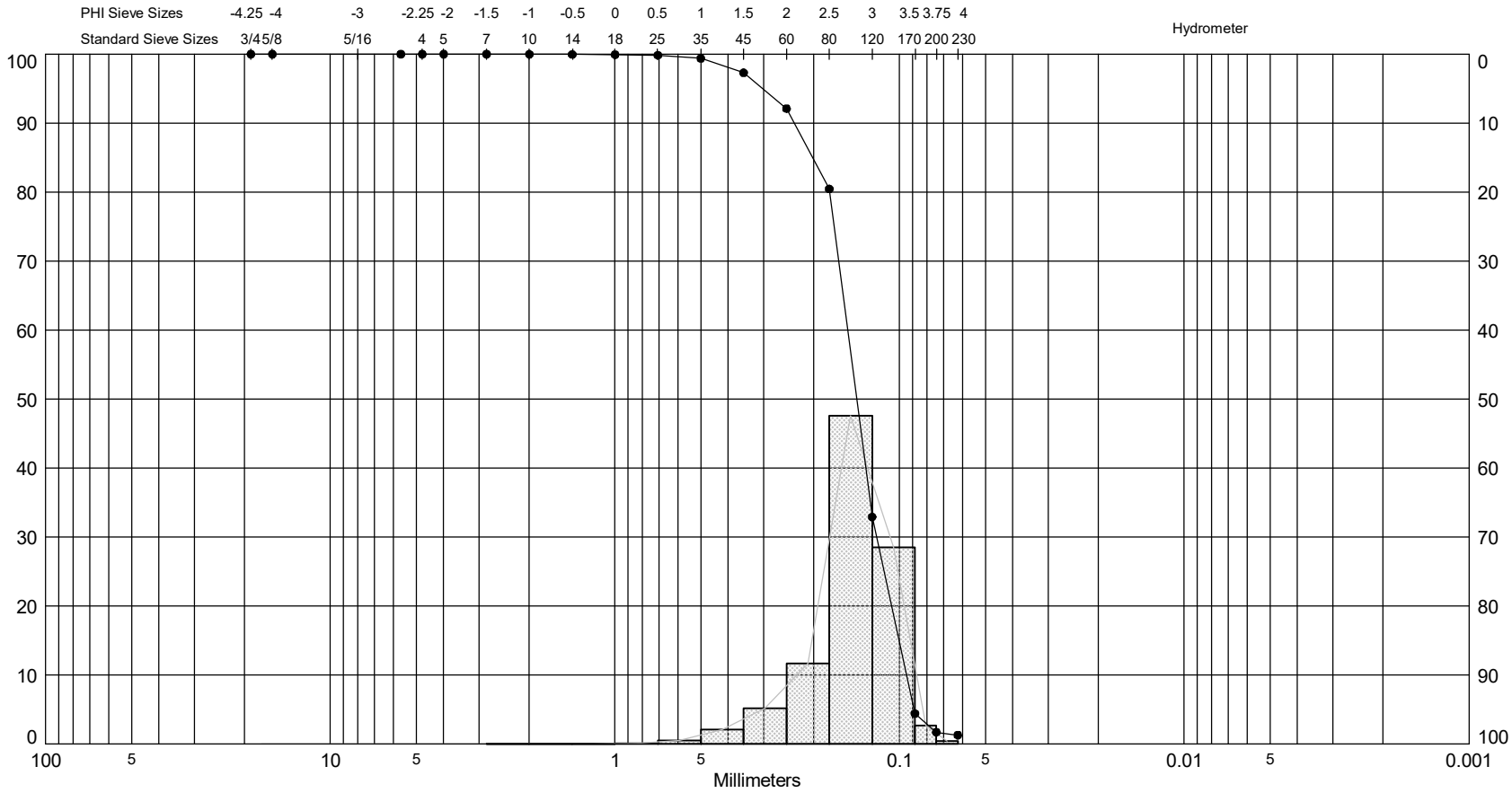
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-9.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-01**		
Sample No.:	**Comp**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP-SM) 5Y 6/1**		

Tare Weight, (g):	49.55	
Dry Wt. Before Washing (g):	177.00	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	1.32	98.96	0	0.00
#3.5	5.600	7.80	92.84	100	7.80
#4	4.750	2.83	90.62	100	2.83
#5	4.000	3.00	88.27	100	3.00
#7	2.800	7.94	82.04	100	7.94
#10	2.000	9.15	74.86	100	9.15
#14	1.400	12.25	65.25	100	12.25
#18	1.000	9.48	57.81	100	9.48
#25	0.710	8.62	51.05	90	7.76
#35	0.500	9.19	43.84	60	5.51
#45	0.355	10.35	35.72	30	3.11
#60	0.250	8.87	28.76	5	0.44
#80	0.180	7.14	23.15	1	0.07
#120	0.125	12.26	13.53	0	0.00
#170	0.090	9.19	6.32	0	0.00
#200	0.075	0.79	5.70	0	0.00
#230	0.063	0.10	5.63	0	0.00
Total Shell Content:		**54**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-01 #A	—●—	-20.4	SP	#200 - 1.70 #230 - 1.28			2.82	2.77	-1.26	6.19	0.51

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	524,294
Northing (Y, ft):	2,249,289
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

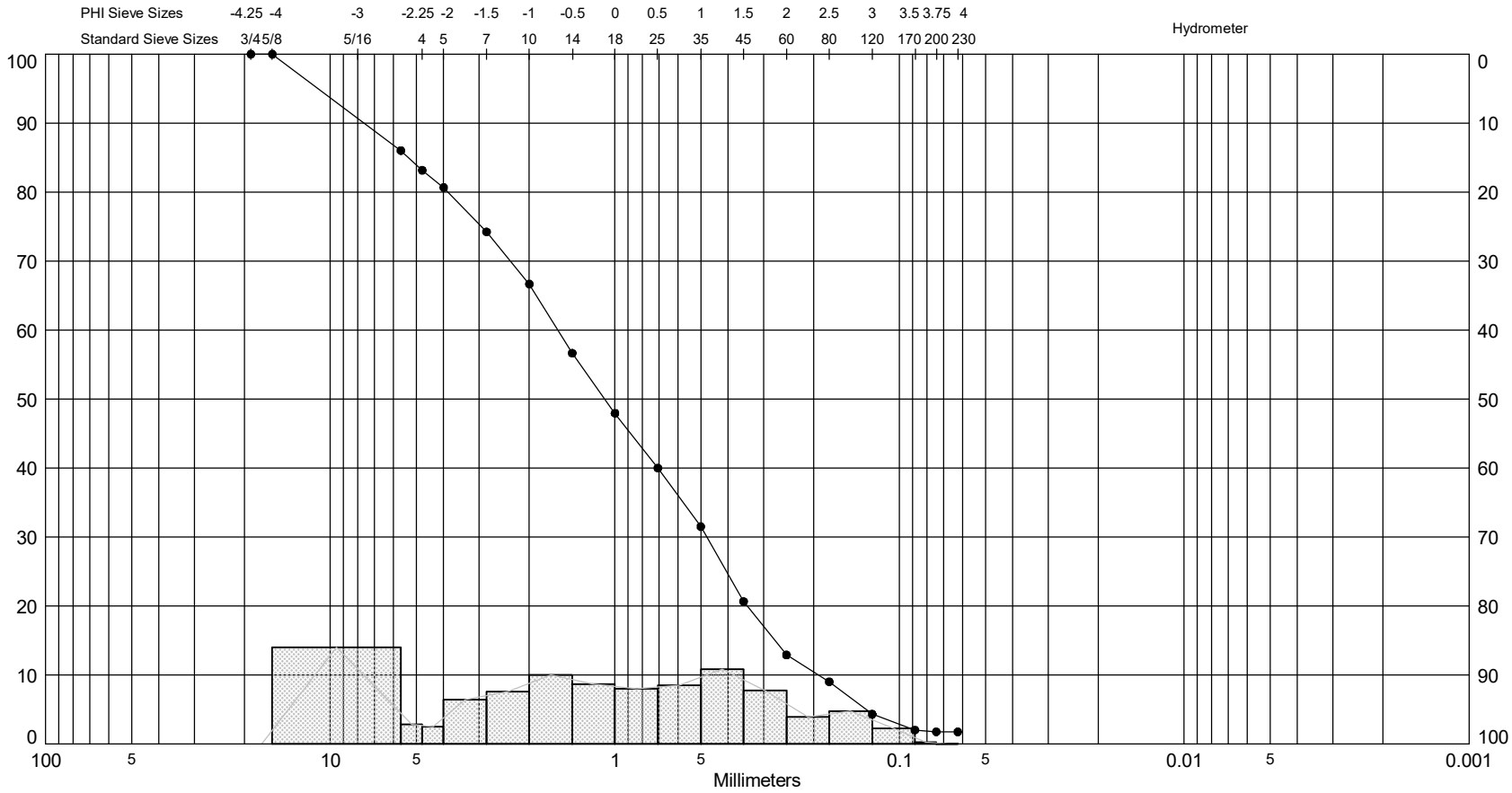
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-01**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.12	
Dry Wt. Before Washing (g):	164.24	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.02	99.98	100	0.02
#14	1.400	0.02	99.96	100	0.02
#18	1.000	0.02	99.95	100	0.02
#25	0.710	0.10	99.86	100	0.10
#35	0.500	0.53	99.40	70	0.37
#45	0.355	2.38	97.31	30	0.71
#60	0.250	5.91	92.13	10	0.59
#80	0.180	13.31	80.47	5	0.67
#120	0.125	54.27	32.91	1	0.54
#170	0.090	32.54	4.40	0	0.00
#200	0.075	3.07	1.71	0	0.00
#230	0.063	0.48	1.29	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-01 #B	—●—	-24.9	SP	#200 - 1.76 #230 - 1.74				-0.23	-0.1	2.08	1.85

Comments: Sample Depth = 5.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	524,294
Northing (Y, ft):	2,249,289
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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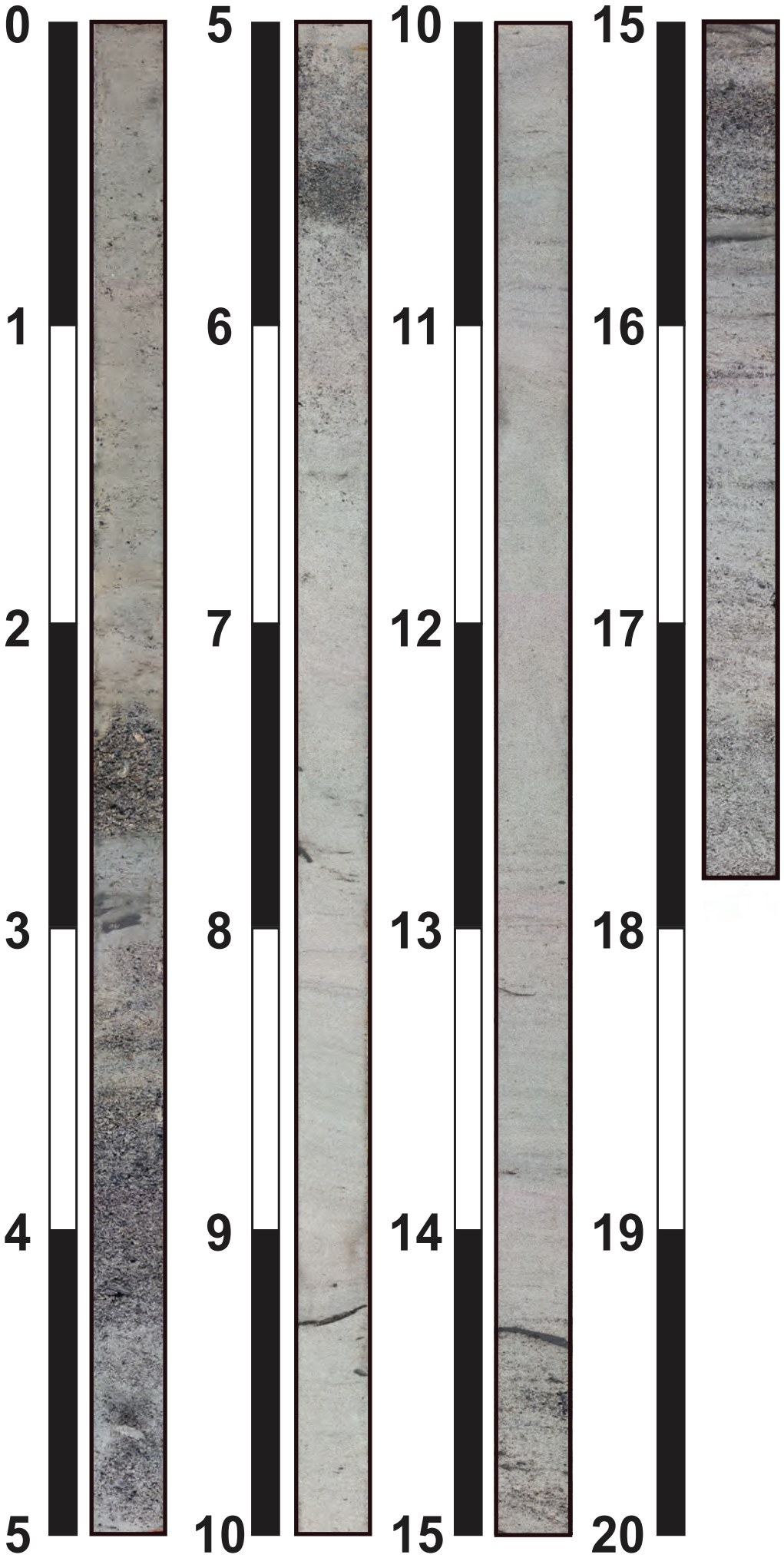
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**5.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-01**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 5Y 6/1**		

Tare Weight, (g):	49.26	
Dry Wt. Before Washing (g):	174.16	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	17.45	86.03	100	17.45
#4	4.750	3.57	83.17	100	3.57
#5	4.000	3.14	80.66	100	3.14
#7	2.800	8.03	74.23	100	8.03
#10	2.000	9.44	66.67	100	9.44
#14	1.400	12.52	56.65	100	12.52
#18	1.000	10.87	47.94	100	10.87
#25	0.710	9.94	39.98	95	9.44
#35	0.500	10.59	31.51	60	6.35
#45	0.355	13.56	20.65	30	4.07
#60	0.250	9.69	12.89	10	0.97
#80	0.180	4.85	9.01	5	0.24
#120	0.125	5.88	4.30	1	0.06
#170	0.090	2.85	2.02	0	0.00
#200	0.075	0.33	1.75	0	0.00
#230	0.063	0.03	1.73	0	0.00
Total Shell Content:		**69**		**%**	



Nassau Sound
Florida
2016 - 2017

C-02

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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(843) 887-3800

Boring Designation C-02

DRILLING LOG

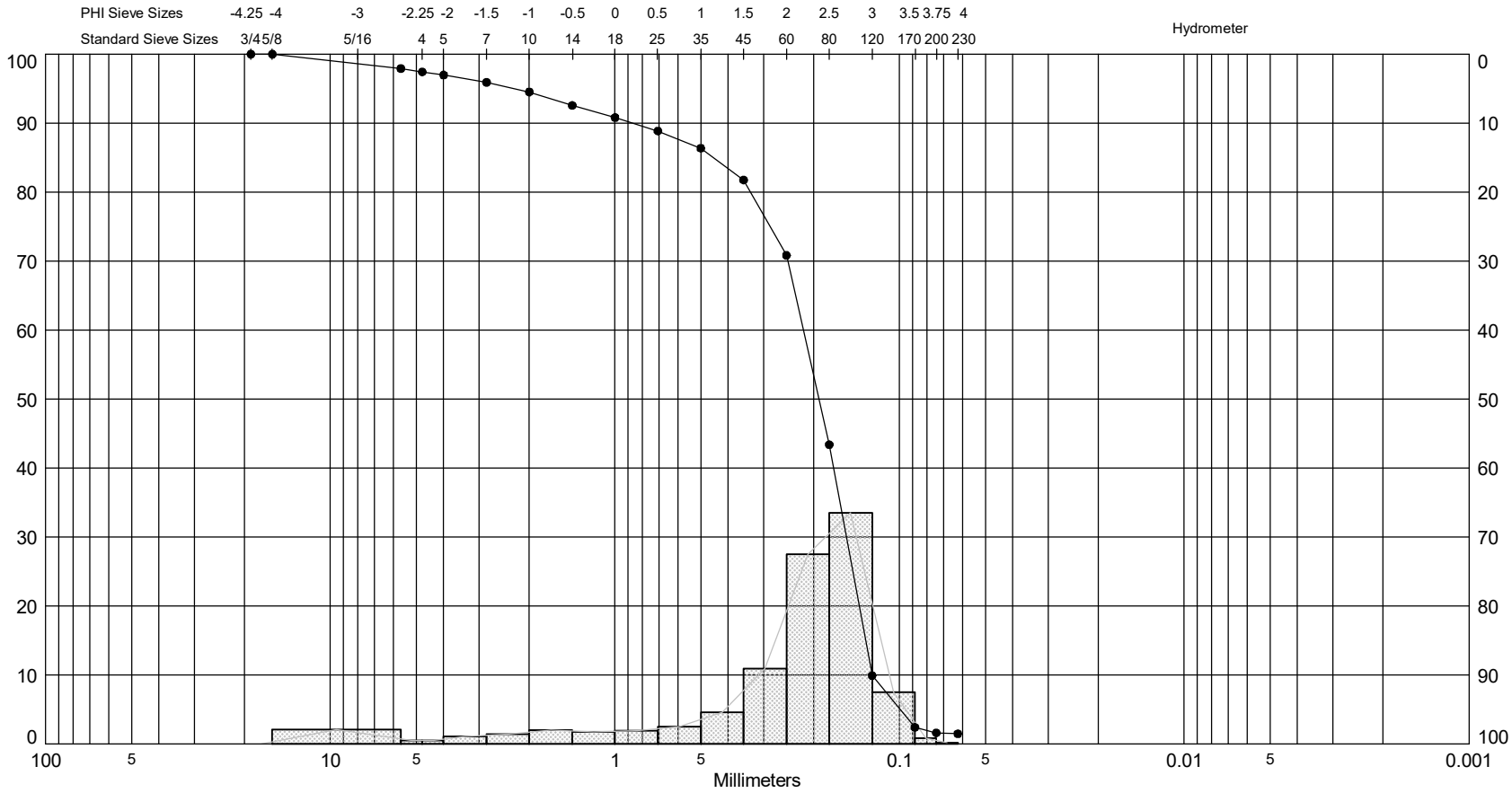
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-02
LOCATION COORDINATES	X = 525,076 Y = 2,249,893
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	20.8 Ft.
15. DATE BORING	STARTED: 02-21-17 12:06 / COMPLETED: 02-21-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-22.5 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	17.8 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-22.5	0.0					
-24.8	2.3		Fine quartz SAND, few fine to medium sand-size shell fragments, trace silt in burrows, poorly graded, subangular, loose, light olive gray (5Y-6/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.14, Phi Sorting: 0.71 Shell: 3%, Fines (#200) - 2.41 (SP)
-25.2	2.7		Medium quartz SAND, some coarse sand-size shell, few coarse quartz sand, well graded, subangular, loose, olive gray (5Y-5/2), (SW).			
-26.8	4.3		Fine to medium quartz SAND, few grading to some coarse sand-size shell fragments, trace silt (between 2.9 and 3.1'), poorly graded, subangular, loose, dark gray (5Y 4/1) to, light olive gray (5Y-6/2), (SP).			
-28.2	5.7		Fine to medium quartz SAND, little medium to coarse sand-size shell fragments, poorly graded, subangular, loose, shell percentage increases to approximately 40% between 5.5 and 5.7', gray (5Y-6/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 17.8' Mean (mm): 0.26, Phi Sorting: 1.34 Shell: 0%, Carbonate: 13.4%, Fines (#200) - 1.60 (SP)
			Fine quartz SAND, few grading to trace (at approximately 6.5') fine to medium sand-size shell fragments, trace silt in burrows and laminations, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.17, Phi Sorting: 0.34 Shell: 0%, Fines (#200) - 0.97 (SP)
-36.8	14.3					
-40.3	17.8		Fine to medium quartz SAND, few fine to medium sand-size shell fragments, trace silt in burrows and laminations, poorly graded, subangular, loose, shell percentage increases to approximately 40% between 15.2 and 15.65', light gray (5Y-7/1), (SP).		C	Sample #C, Depth = 15.8' - 16.3' Mean (mm): 0.23, Phi Sorting: 0.65 Shell: 12%, Fines (#200) - 1.39 (SP)
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-02 #COMP	—●—	-22.5	SP	#200 - 1.60 #230 - 1.46		13.40	2.38	1.97	-2.17	7.73	1.34

Comments: Sample Interval = 0 - 17.8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,076
Northing (Y, ft):	2,249,893
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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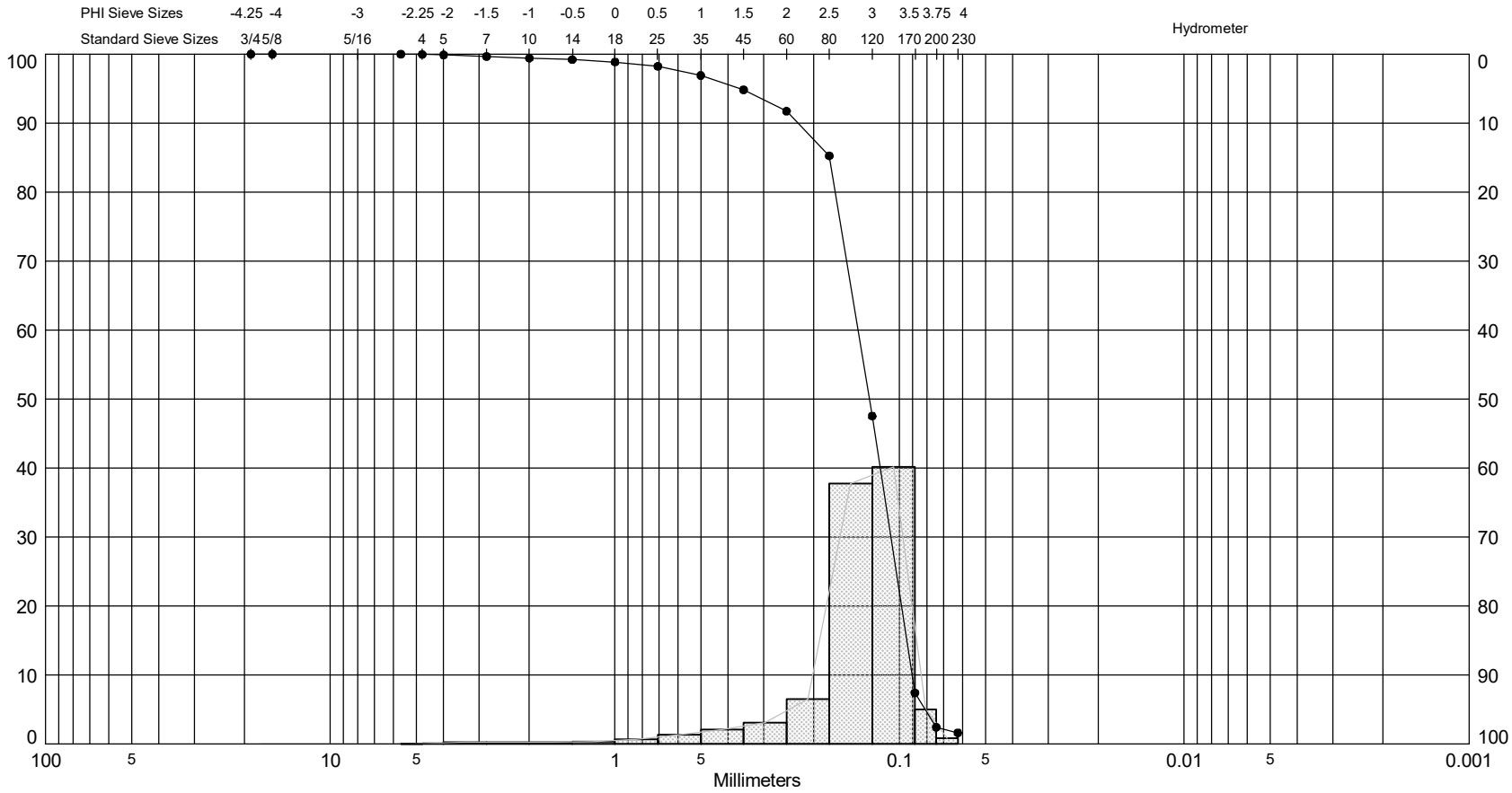
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-17.8'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-02**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.84	
Dry Wt. Before Washing (g):	211.67	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00		0.00
5/8"	16.000	0.00	100.00		0.00
#3.5	5.600	3.37	97.92		0.00
#4	4.750	0.78	97.44		0.00
#5	4.000	0.76	96.97		0.00
#7	2.800	1.71	95.91		0.00
#10	2.000	2.24	94.53		0.00
#14	1.400	3.18	92.56		0.00
#18	1.000	2.85	90.80		0.00
#25	0.710	3.12	88.87		0.00
#35	0.500	4.04	86.37		0.00
#45	0.355	7.44	81.78		0.00
#60	0.250	17.68	70.85		0.00
#80	0.180	44.44	43.39		0.00
#120	0.125	54.18	9.91		0.00
#170	0.090	12.14	2.41		0.00
#200	0.075	1.30	1.61		0.00
#230	0.063	0.23	1.46		0.00
Total Shell Content:		**0**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-02 #A	—●—	-23.3	SP	#200 - 2.41 #230 - 1.61			2.97	2.83	-2.85	14.95	0.71

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,076
Northing (Y, ft):	2,249,893
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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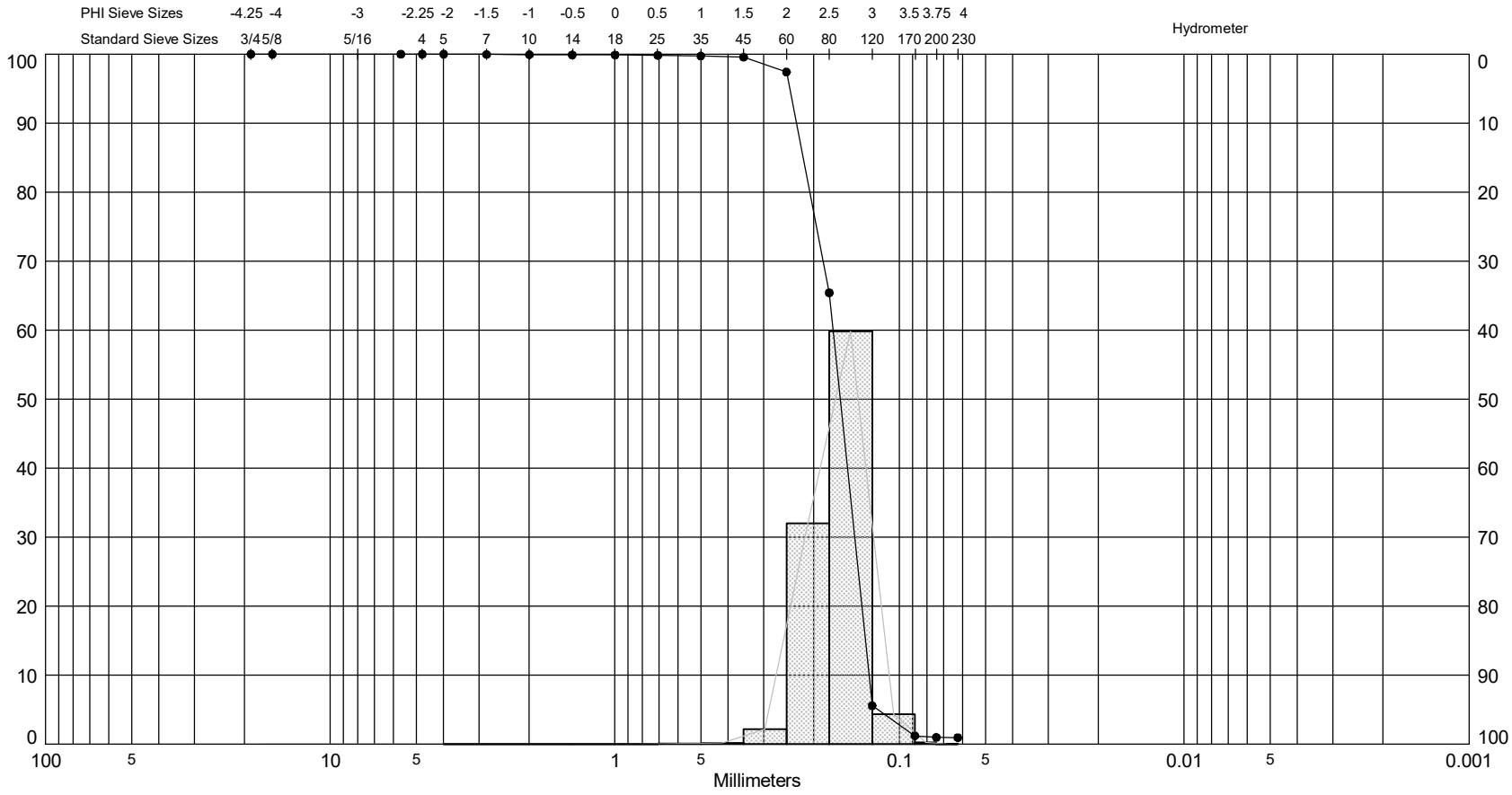
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-02**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	50.02	
Dry Wt. Before Washing (g):	183.53	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.06	99.96	100	0.06
#5	4.000	0.09	99.89	100	0.09
#7	2.800	0.29	99.67	100	0.29
#10	2.000	0.32	99.43	100	0.32
#14	1.400	0.29	99.21	100	0.29
#18	1.000	0.45	98.88	100	0.45
#25	0.710	0.84	98.25	70	0.59
#35	0.500	1.76	96.93	50	0.88
#45	0.355	2.78	94.85	30	0.83
#60	0.250	4.15	91.74	5	0.21
#80	0.180	8.63	85.27	1	0.09
#120	0.125	50.37	47.55	0	0.00
#170	0.090	53.60	7.40	0	0.00
#200	0.075	6.65	2.42	0	0.00
#230	0.063	1.07	1.62	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-02 #B	—●—	-31.3	SP	#200 - 0.97 #230 - 0.94			2.63	2.58	-2.18	23.44	0.34

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,076
Northing (Y, ft):	2,249,893
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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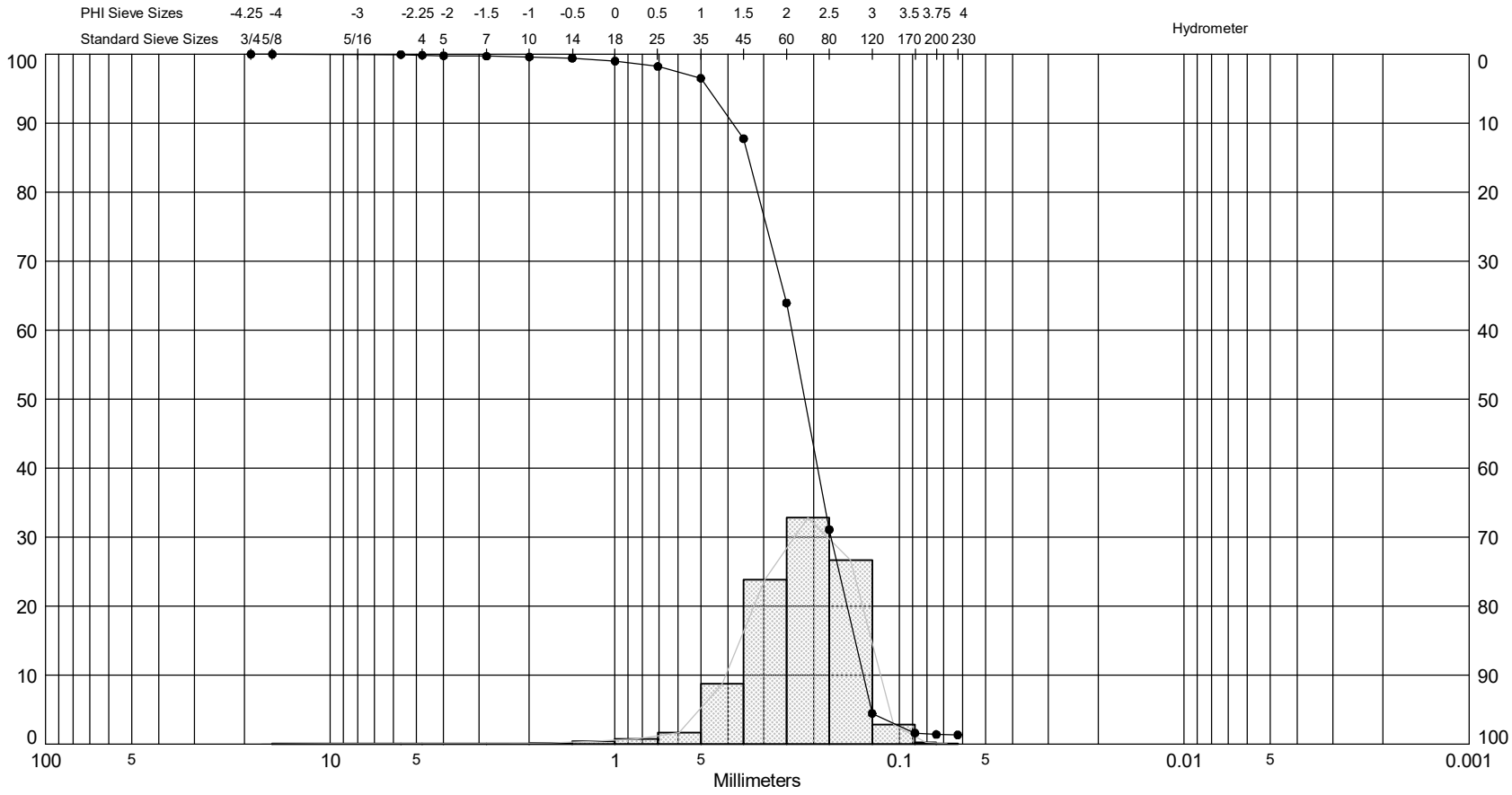
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-02**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.38	
Dry Wt. Before Washing (g):	179.25	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.05	99.96	100	0.05
#10	2.000	0.04	99.93	100	0.04
#14	1.400	0.05	99.89	100	0.05
#18	1.000	0.01	99.88	70	0.01
#25	0.710	0.05	99.84	50	0.03
#35	0.500	0.14	99.74	40	0.06
#45	0.355	0.20	99.58	30	0.06
#60	0.250	2.78	97.42	10	0.28
#80	0.180	41.22	65.44	0	0.00
#120	0.125	77.15	5.57	0	0.00
#170	0.090	5.60	1.23	0	0.00
#200	0.075	0.29	1.00	0	0.00
#230	0.063	0.04	0.97	0	0.00
Total Shell Content:		**0**		**%**	



SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-02 #C	—●—	-38.3	SP	#200 - 1.39 #230 - 1.33			2.21	2.13	-1.69	10.72	0.65

Comments: Sample Depth = 16'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,076
Northing (Y, ft):	2,249,893
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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Jacksonville, Florida 32257
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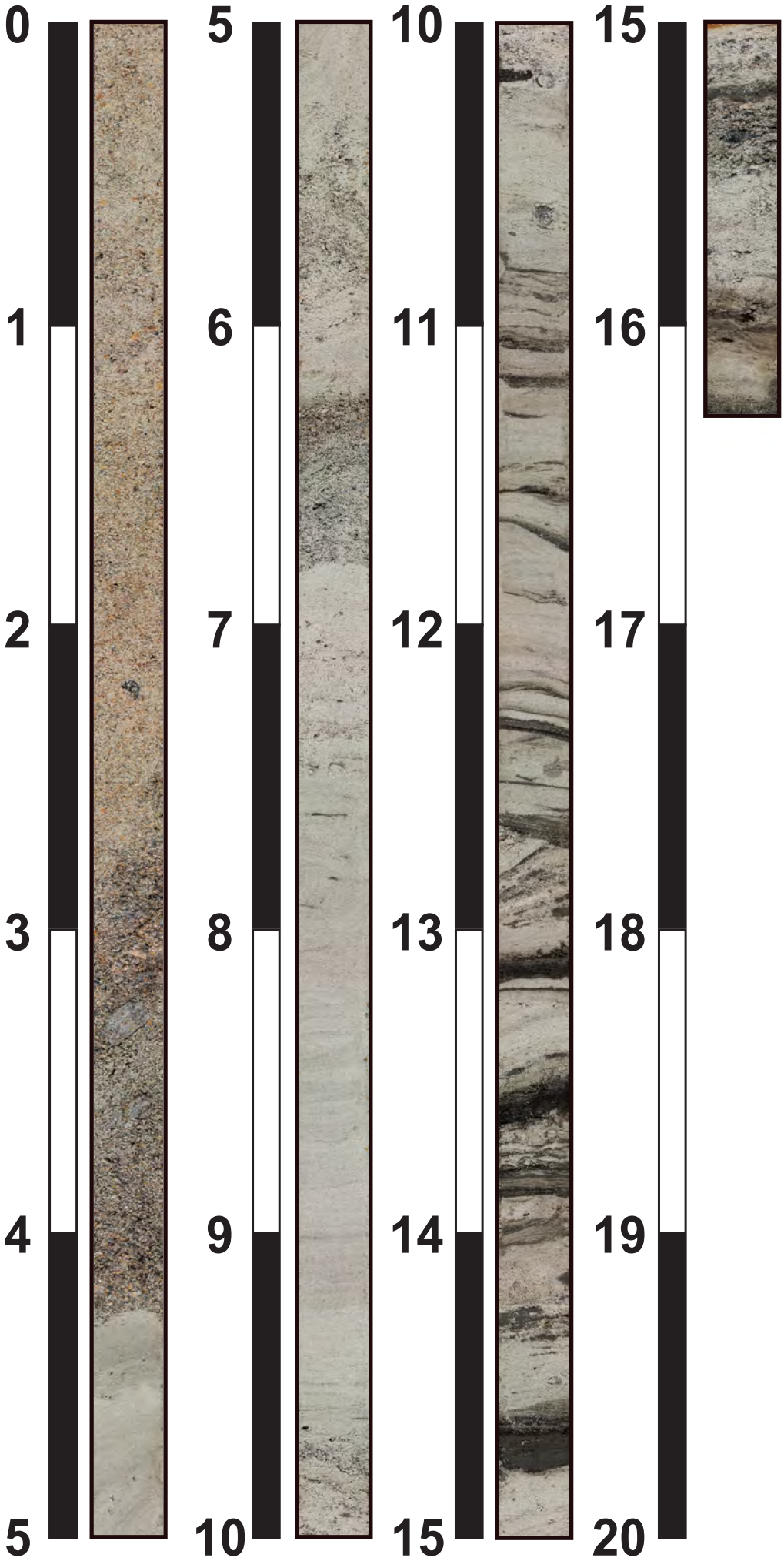
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**16'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-02**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	51.58	
Dry Wt. Before Washing (g):	204.79	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.07	99.95	100	0.07
#4	4.750	0.14	99.86	100	0.14
#5	4.000	0.13	99.78	100	0.13
#7	2.800	0.11	99.71	100	0.11
#10	2.000	0.17	99.60	100	0.17
#14	1.400	0.28	99.41	100	0.28
#18	1.000	0.65	98.99	100	0.65
#25	0.710	1.20	98.21	80	0.96
#35	0.500	2.60	96.51	70	1.82
#45	0.355	13.43	87.74	40	5.37
#60	0.250	36.47	63.94	20	7.29
#80	0.180	50.36	31.07	2	1.01
#120	0.125	40.82	4.43	0	0.00
#170	0.090	4.34	1.59	0	0.00
#200	0.075	0.33	1.38	0	0.00
#230	0.063	0.09	1.32	0	0.00
Total Shell Content:		**12**		**%**	



Nassau Sound
Florida
2016 - 2017

C-03

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
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(843) 887-3800

Boring Designation C-03

DRILLING LOG

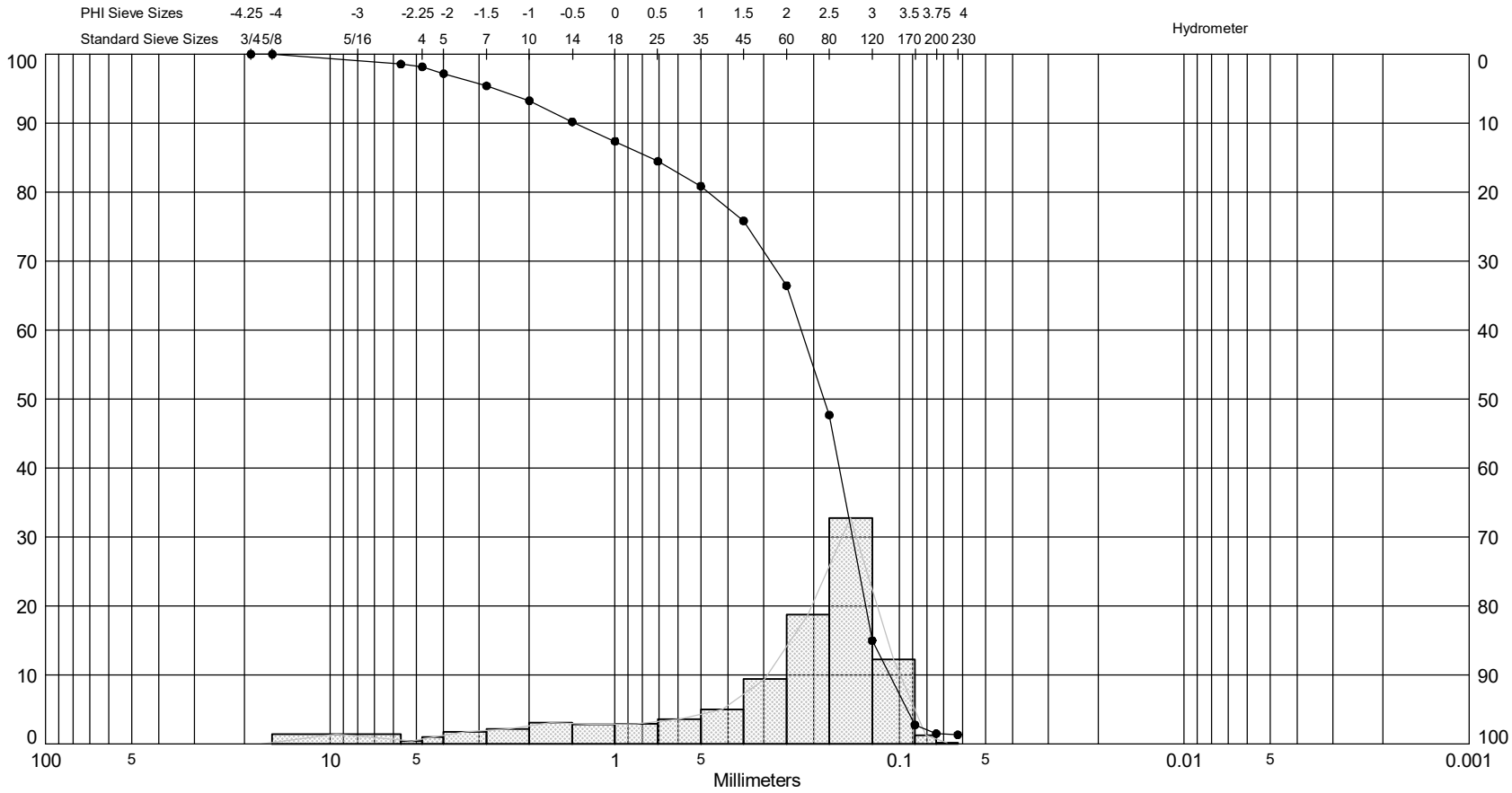
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-03
LOCATION COORDINATES	X = 520,837 Y = 2,246,964
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	5.8 Ft.
15. DATE BORING	STARTED 07-11-16 07:27 / COMPLETED 07-11-16
16. ELEVATION TOP OF BORING	-9.0 Ft.
17. TOTAL RECOVERY FOR BORING	16.3 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-9.0	0.0					
-11.8	2.8		Fine to medium SAND with few shell fragments <1.0cm., light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.41, Phi Sorting: 1.39 Shell: 32%, Fines (#200) - 0.81 (SP)
-13.3	4.3		Fine to Medium SAND with little shell fragments <4.0cm., light gray (5Y-7/1), (SP).			
-14.5	5.5		Fine SAND, clean, bedding present., light greenish gray (10Y-7/1), (SP).			
-15.8	6.8		Fine SAND, few shell fragments <1.0cm increasing downcore., light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 16.3' Mean (mm): 0.27, Phi Sorting: 1.45 Shell: 24%, Carbonate: 17.8%, Fines (#200) - 1.49 (SP)
-18.6	9.6		Fine SAND, trace shell fragments decreasing downcore, bedding present., light greenish gray (10Y-7/1), (SP).		B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.15, Phi Sorting: 0.43 Shell: 3%, Fines (#200) - 1.19 (SP)
-19.2	10.2		Fine to medium SAND, trace shell fragments., light greenish gray (10Y-7/1), (SP).			
-24.2	15.2		Fine SAND with silt in lenses and beds increasing in thickness downcore, bedding present, trace organics., light greenish gray (10Y-7/1), (SP-SC).			
-24.9	15.9		Fine to medium SAND, trace shell fragments decreasing downcore., light greenish gray (10Y-8/1), (SP).			
-25.3	16.3		Fine SAND with silt, wood fragment at top of unit., dark greenish gray (10Y-4/1), (SP-SM).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-03 #COMP	—●—	-9.0	SP	#200 - 1.49 #230 - 1.32		17.80	2.44	1.89	-1.61	5.06	1.45

Comments: Sample Interval = 0 - 16.3'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	520,837
Northing (Y, ft):	2,246,964
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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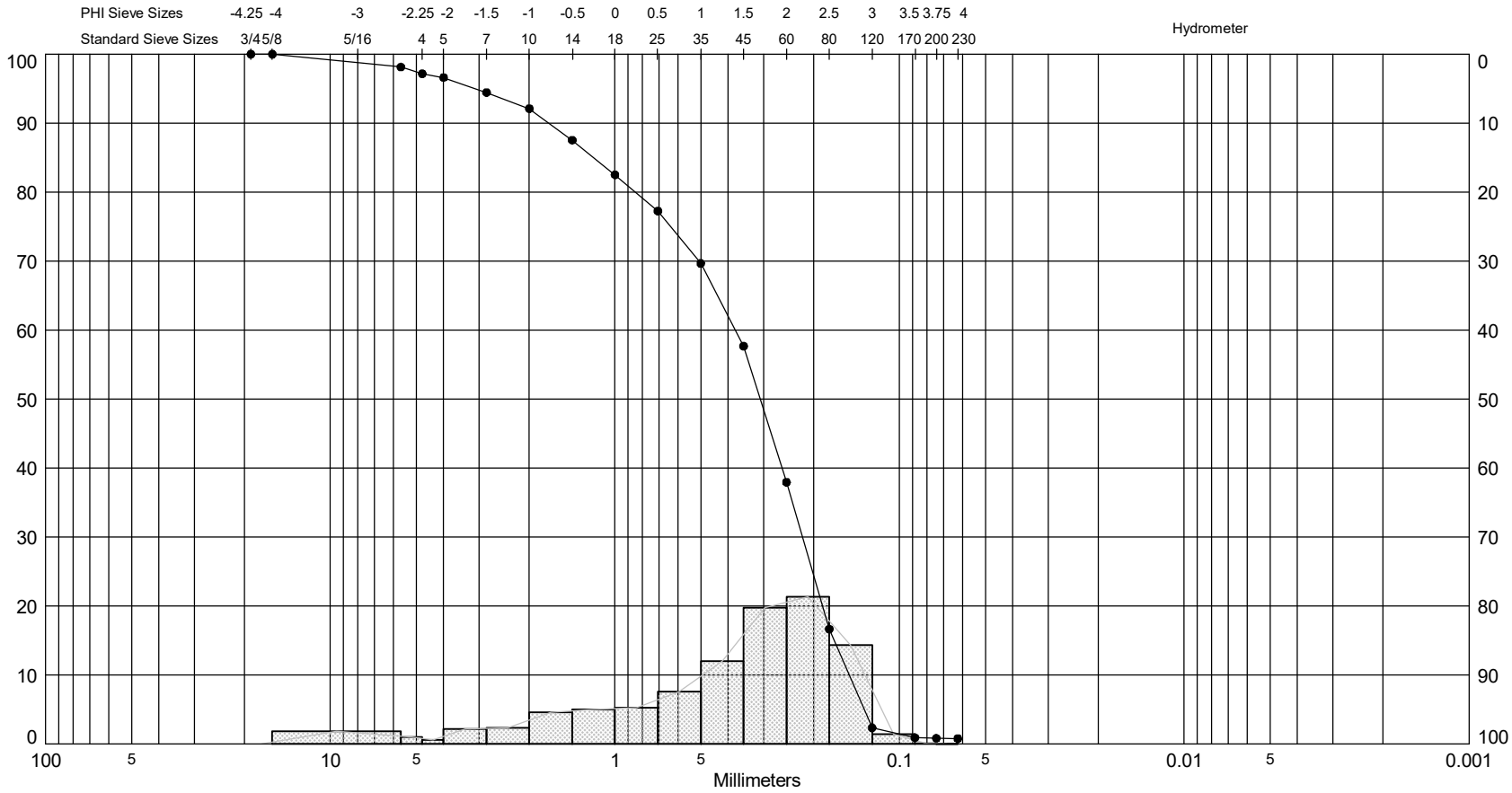
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-16.3'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-03**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.90	
Dry Wt. Before Washing (g):	204.45	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.24	98.55	100	2.24
#4	4.750	0.59	98.17	100	0.59
#5	4.000	1.53	97.18	100	1.53
#7	2.800	2.75	95.40	100	2.75
#10	2.000	3.33	93.24	100	3.33
#14	1.400	4.71	90.20	100	4.71
#18	1.000	4.37	87.37	100	4.37
#25	0.710	4.49	84.46	80	3.59
#35	0.500	5.56	80.87	60	3.34
#45	0.355	7.78	75.83	50	3.89
#60	0.250	14.50	66.45	30	4.35
#80	0.180	29.01	47.68	10	2.90
#120	0.125	50.57	14.96	0	0.00
#170	0.090	18.87	2.75	0	0.00
#200	0.075	1.94	1.49	0	0.00
#230	0.063	0.26	1.33	0	0.00
Total Shell Content:		**24**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-03 #A	—●—	-9.8	SP	#200 - 0.81 #230 - 0.78			1.69	1.29	-1.23	4.15	1.39

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	520,837
Northing (Y, ft):	2,246,964
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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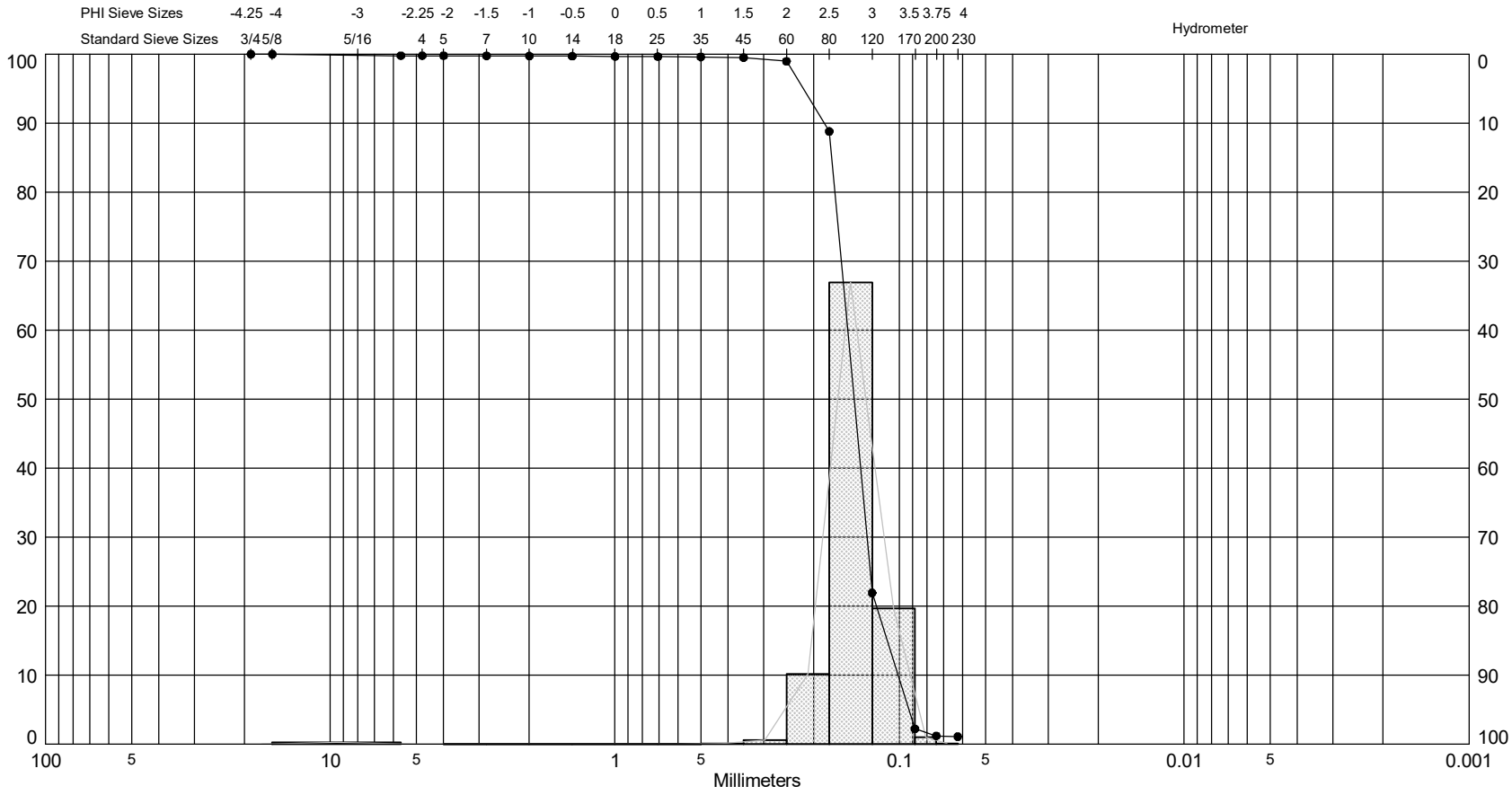
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-03**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.58	
Dry Wt. Before Washing (g):	197.56	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.77	98.13	100	2.77
#4	4.750	1.42	97.17	100	1.42
#5	4.000	0.82	96.61	100	0.82
#7	2.800	3.21	94.45	100	3.21
#10	2.000	3.46	92.11	100	3.46
#14	1.400	6.77	87.53	100	6.77
#18	1.000	7.43	82.51	100	7.43
#25	0.710	7.79	77.25	80	6.23
#35	0.500	11.25	69.64	60	6.75
#45	0.355	17.74	57.66	30	5.32
#60	0.250	29.18	37.94	10	2.92
#80	0.180	31.53	16.63	0	0.00
#120	0.125	21.18	2.32	0	0.00
#170	0.090	2.11	0.89	0	0.00
#200	0.075	0.14	0.80	0	0.00
#230	0.063	0.04	0.77	0	0.00
Total Shell Content:		**32**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-03 #B	—●—	-17.8	SP	#200 - 1.19 #230 - 1.08			2.79	2.78	-6.57	88.53	0.43

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	520,837
Northing (Y, ft):	2,246,964
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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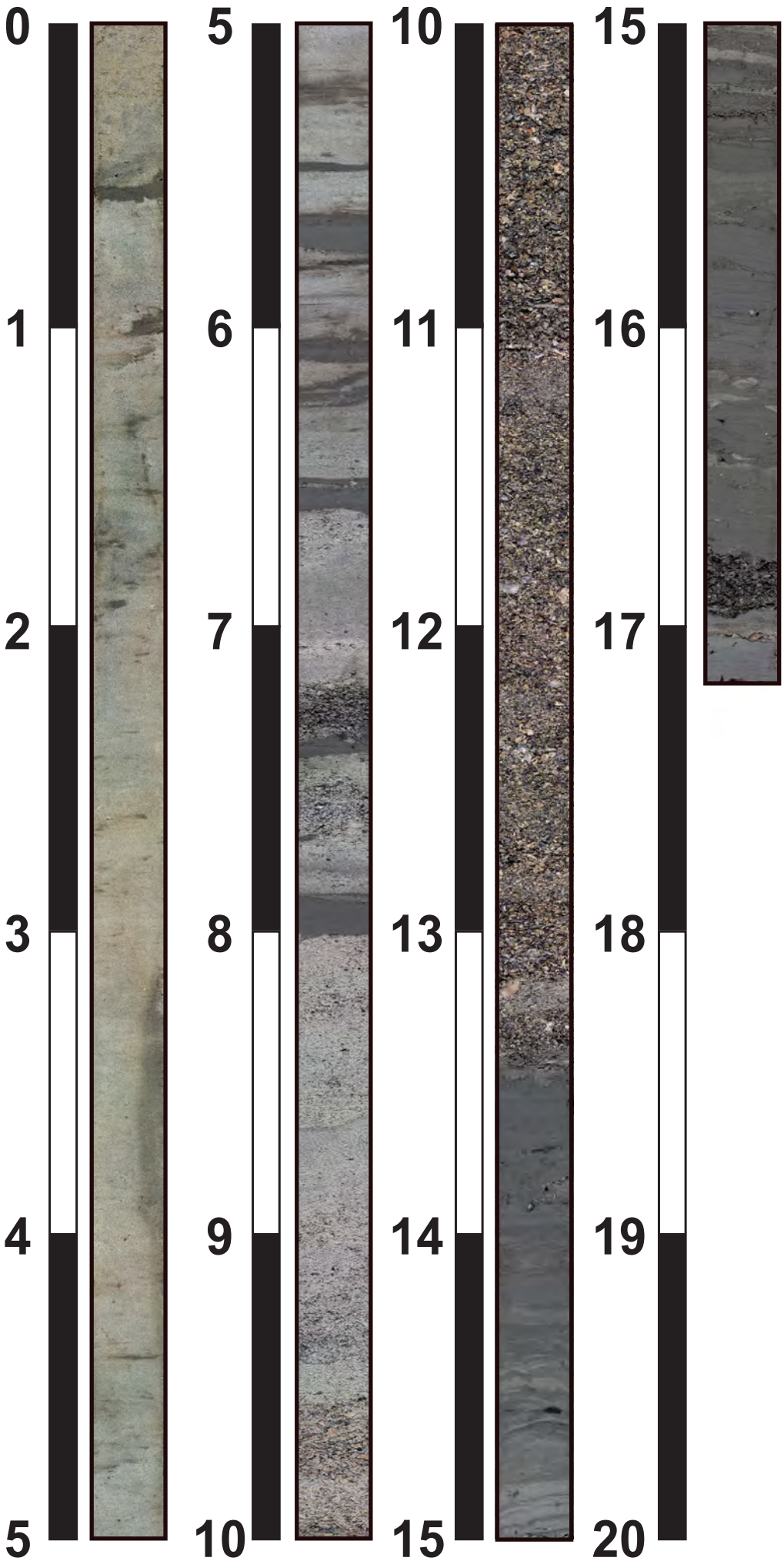
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-03**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.85	
Dry Wt. Before Washing (g):	200.28	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.31	99.79	100	0.31
#4	4.750	0.00	99.79	0	0.00
#5	4.000	0.00	99.79	0	0.00
#7	2.800	0.04	99.77	100	0.04
#10	2.000	0.05	99.73	100	0.05
#14	1.400	0.03	99.71	100	0.03
#18	1.000	0.05	99.68	100	0.05
#25	0.710	0.05	99.65	100	0.05
#35	0.500	0.06	99.61	70	0.04
#45	0.355	0.15	99.51	50	0.08
#60	0.250	0.83	98.96	40	0.33
#80	0.180	15.29	88.79	20	3.06
#120	0.125	100.63	21.90	1	1.01
#170	0.090	29.63	2.20	0	0.00
#200	0.075	1.53	1.18	0	0.00
#230	0.063	0.16	1.08	0	0.00
Total Shell Content:		**3**		**%**	



Nassau Sound
Florida
2016 - 2017

C-04

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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www.athenatechnologies.com
(843) 887-3800

Boring Designation C-04

DRILLING LOG

CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-04
LOCATION COORDINATES	X = 525,101 Y = 2,248,660
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	16.5 Ft.
15. DATE BORING	STARTED 03-18-17 09:22 / COMPLETED 03-18-17
16. ELEVATION TOP OF BORING	-18.9 Ft.
17. TOTAL RECOVERY FOR BORING	17.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-18.9	0.0					
			Fine quartz SAND, trace silt in burrows and laminations, trace fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 1.8' - 2.3' Mean (mm): 0.13, Phi Sorting: 0.35 Shell: 1%, Fines (#200) - 2.12 (SP)
-24.1	5.2					
			Interbedded, fine quartz SAND (SP; light gray [5Y 7/1]) and sandy SILT (ML; dark gray [5Y 4/1]), trace fine to coarse sand-size shell (primarily in layers at 6.7-6.8', 7.2-7.3', and 7.5-7.7'), light gray (5Y-7/1), (SP-SM).		COMP	Sample #COMP, Depth = 0.0' - 13.0' Mean (mm): 0.35, Phi Sorting: 1.99 Shell: 29%, Carbonate: 29.2%, Fines (#200) - 2.97 (SP)
-26.9	8.0					
			Fine to medium quartz SAND, few fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
-28.8	9.9					
			Fine gravel-size SHELL, few medium quartz sand, poorly graded, very loose, subangular, olive gray (5Y-5/2), (GP).			
-30.0	11.1					
			Coarse sand-size SHELL, little medium quartz sand, poorly graded, very loose, subangular, olive gray (5Y-5/2), (SP).		B	Sample #B, Depth = 12.8' - 13.3' Mean (mm): 2.03, Phi Sorting: 1.79 Shell: 83%, Fines (#200) - 1.68 (SP)
-32.3	13.4					
			Interbedded/bioturbated, silty fine quartz SAND (SM; gray [5Y 5/1]) and sandy SILT (ML; dark gray [5Y 4/1]), few fine to coarse sand-size shell (primarily in layers at 13.7-13.9', 15.3' and 16.7-16.9'), trace organic material, gray (5Y-5/1), (SM).			
-36.1	17.2					

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

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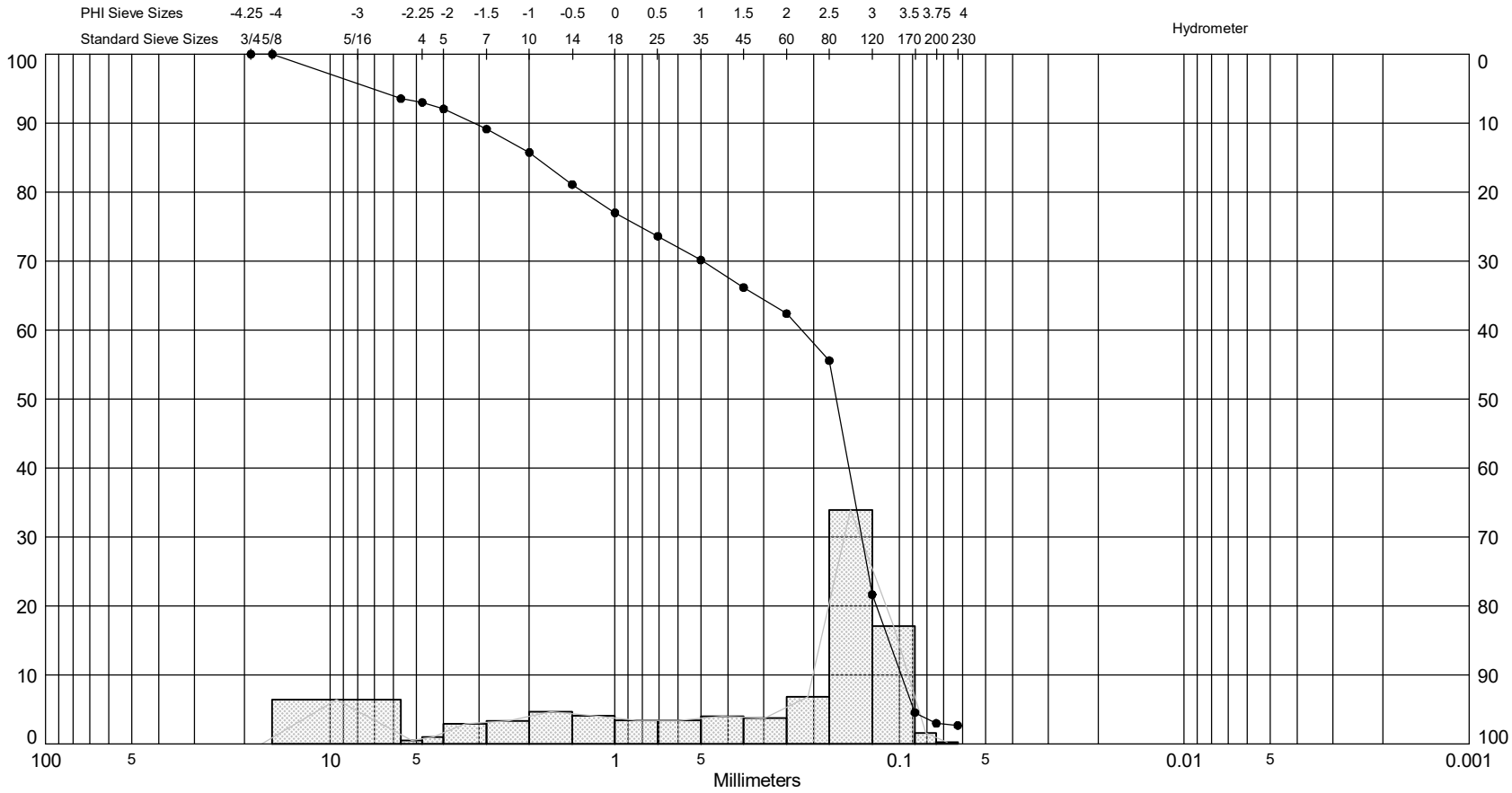
End of Boring



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-04 #COMP	—●—	-18.9	SP	#200 - 2.97 #230 - 2.68		29.20	2.58	1.52	-1.13	3.04	1.99

Comments: Sample Interval = 0 - 13.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,101
Northing (Y, ft):	2,248,660
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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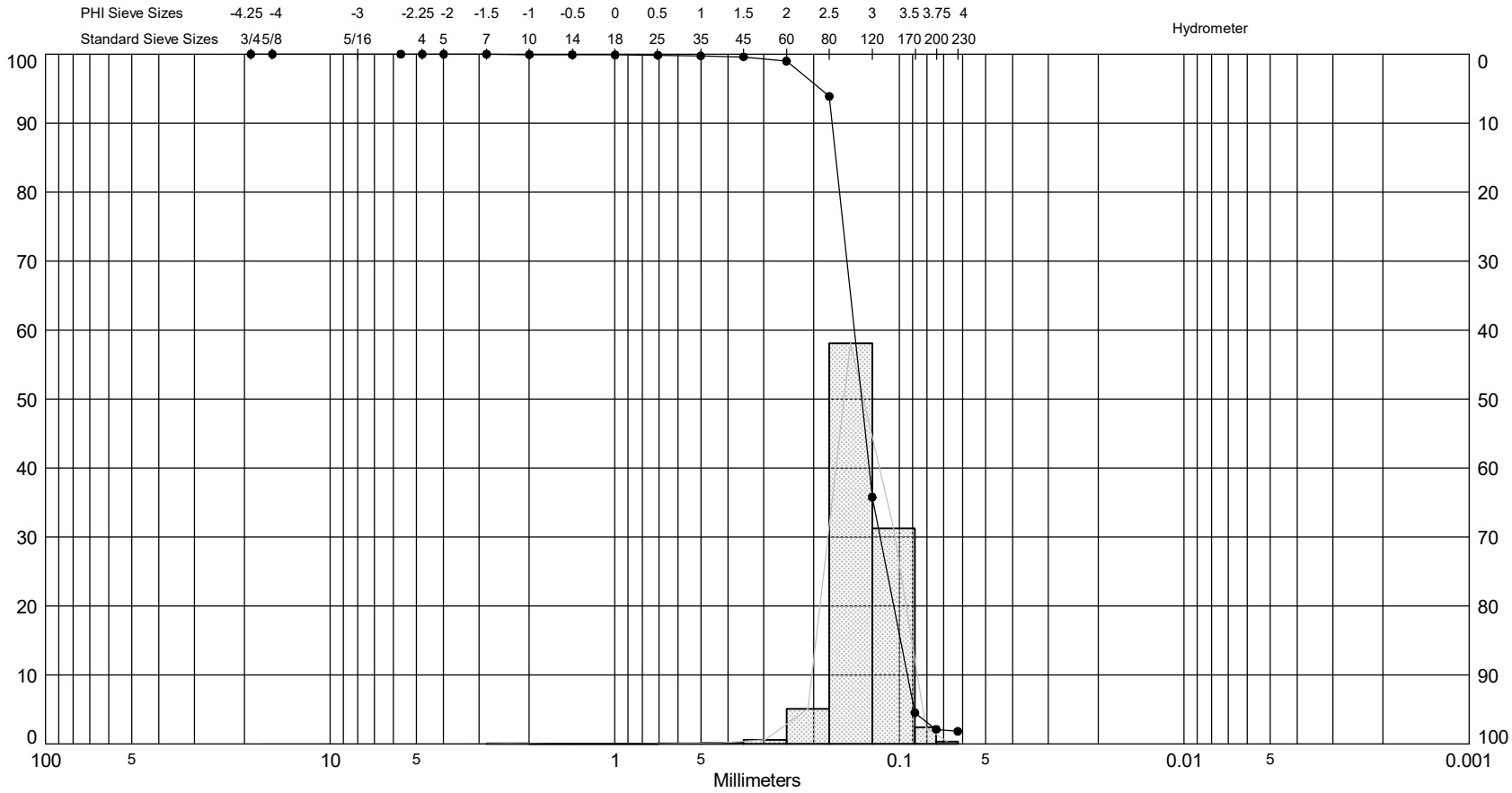
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-13'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-04**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 2.5Y 7/1**		

Tare Weight, (g):	49.17	
Dry Wt. Before Washing (g):	188.43	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	8.98	93.55	100	8.98
#4	4.750	0.75	93.01	100	0.75
#5	4.000	1.33	92.06	100	1.33
#7	2.800	4.06	89.14	100	4.06
#10	2.000	4.69	85.77	100	4.69
#14	1.400	6.48	81.12	100	6.48
#18	1.000	5.73	77.01	98	5.62
#25	0.710	4.73	73.61	80	3.78
#35	0.500	4.81	70.16	60	2.89
#45	0.355	5.54	66.18	30	1.66
#60	0.250	5.28	62.39	10	0.53
#80	0.180	9.48	55.58	1	0.09
#120	0.125	47.25	21.65	0	0.00
#170	0.090	23.81	4.55	0	0.00
#200	0.075	2.19	2.98	0	0.00
#230	0.063	0.40	2.69	0	0.00
Total Shell Content:		**29**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-04 #A	—●—	-20.7	SP	#200 - 2.12 #230 - 1.82			2.88	2.89	-1.82	20.4	0.35

Comments: Sample Depth = 2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,101
Northing (Y, ft):	2,248,660
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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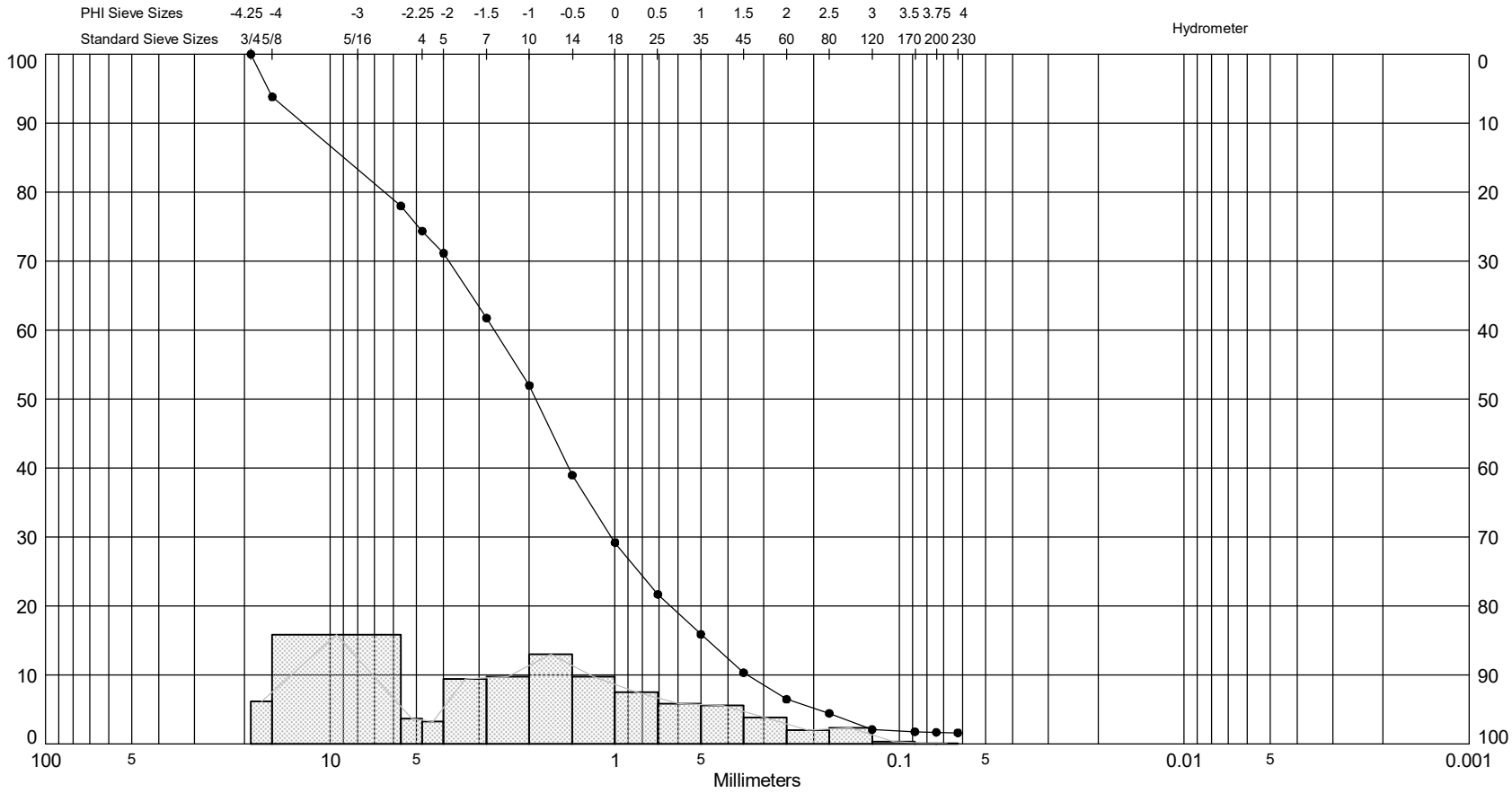
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**2'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-04**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.94	
Dry Wt. Before Washing (g):	168.42	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.07	99.94	100	0.07
#14	1.400	0.02	99.92	100	0.02
#18	1.000	0.03	99.90	100	0.03
#25	0.710	0.04	99.86	100	0.04
#35	0.500	0.11	99.77	100	0.11
#45	0.355	0.18	99.62	90	0.16
#60	0.250	0.73	99.00	40	0.29
#80	0.180	6.01	93.88	5	0.30
#120	0.125	68.26	35.78	1	0.68
#170	0.090	36.71	4.53	0	0.00
#200	0.075	2.83	2.12	0	0.00
#230	0.063	0.35	1.82	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-04 #B	—●—	-31.7	SP	#200 - 1.68 #230 - 1.61				-1.02	0.11	2.33	1.79

Comments: Sample Depth = 13'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,101
Northing (Y, ft):	2,248,660
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

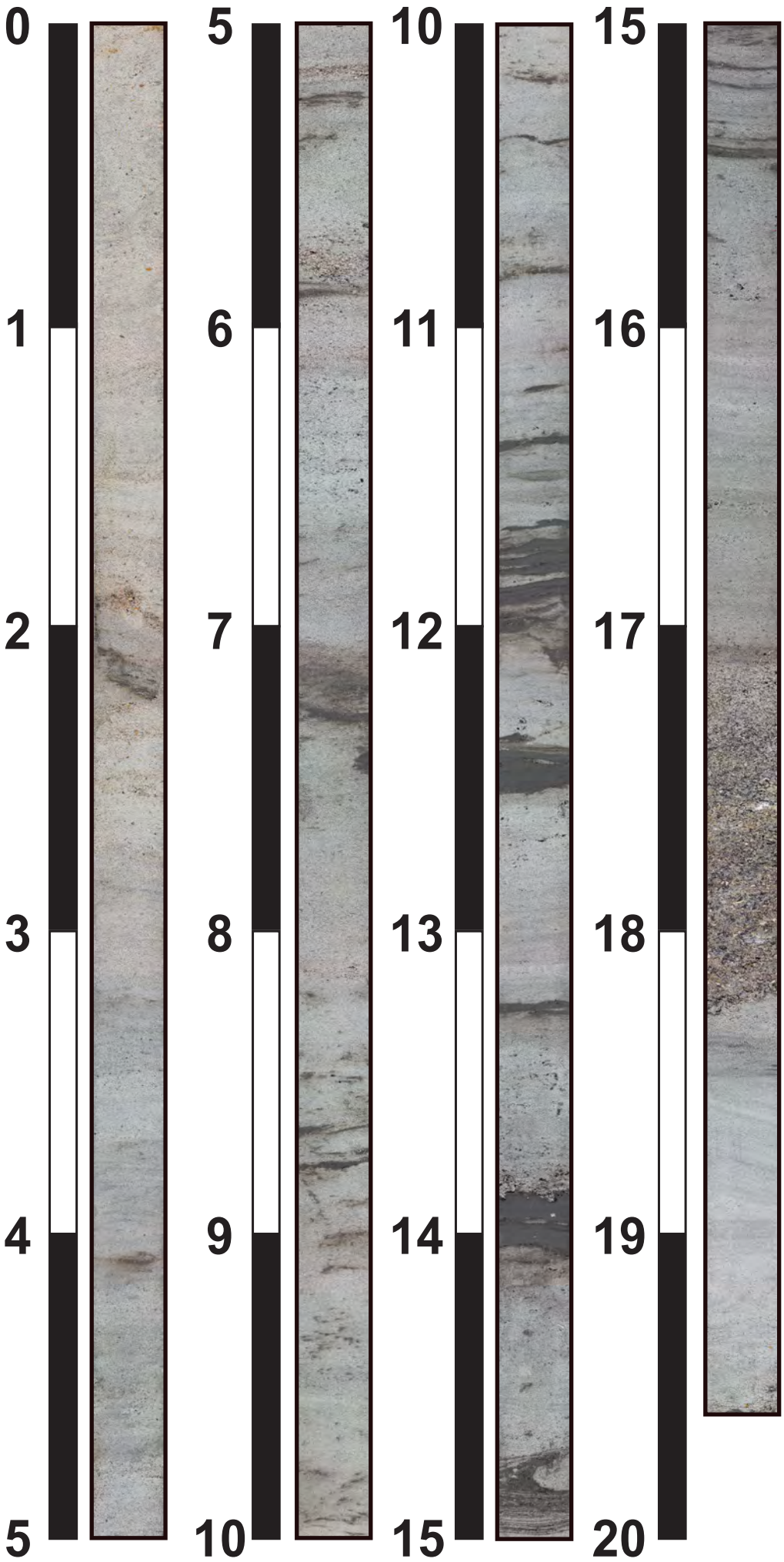
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-04**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 2.5Y 5/1**		

Tare Weight, (g):	49.71	
Dry Wt. Before Washing (g):	185.49	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	8.42	93.80	100	8.42
#3.5	5.600	21.47	77.99	100	21.47
#4	4.750	4.94	74.35	100	4.94
#5	4.000	4.36	71.14	100	4.36
#7	2.800	12.78	61.72	100	12.78
#10	2.000	13.26	51.96	100	13.26
#14	1.400	17.65	38.96	100	17.65
#18	1.000	13.25	29.20	98	12.99
#25	0.710	10.20	21.69	90	9.18
#35	0.500	7.89	15.88	60	4.73
#45	0.355	7.56	10.31	30	2.27
#60	0.250	5.23	6.46	10	0.52
#80	0.180	2.74	4.44	1	0.03
#120	0.125	3.19	2.09	0	0.00
#170	0.090	0.43	1.77	0	0.00
#200	0.075	0.12	1.69	0	0.00
#230	0.063	0.09	1.62	0	0.00
Total Shell Content:		**83**		**%**	



Nassau Sound
Florida
2016 - 2017

C-05

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-05

DRILLING LOG

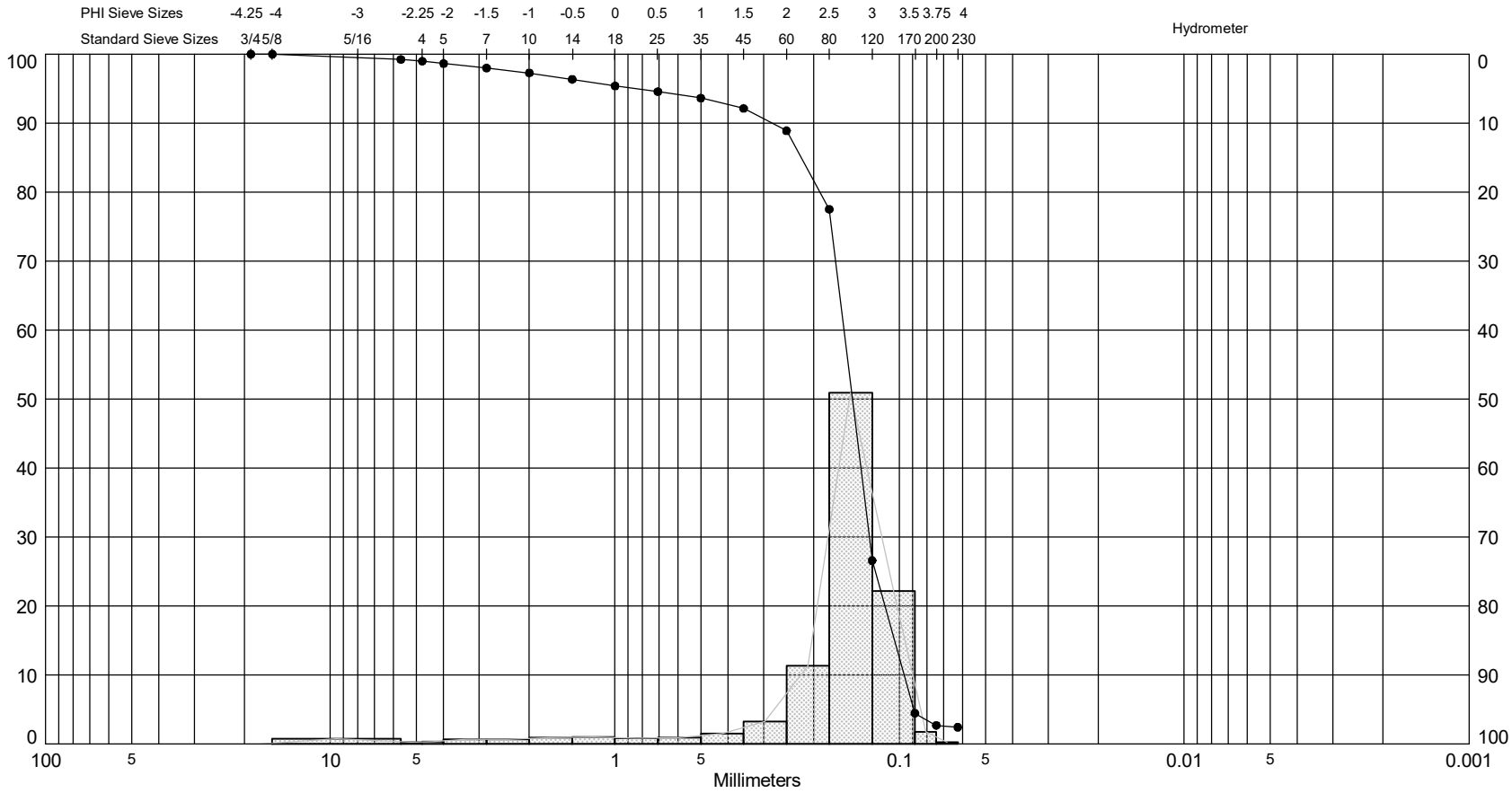
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-05
LOCATION COORDINATES	X = 525,119 Y = 2,248,032
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	10.2 Ft.
15. DATE BORING	STARTED: 03-18-17 09:57 / COMPLETED: 03-18-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-12.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	19.6 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-12.0	0.0					
-14.8	2.8		Fine quartz SAND, few medium to coarse sand-size shell, trace silt (between 1.9-2.25') poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.18, Phi Sorting: 0.57 Shell: 3%, Fines (#200) - 1.32 (SP)
-19.0	7.0		Fine quartz SAND, few fine to medium sand-size shell, trace silt in occasional burrow or lamination, poorly graded, loose, subangular, gray (5Y-6/1), (SP).			
-19.4	7.4		Fine quartz SAND, few silt in burrows and laminations, poorly graded, loose, subangular, gray (5Y-5/1), (SP-SM).			
-23.6	11.6		Fine quartz SAND, trace silt in burrows and laminations, trace fine to coarse sand-size shell, poorly graded, loose, subangular, gray (5Y-6/1), (SP).		B COMP	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.14, Phi Sorting: 0.29 Shell: 1%, Fines (#200) - 1.83 (SP) Sample #COMP, Depth = 0.0' - 19.5' Mean (mm): 0.17, Phi Sorting: 1.05 Shell: 7%, Carbonate: 4.8%, Fines (#200) - 2.69 (SP)
-27.1	15.1		Interbedded, fine quartz SAND (SP; light gray [5Y 7/1]) and sandy SILT (ML; dark gray [5Y 4/1]), trace fine to coarse sand-size shell, dark gray (5Y-4/1), (SP-SM).			
-29.1	17.1		Fine quartz SAND, trace silt in burrows and laminations, trace fine to coarse sand-size shell, poorly graded, loose, subangular, gray (5Y-6/1), (SP).		C	Sample #C, Depth = 16.8' - 17.3' Mean (mm): 0.18, Phi Sorting: 1.08 Shell: 10%, Fines (#200) - 1.48 (SP)
-30.2	18.2		Medium quartz SAND, some medium to coarse sand-size shell, poorly graded, loose, subangular, color grades from light gray (5Y 7/2) to, light olive gray (5Y-6/2), (SP).			
-31.6	19.6		Fine quartz SAND, trace silt, trace fine sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-05 #COMP	—●—	-12.0	SP	#200 - 2.69 #230 - 2.41		4.80	2.77	2.53	-3.21	14.6	1.05

Comments: Sample Interval = 0 - 19.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,119
Northing (Y, ft):	2,248,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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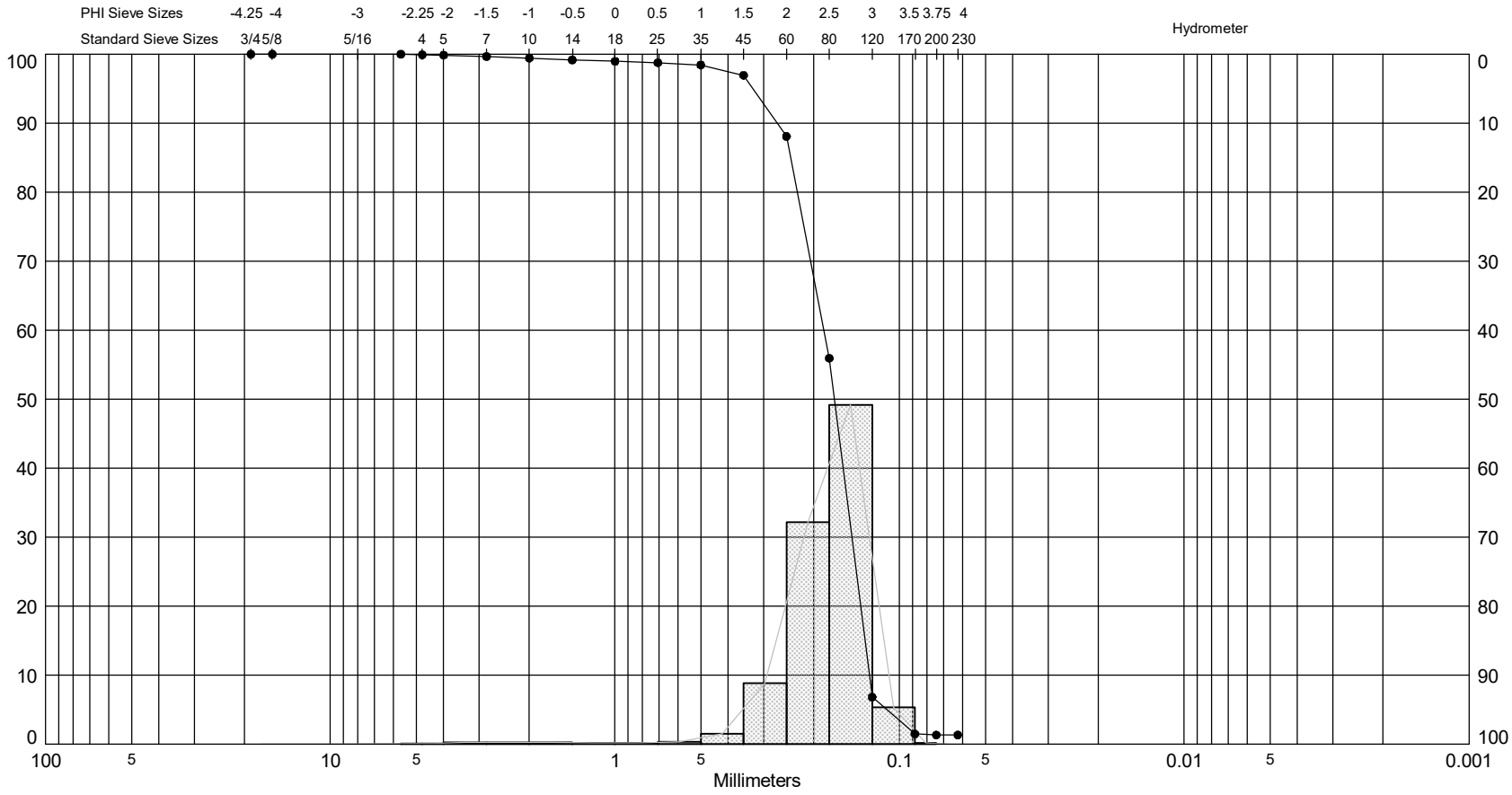
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-19.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-05**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.10	
Dry Wt. Before Washing (g):	190.99	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.08	99.23	100	1.08
#4	4.750	0.35	98.99	100	0.35
#5	4.000	0.48	98.64	100	0.48
#7	2.800	0.92	97.99	100	0.92
#10	2.000	0.99	97.29	100	0.99
#14	1.400	1.31	96.36	100	1.31
#18	1.000	1.36	95.39	100	1.36
#25	0.710	1.16	94.57	98	1.14
#35	0.500	1.33	93.63	50	0.67
#45	0.355	2.11	92.13	30	0.63
#60	0.250	4.56	88.89	10	0.46
#80	0.180	16.02	77.52	1	0.16
#120	0.125	71.75	26.60	0	0.00
#170	0.090	31.19	4.46	0	0.00
#200	0.075	2.48	2.70	0	0.00
#230	0.063	0.40	2.41	0	0.00
Total Shell Content:		**7**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-05 #A	—●—	-12.8	SP	#200 - 1.32 #230 - 1.32			2.56	2.45	-3.29	22.45	0.57

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,119
Northing (Y, ft):	2,248,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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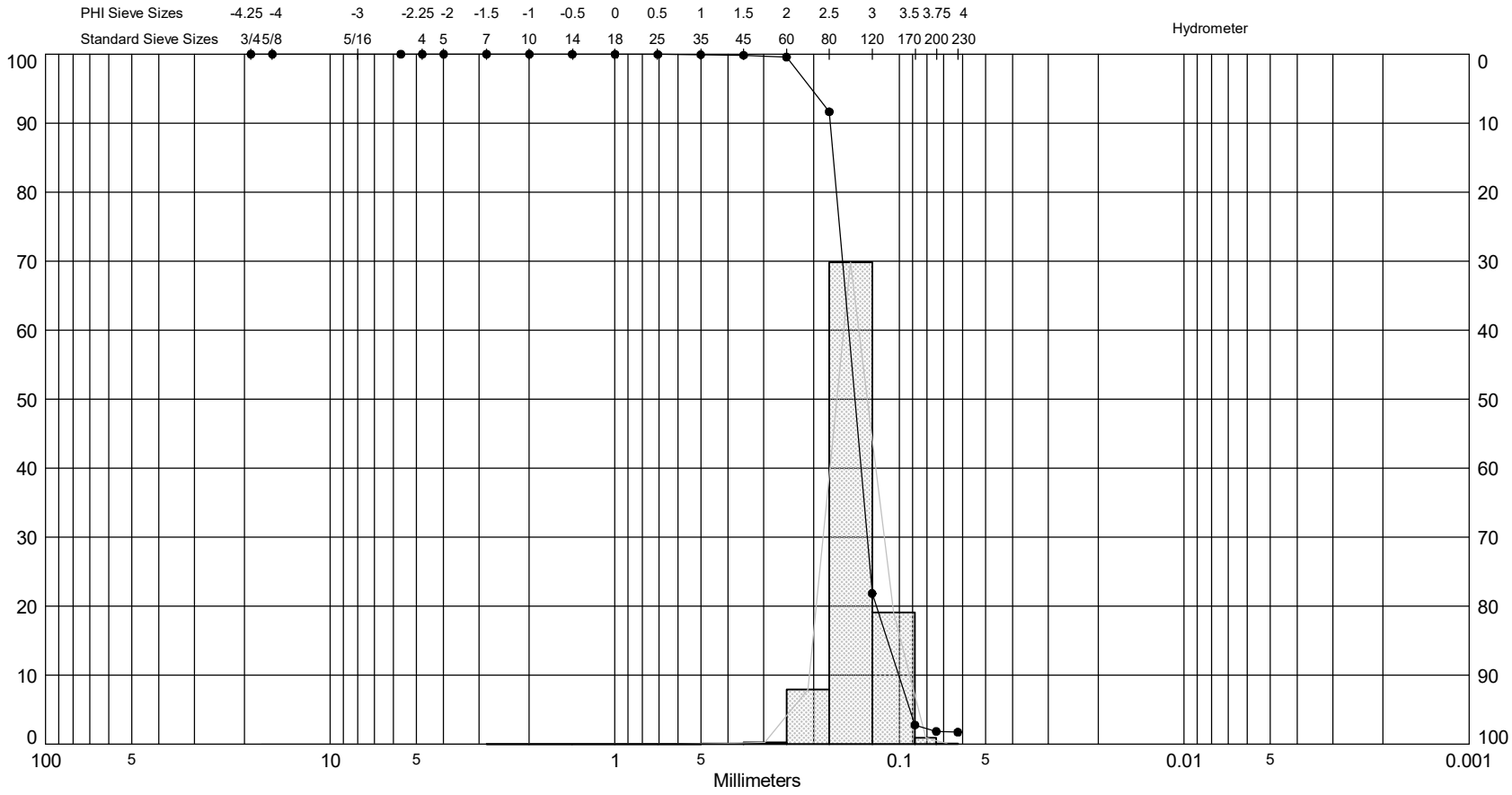
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-05**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.74	
Dry Wt. Before Washing (g):	170.79	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.10	99.92	100	0.10
#5	4.000	0.06	99.87	100	0.06
#7	2.800	0.25	99.66	100	0.25
#10	2.000	0.25	99.45	100	0.25
#14	1.400	0.34	99.16	100	0.34
#18	1.000	0.24	98.96	100	0.24
#25	0.710	0.23	98.77	90	0.21
#35	0.500	0.38	98.45	70	0.27
#45	0.355	1.79	96.94	30	0.54
#60	0.250	10.55	88.08	5	0.53
#80	0.180	38.27	55.93	1	0.38
#120	0.125	58.49	6.80	0	0.00
#170	0.090	6.36	1.46	0	0.00
#200	0.075	0.18	1.31	0	0.00
#230	0.063	0.00	1.31	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-05 #B	—●—	-20.8	SP	#200 - 1.83 #230 - 1.72			2.8	2.81	-0.57	11.84	0.29

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,119
Northing (Y, ft):	2,248,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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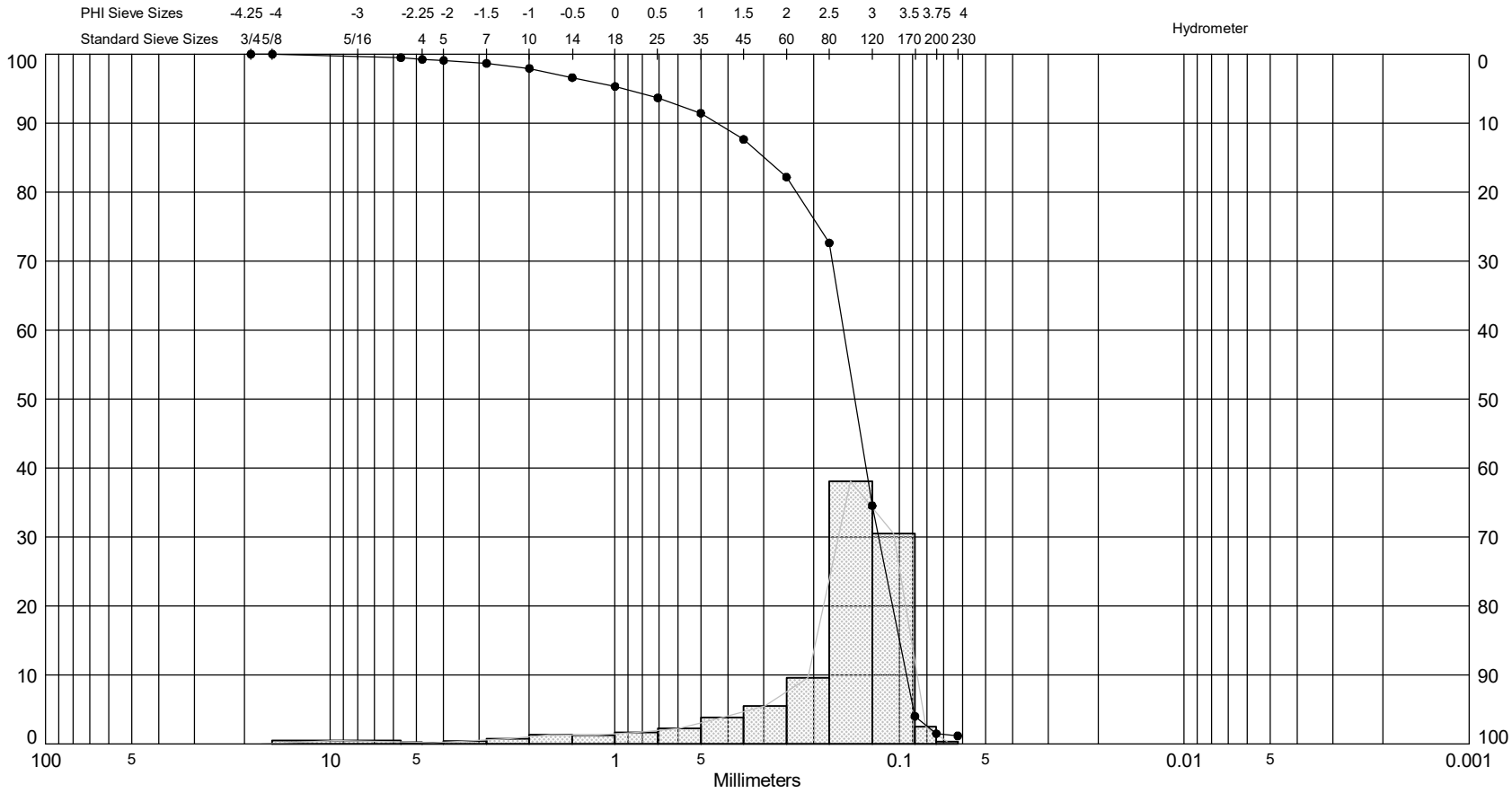
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-05**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.81	
Dry Wt. Before Washing (g):	173.91	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	100	0.00
#5	4.000	0.00	100.00	100	0.00
#7	2.800	0.00	100.00	100	0.00
#10	2.000	0.01	99.99	100	0.01
#14	1.400	0.01	99.98	100	0.01
#18	1.000	0.01	99.98	100	0.01
#25	0.710	0.01	99.97	100	0.01
#35	0.500	0.04	99.93	90	0.04
#45	0.355	0.10	99.85	70	0.07
#60	0.250	0.32	99.59	50	0.16
#80	0.180	9.69	91.65	5	0.48
#120	0.125	85.24	21.84	1	0.85
#170	0.090	23.28	2.78	0	0.00
#200	0.075	1.15	1.83	0	0.00
#230	0.063	0.14	1.72	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-05 #C	—●—	-28.8	SP	#200 - 1.48 #230 - 1.16			2.8	2.5	-2.43	9.97	1.08

Comments: Sample Depth = 17'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,119
Northing (Y, ft):	2,248,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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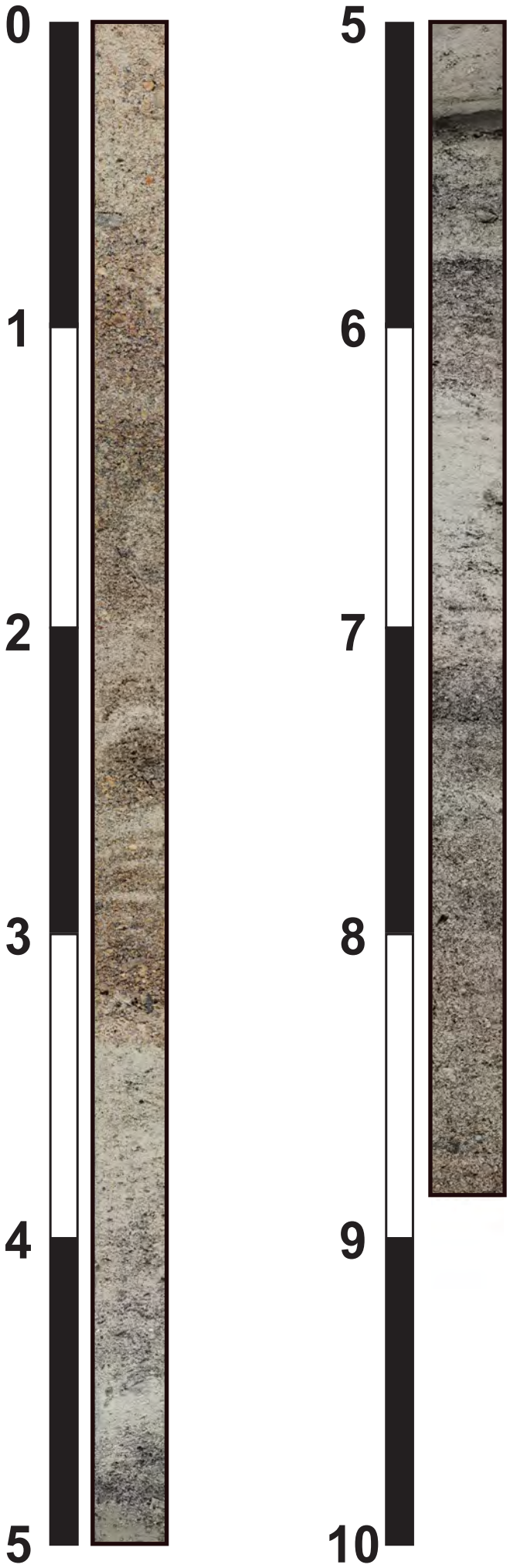
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**17'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-05**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.75	
Dry Wt. Before Washing (g):	178.50	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.64	99.50	100	0.64
#4	4.750	0.33	99.23	100	0.33
#5	4.000	0.18	99.09	100	0.18
#7	2.800	0.55	98.66	100	0.55
#10	2.000	0.92	97.93	100	0.92
#14	1.400	1.69	96.60	100	1.69
#18	1.000	1.63	95.31	98	1.60
#25	0.710	2.11	93.65	90	1.90
#35	0.500	2.81	91.43	70	1.97
#45	0.355	4.82	87.63	30	1.45
#60	0.250	6.92	82.17	20	1.38
#80	0.180	12.11	72.62	1	0.12
#120	0.125	48.28	34.52	0	0.00
#170	0.090	38.70	3.99	0	0.00
#200	0.075	3.21	1.46	0	0.00
#230	0.063	0.41	1.14	0	0.00
Total Shell Content:		**10**		**%**	



Nassau Sound
Florida
2016 - 2017

C-06

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

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Boring Designation C-06

DRILLING LOG

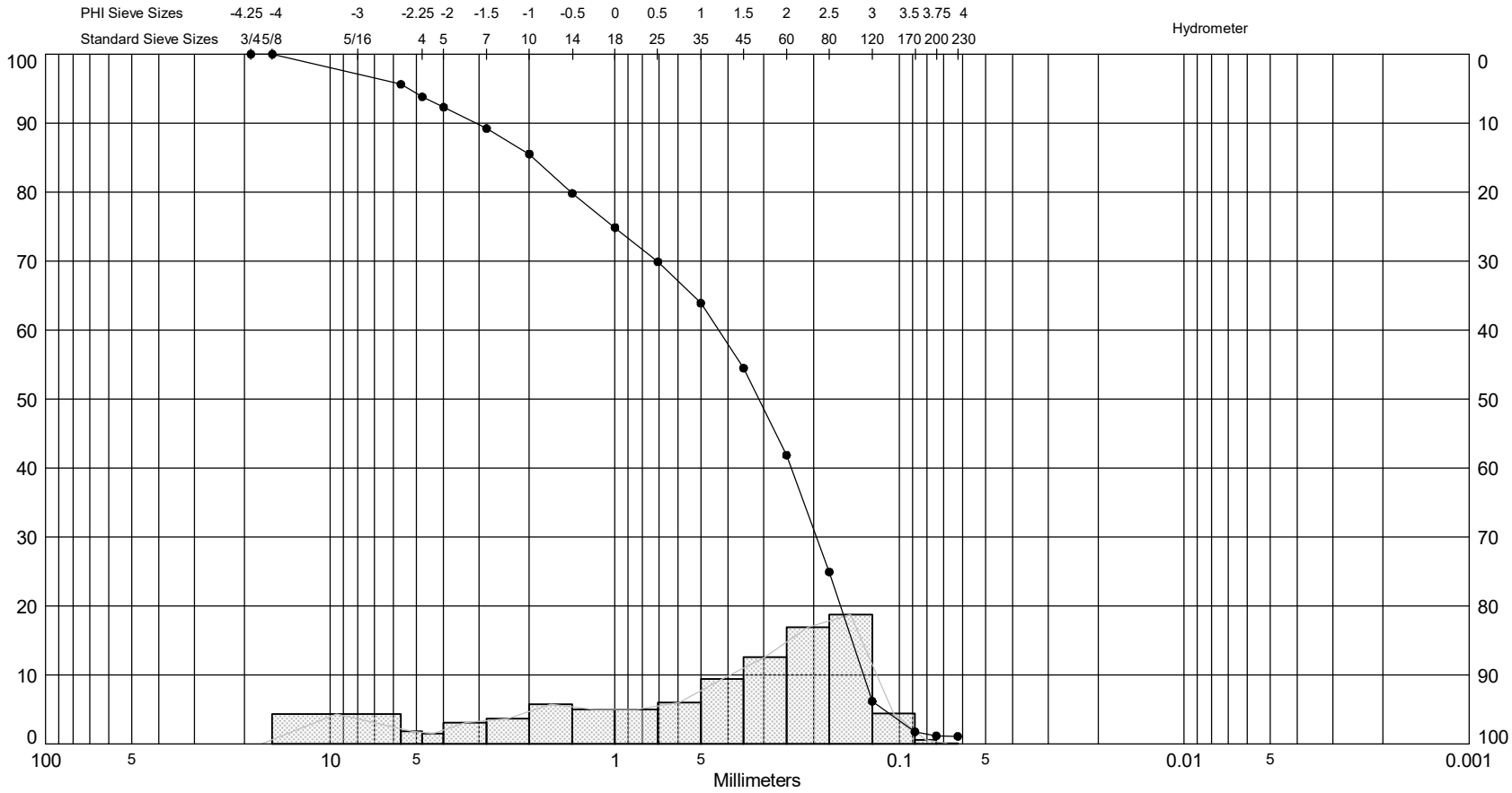
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
2. BORING DESIGNATION	C-06
LOCATION COORDINATES	X = 521,534 Y = 2,247,017
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	6.5 Ft.
15. DATE BORING	STARTED 07-11-16 09:38 / COMPLETED 07-11-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-12.5 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	8.8 Ft.
8. TOTAL DEPTH OF BORING	10.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-12.5	0.0					
			Fine SAND, few shell fragments <1.0cm, shell layer at 1.8-2.2', light greenish gray (10Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.60, Phi Sorting: 1.80 Shell: 46%, Fines (#200) - 0.78 (SP)
-15.8	3.3				COMP	Sample #COMP, Depth = 0.0' - 8.5' Mean (mm): 0.47, Phi Sorting: 1.75 Shell: 35%, Carbonate: 32.6%, Fines (#200) - 1.16 (SP)
			Fine SAND, few shell fragments, trace silt in lenses, 1 silt at 5.3'., light greenish gray (10Y-8/1), (SP).		B	Sample #B, Depth = 4.8' - 5.3' Mean (mm): 0.24, Phi Sorting: 1.83 Shell: 18%, Fines (#200) - 2.14 (SP)
-19.7	7.2					
			Fine SAND, little shell fragments <1.0cm, light greenish gray (10Y-7/1), (SW).			
-21.3	8.8					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-06 #COMP	—●—	-12.5	SP	#200 - 1.16 #230 - 1.10		32.60	1.68	1.1	-0.92	2.91	1.75

Comments: Sample Interval = 0 - 8.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	521,534
Northing (Y, ft):	2,247,017
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

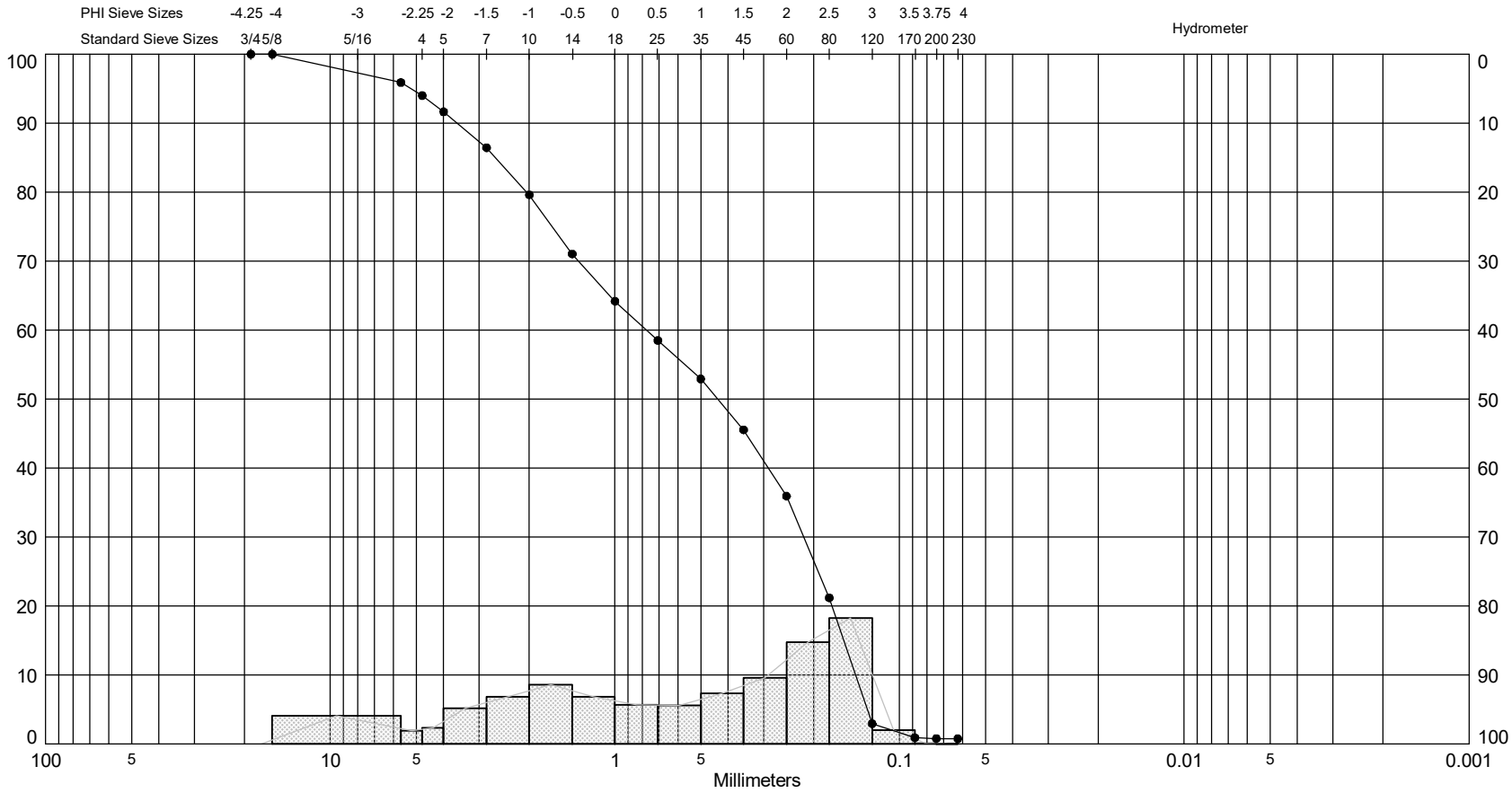
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-8.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-06**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.90	
Dry Wt. Before Washing (g):	189.46	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	6.10	95.63	100	6.10
#4	4.750	2.54	93.81	100	2.54
#5	4.000	2.09	92.31	100	2.09
#7	2.800	4.31	89.22	100	4.31
#10	2.000	5.15	85.53	100	5.15
#14	1.400	7.97	79.82	98	7.81
#18	1.000	6.92	74.86	95	6.57
#25	0.710	6.94	69.89	70	4.86
#35	0.500	8.37	63.89	50	4.19
#45	0.355	13.13	54.49	30	3.94
#60	0.250	17.60	41.87	5	0.88
#80	0.180	23.64	24.94	1	0.24
#120	0.125	26.16	6.19	0	0.00
#170	0.090	6.18	1.76	0	0.00
#200	0.075	0.84	1.16	0	0.00
#230	0.063	0.08	1.10	0	0.00
Total Shell Content:		**35**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-06 #A	—●—	-13.3	SP	#200 - 0.78 #230 - 0.76			1.2	0.74	-0.51	2.11	1.8

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	521,534
Northing (Y, ft):	2,247,017
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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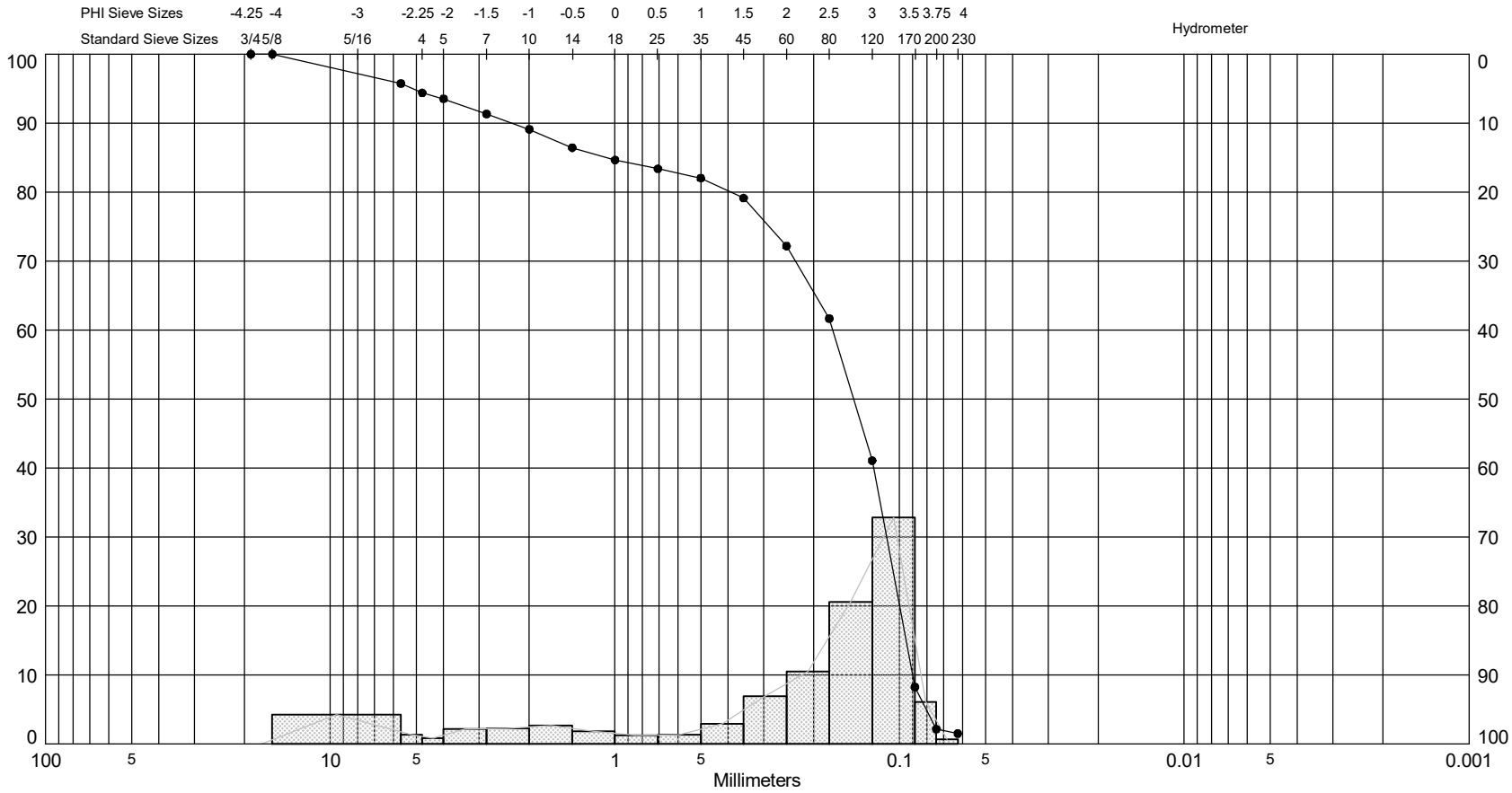
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-06**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 7/2**		

Tare Weight, (g):	49.61	
Dry Wt. Before Washing (g):	192.56	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	5.87	95.89	100	5.87
#4	4.750	2.70	94.00	100	2.70
#5	4.000	3.38	91.64	100	3.38
#7	2.800	7.42	86.45	100	7.42
#10	2.000	9.77	79.62	100	9.77
#14	1.400	12.27	71.03	98	12.02
#18	1.000	9.81	64.17	95	9.32
#25	0.710	8.14	58.47	90	7.33
#35	0.500	7.97	52.90	50	3.99
#45	0.355	10.53	45.53	30	3.16
#60	0.250	13.74	35.92	5	0.69
#80	0.180	21.09	21.17	1	0.21
#120	0.125	26.07	2.93	0	0.00
#170	0.090	2.91	0.90	0	0.00
#200	0.075	0.17	0.78	0	0.00
#230	0.063	0.03	0.76	0	0.00
Total Shell Content:		**46**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-06 #B	—●—	-17.3	SP	#200 - 2.14 #230 - 1.50			2.78	2.04	-1.65	4.63	1.83

Comments: Sample Depth = 5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	521,534
Northing (Y, ft):	2,247,017
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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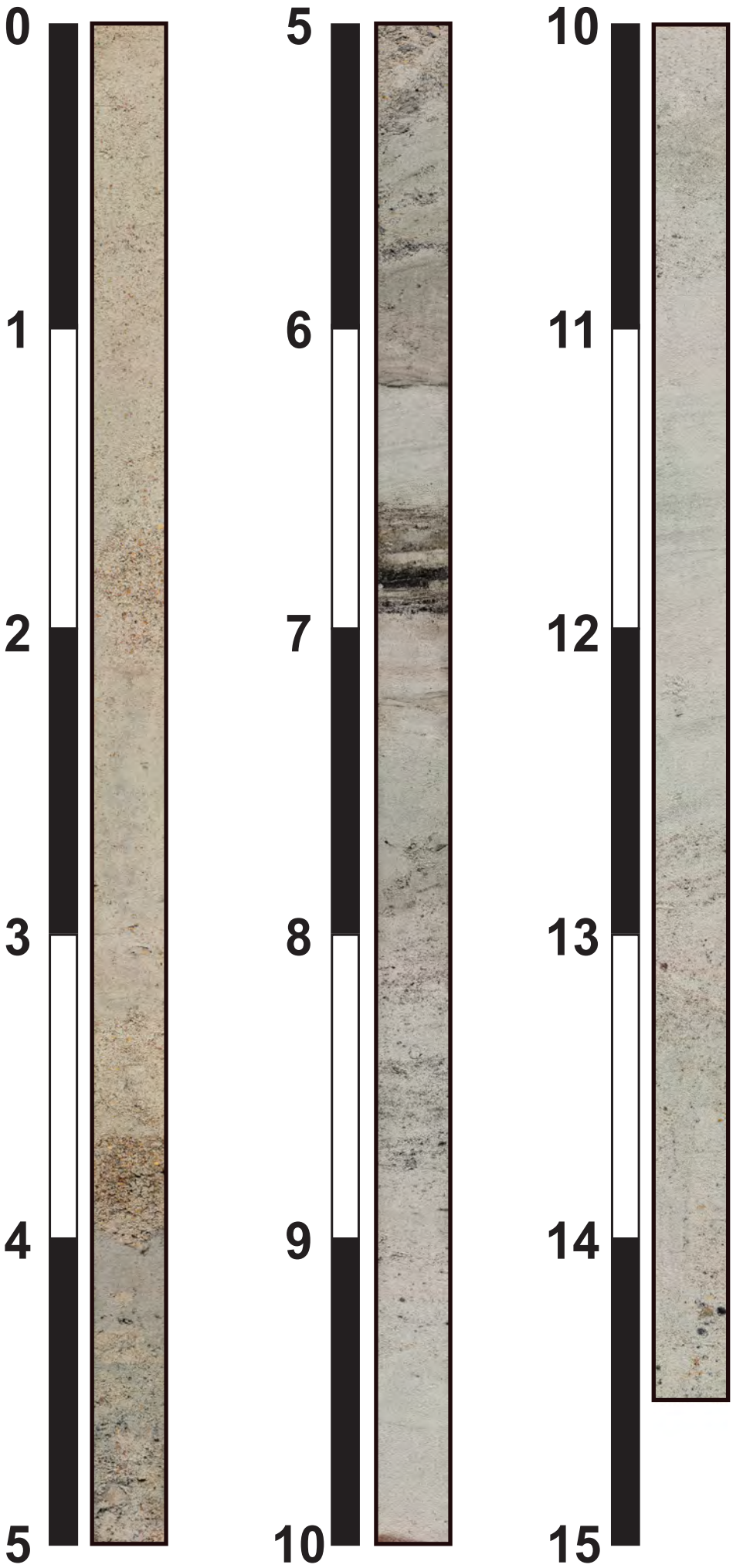
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-06**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.69	
Dry Wt. Before Washing (g):	169.43	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	5.09	95.75	100	5.09
#4	4.750	1.64	94.38	100	1.64
#5	4.000	1.00	93.54	100	1.00
#7	2.800	2.64	91.34	100	2.64
#10	2.000	2.67	89.11	100	2.67
#14	1.400	3.18	86.45	99	3.15
#18	1.000	2.16	84.65	95	2.05
#25	0.710	1.52	83.38	80	1.22
#35	0.500	1.61	82.04	50	0.81
#45	0.355	3.48	79.13	30	1.04
#60	0.250	8.30	72.20	5	0.42
#80	0.180	12.61	61.67	1	0.13
#120	0.125	24.67	41.06	0	0.00
#170	0.090	39.30	8.24	0	0.00
#200	0.075	7.32	2.13	0	0.00
#230	0.063	0.77	1.49	0	0.00
Total Shell Content:		**18**		**%**	



Nassau Sound
Florida
2016 - 2017

C-07

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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(843) 887-3800

Boring Designation C-07

DRILLING LOG

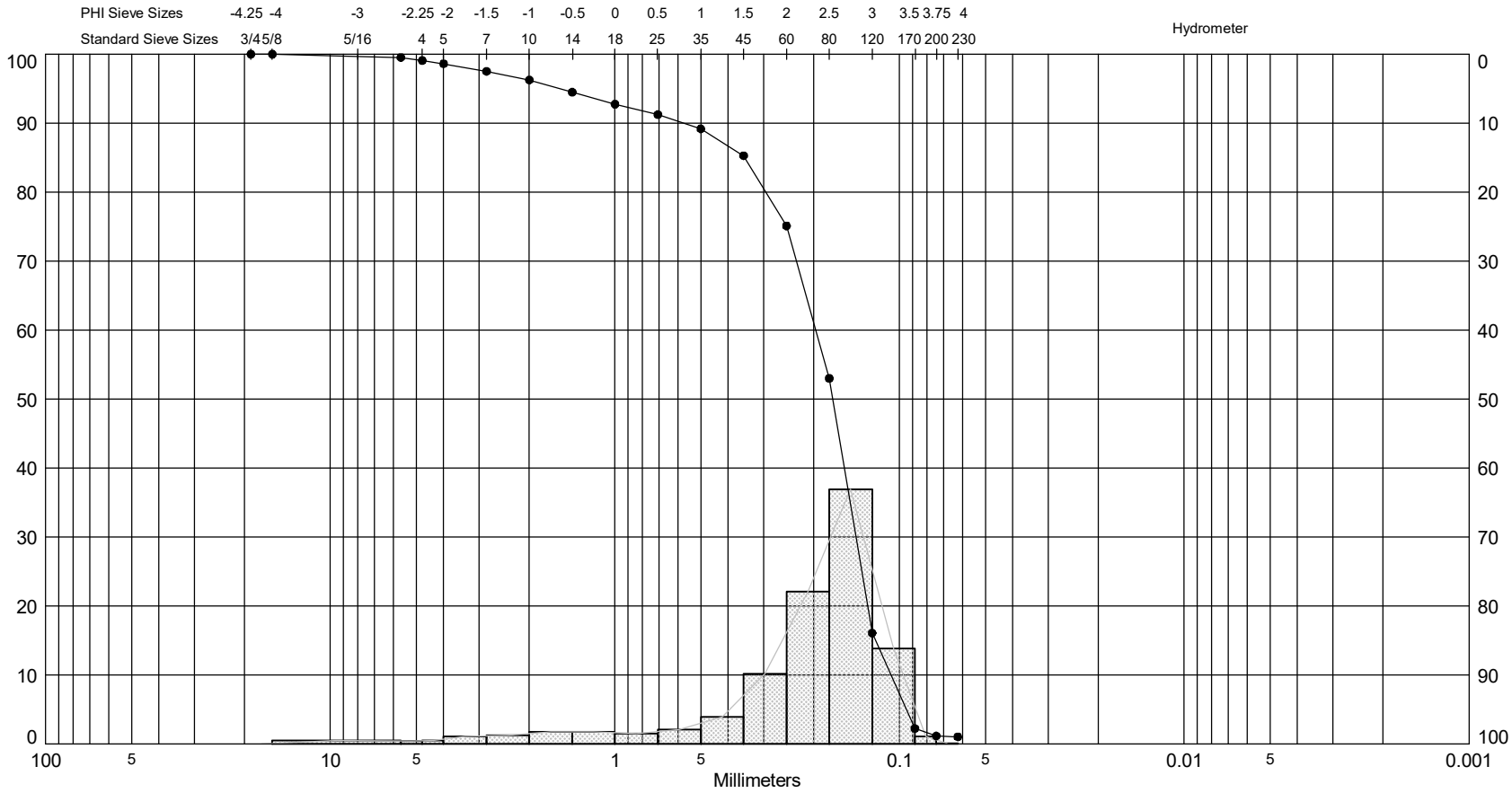
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-07
LOCATION COORDINATES	X = 521,485 Y = 2,247,721
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	17.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	8.8 Ft.
15. DATE BORING	STARTED 07-11-16 10:32 / COMPLETED 07-11-16
16. ELEVATION TOP OF BORING	-8.7 Ft.
17. TOTAL RECOVERY FOR BORING	14.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-8.7	0.0					
-12.6	3.9		Fine SAND, trace shell fragments <1.0cm with shell content varying. 3 shell layer at base., light greenish gray (10Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.23, Phi Sorting: 1.17 Shell: 15%, Fines (#200) - 0.99 (SP)
-14.5	5.8		Fine SAND, trace shell fragments <3.0cm., light greenish gray (10Y-7/1), (SP).			
-16.6	7.9		Fine SAND, trace silt in beds, 3 interbedded sand and silt layer at 6.9'., light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 14.5' Mean (mm): 0.22, Phi Sorting: 1.17 Shell: 17%, Carbonate: 11.0%, Fines (#200) - 1.15 (SP)
-23.2	14.5		Fine SAND. trace shell fragments <1.0cm with shell content varying and decreasing downcore., light greenish gray (10Y-7/1), (SP).		B	Sample #B, Depth = 10.8' - 11.3' Mean (mm): 0.18, Phi Sorting: 0.51 Shell: 2%, Fines (#200) - 0.85 (SP)
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-07 #COMP	—●—	-8.7	SP	#200 - 1.15 #230 - 1.04		11.00	2.54	2.19	-2.15	7.96	1.17

Comments: Sample Interval = 0 - 14.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	521,485
Northing (Y, ft):	2,247,721
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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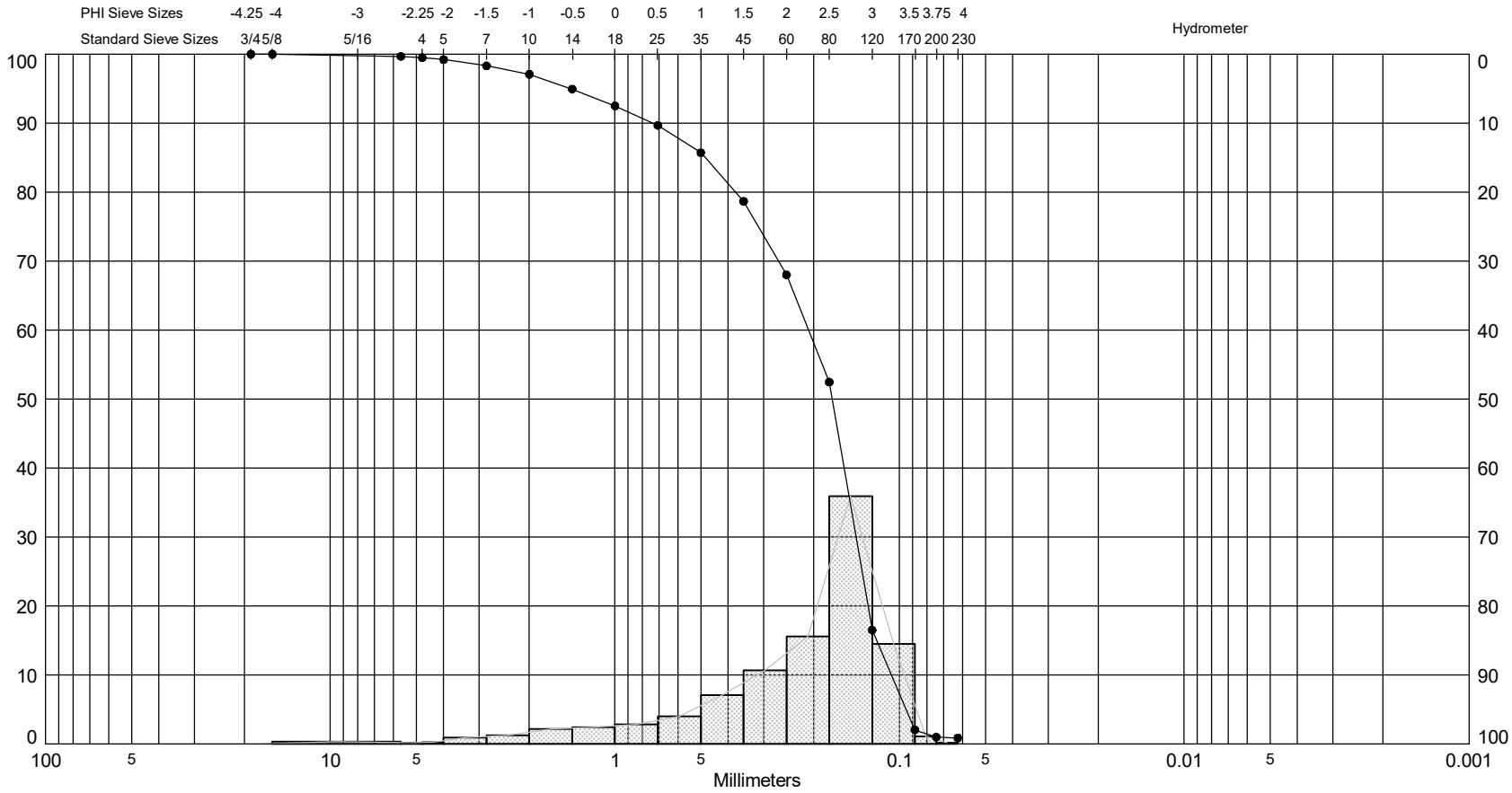
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14.5'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-07**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.63	
Dry Wt. Before Washing (g):	198.20	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.70	99.53	100	0.70
#4	4.750	0.67	99.08	100	0.67
#5	4.000	0.68	98.62	100	0.68
#7	2.800	1.63	97.52	100	1.63
#10	2.000	1.86	96.27	100	1.86
#14	1.400	2.65	94.49	100	2.65
#18	1.000	2.58	92.75	100	2.58
#25	0.710	2.25	91.24	80	1.80
#35	0.500	3.06	89.18	70	2.14
#45	0.355	5.78	85.29	50	2.89
#60	0.250	15.13	75.10	30	4.54
#80	0.180	32.85	52.99	10	3.29
#120	0.125	54.86	16.07	0	0.00
#170	0.090	20.56	2.23	0	0.00
#200	0.075	1.60	1.15	0	0.00
#230	0.063	0.17	1.04	0	0.00
Total Shell Content:		**17**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-07 #A	—●—	-9.5	SP	#200 - 0.99 #230 - 0.86			2.53	2.11	-1.65	5.8	1.17

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	521,485
Northing (Y, ft):	2,247,721
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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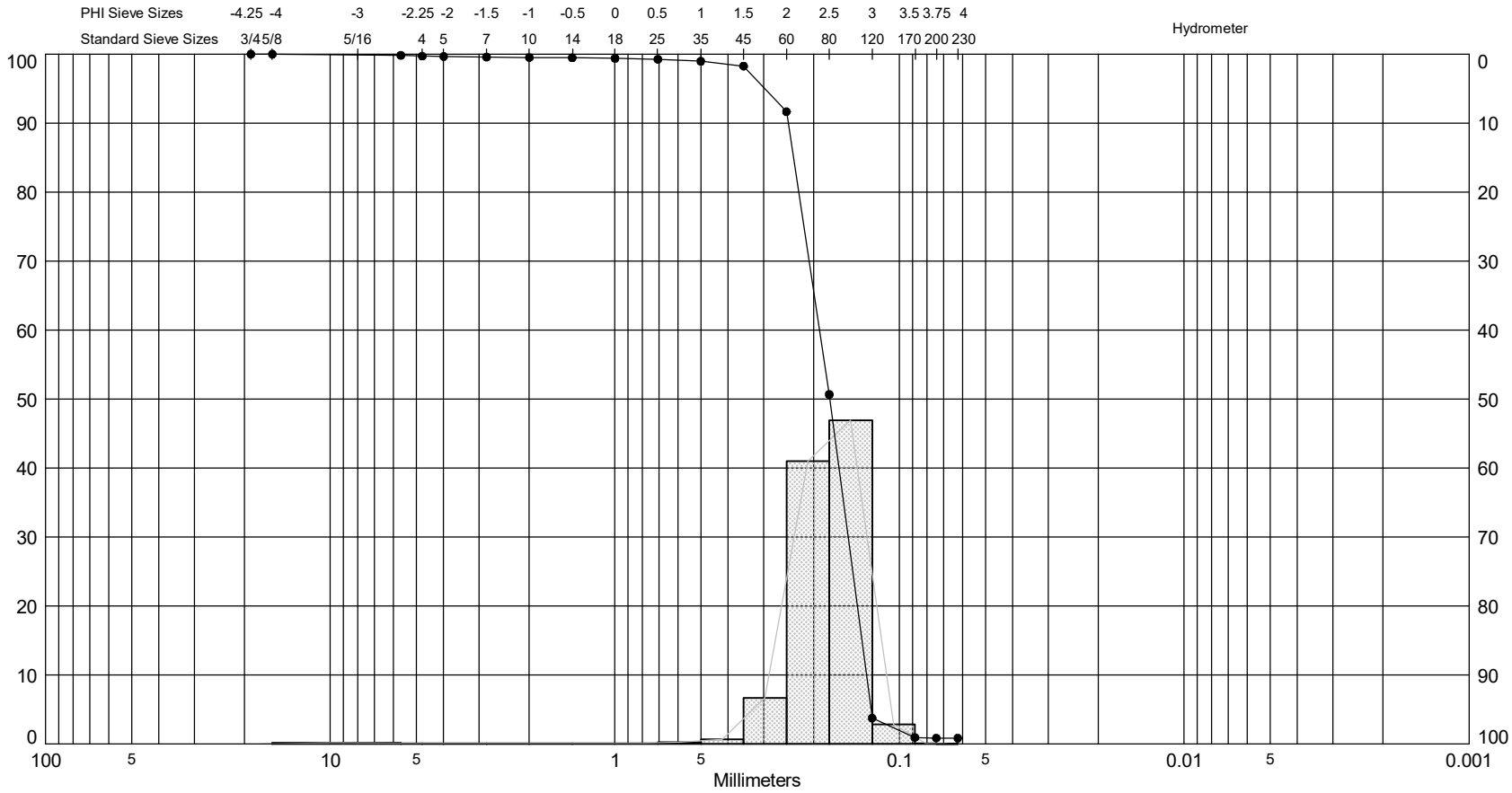
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-07**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.28	
Dry Wt. Before Washing (g):	207.94	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.51	99.68	100	0.51
#4	4.750	0.29	99.49	100	0.29
#5	4.000	0.45	99.21	100	0.45
#7	2.800	1.43	98.30	100	1.43
#10	2.000	1.90	97.10	100	1.90
#14	1.400	3.38	94.95	100	3.38
#18	1.000	3.85	92.51	100	3.85
#25	0.710	4.45	89.69	70	3.12
#35	0.500	6.28	85.70	60	3.77
#45	0.355	11.11	78.66	30	3.33
#60	0.250	16.78	68.01	10	1.68
#80	0.180	24.53	52.45	1	0.25
#120	0.125	56.67	16.51	0	0.00
#170	0.090	22.83	2.03	0	0.00
#200	0.075	1.66	0.98	0	0.00
#230	0.063	0.21	0.84	0	0.00
Total Shell Content:		**15**		**%**	



SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-07 #B	—●—	-19.5	SP	#200 - 0.85 #230 - 0.84			2.51	2.44	-4.82	46.26	0.51

Comments: Sample Depth = 11'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	521,485
Northing (Y, ft):	2,247,721
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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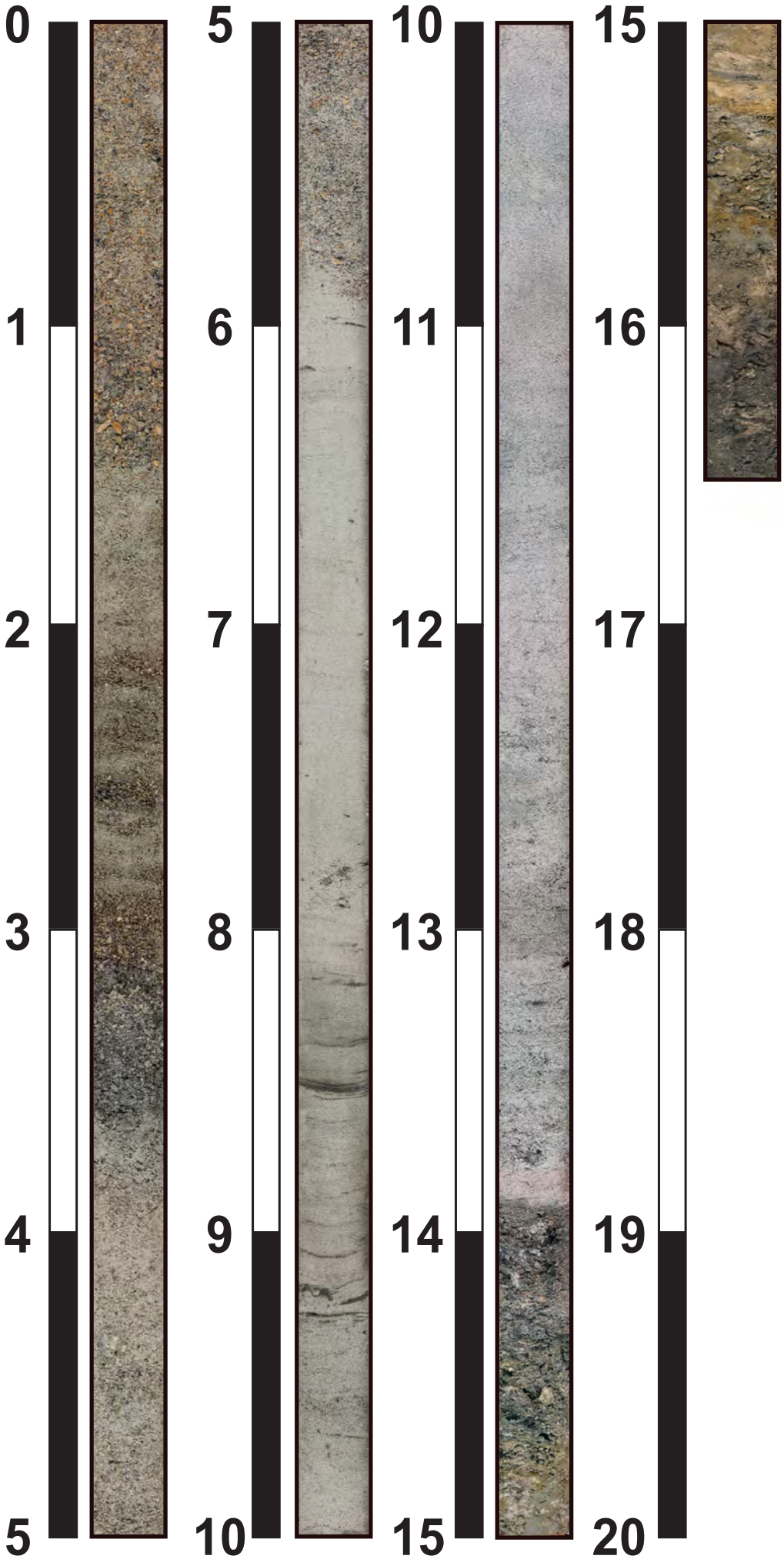
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**11'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-07**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	51.75	
Dry Wt. Before Washing (g):	205.97	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.26	99.83	100	0.26
#4	4.750	0.18	99.71	100	0.18
#5	4.000	0.07	99.67	100	0.07
#7	2.800	0.13	99.59	100	0.13
#10	2.000	0.07	99.54	90	0.06
#14	1.400	0.10	99.47	100	0.10
#18	1.000	0.14	99.38	100	0.14
#25	0.710	0.18	99.27	80	0.14
#35	0.500	0.45	98.98	60	0.27
#45	0.355	1.07	98.28	40	0.43
#60	0.250	10.22	91.65	20	2.04
#80	0.180	63.21	50.67	0	0.00
#120	0.125	72.36	3.75	0	0.00
#170	0.090	4.33	0.94	0	0.00
#200	0.075	0.12	0.86	0	0.00
#230	0.063	0.01	0.86	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-08

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-08

DRILLING LOG

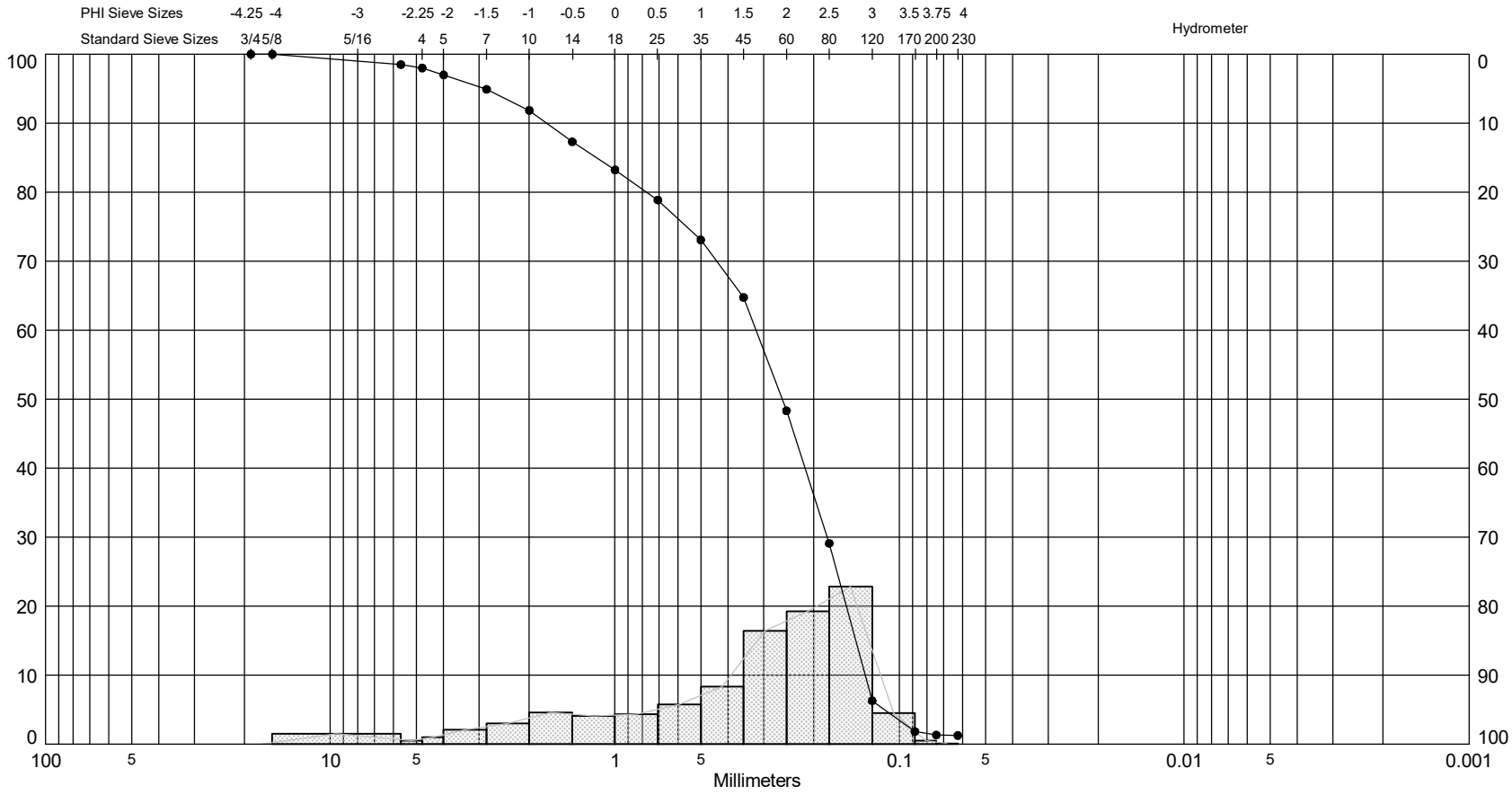
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-08
LOCATION COORDINATES	X = 523,914 Y = 2,249,631
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	24.2 Ft.
15. DATE BORING	STARTED 08-22-16 00:04 / COMPLETED 08-22-16
16. ELEVATION TOP OF BORING*	-22.7 Ft.
17. TOTAL RECOVERY FOR BORING	16.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-22.7	0.0					
-24.1	1.4		Fine to medium SAND, little shell fragments <1.0cm, greenish gray (10Y-6/1), (SW).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.85, Phi Sorting: 1.63 Shell: 56%, Fines (#200) - 1.03 (SP)
-25.6	2.9		Fine to medium sand, trace shell fragments, light greenish gray (10Y-7/1), (SP).			
-26.3	3.6		Fine to medium SAND, little shell fragments <1.0cm, greenish gray (10Y-6/1), (SW).			
-28.5	5.8		Fine SAND, few shell fragments <1.5cm, light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 14.5' Mean (mm): 0.36, Phi Sorting: 1.46 Shell: 27%, Carbonate: 22.8%, Fines (#200) - 1.32 (SP)
-36.6	13.9		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).		B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 0.22, Phi Sorting: 0.42 Shell: 2%, Fines (#200) - 0.96 (SP)
-37.5	14.8		Fine SAND, little shell fragments <3.0cm, trace silt, greenish gray (10Y-5/1), (SW).			
-39.2	16.5		SILTY SAND, trace shell fragments, color grades to 5GY4/2, (10Y-6/2), (SM).			
			End of Boring			* = Top of boring elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

0 5 10 15 20 25

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-08 #COMP	—●—	-22.7	SP	#200 - 1.32 #230 - 1.24		22.80	1.95	1.49	-1.21	3.88	1.46

Comments: Sample Interval = 0 - 14.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,914
Northing (Y, ft):	2,249,631
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

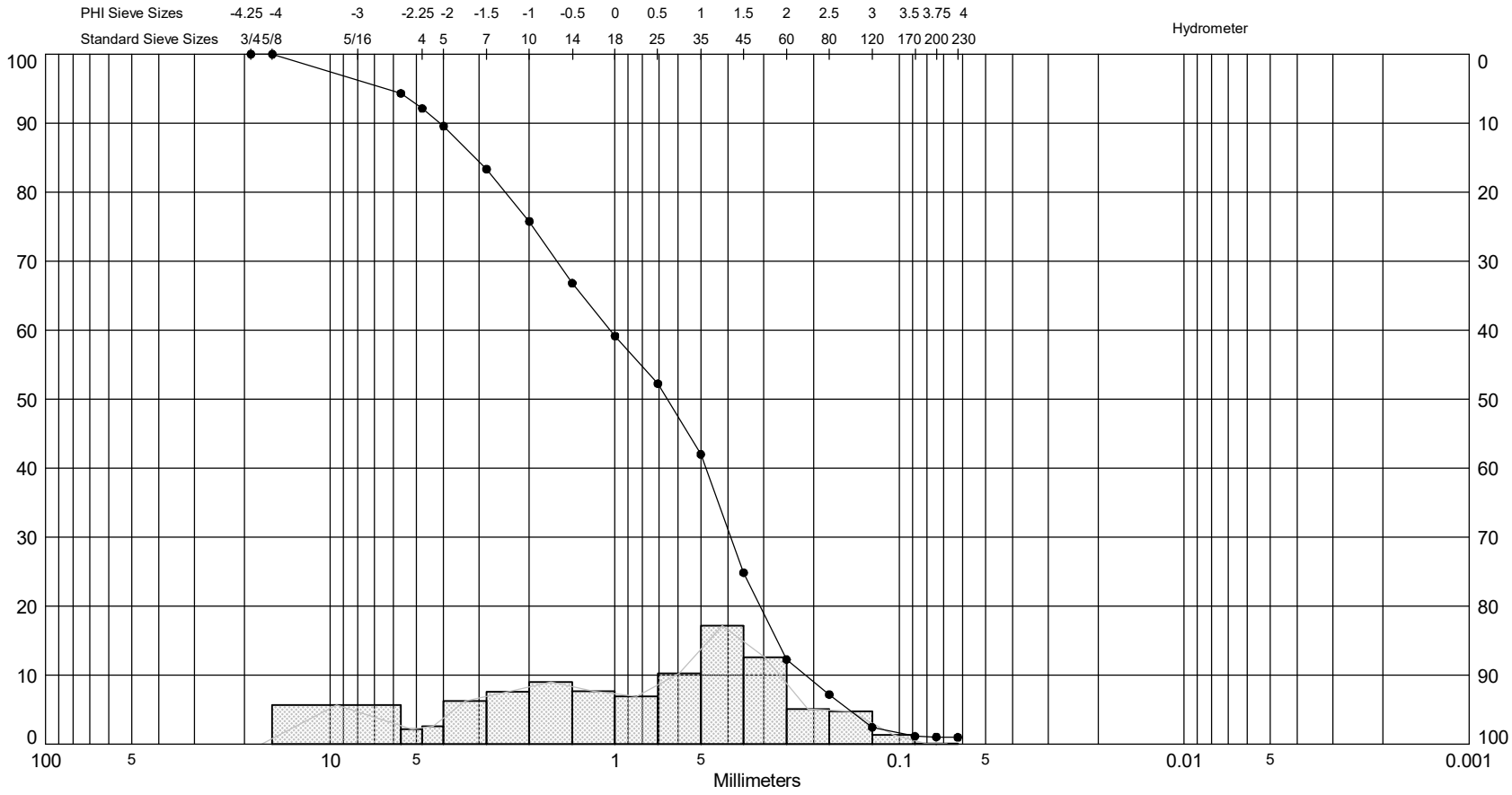
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14.5'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-08**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.30	
Dry Wt. Before Washing (g):	187.92	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.08	98.49	100	2.08
#4	4.750	0.68	97.99	100	0.68
#5	4.000	1.39	96.98	100	1.39
#7	2.800	2.87	94.90	100	2.87
#10	2.000	4.18	91.86	100	4.18
#14	1.400	6.28	87.30	100	6.28
#18	1.000	5.62	83.21	90	5.06
#25	0.710	5.98	78.87	70	4.19
#35	0.500	7.97	73.08	50	3.99
#45	0.355	11.46	64.75	30	3.44
#60	0.250	22.63	48.31	10	2.26
#80	0.180	26.43	29.10	1	0.26
#120	0.125	31.39	6.29	0	0.00
#170	0.090	6.17	1.81	0	0.00
#200	0.075	0.67	1.32	0	0.00
#230	0.063	0.11	1.24	0	0.00
Total Shell Content:		**27**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-08 #A	—●—	-23.5	SP	#200 - 1.03 #230 - 0.97			0.61	0.24	-0.42	2.36	1.63

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,914
Northing (Y, ft):	2,249,631
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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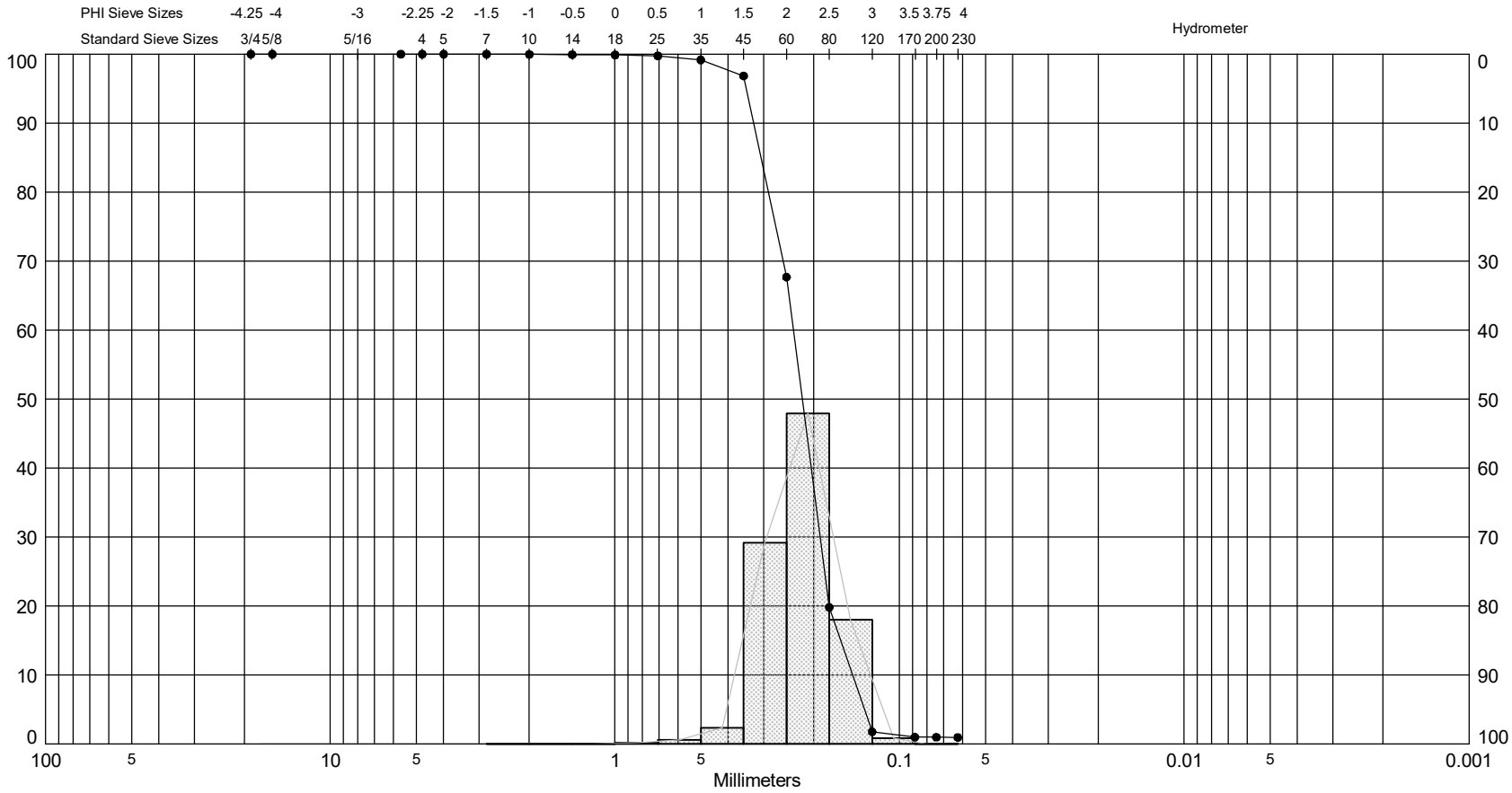
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-08**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	50.99	
Dry Wt. Before Washing (g):	188.01	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.79	94.31	100	7.79
#4	4.750	2.99	92.13	100	2.99
#5	4.000	3.53	89.56	100	3.53
#7	2.800	8.52	83.34	100	8.52
#10	2.000	10.35	75.78	100	10.35
#14	1.400	12.30	66.81	100	12.30
#18	1.000	10.51	59.14	100	10.51
#25	0.710	9.45	52.24	70	6.62
#35	0.500	14.02	42.01	50	7.01
#45	0.355	23.50	24.86	30	7.05
#60	0.250	17.24	12.28	1	0.17
#80	0.180	6.97	7.19	0	0.00
#120	0.125	6.51	2.44	0	0.00
#170	0.090	1.78	1.14	0	0.00
#200	0.075	0.14	1.04	0	0.00
#230	0.063	0.08	0.98	0	0.00
Total Shell Content:		**56**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-08 #B	—●—	-32.5	SP	#200 - 0.96 #230 - 0.94			2.18	2.16	-0.63	6.36	0.42

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,914
Northing (Y, ft):	2,249,631
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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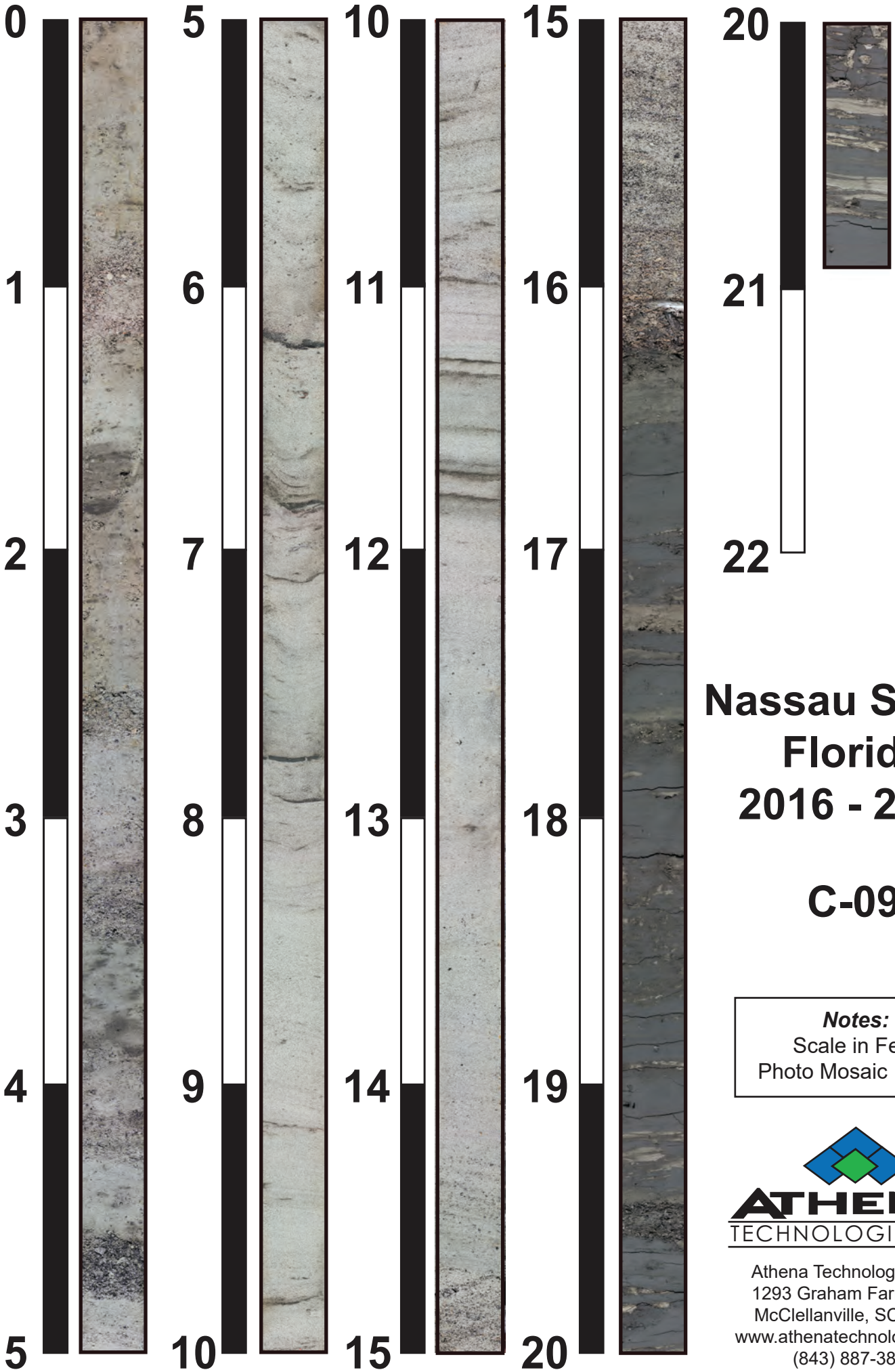
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-08**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.98	
Dry Wt. Before Washing (g):	184.62	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.05	99.96	100	0.05
#14	1.400	0.04	99.93	80	0.03
#18	1.000	0.06	99.89	70	0.04
#25	0.710	0.19	99.75	40	0.08
#35	0.500	0.78	99.17	30	0.23
#45	0.355	3.12	96.85	20	0.62
#60	0.250	39.28	67.68	5	1.96
#80	0.180	64.46	19.80	0	0.00
#120	0.125	24.28	1.77	0	0.00
#170	0.090	1.08	0.97	0	0.00
#200	0.075	0.01	0.96	0	0.00
#230	0.063	0.03	0.93	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-09

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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(843) 887-3800

Boring Designation C-09

DRILLING LOG

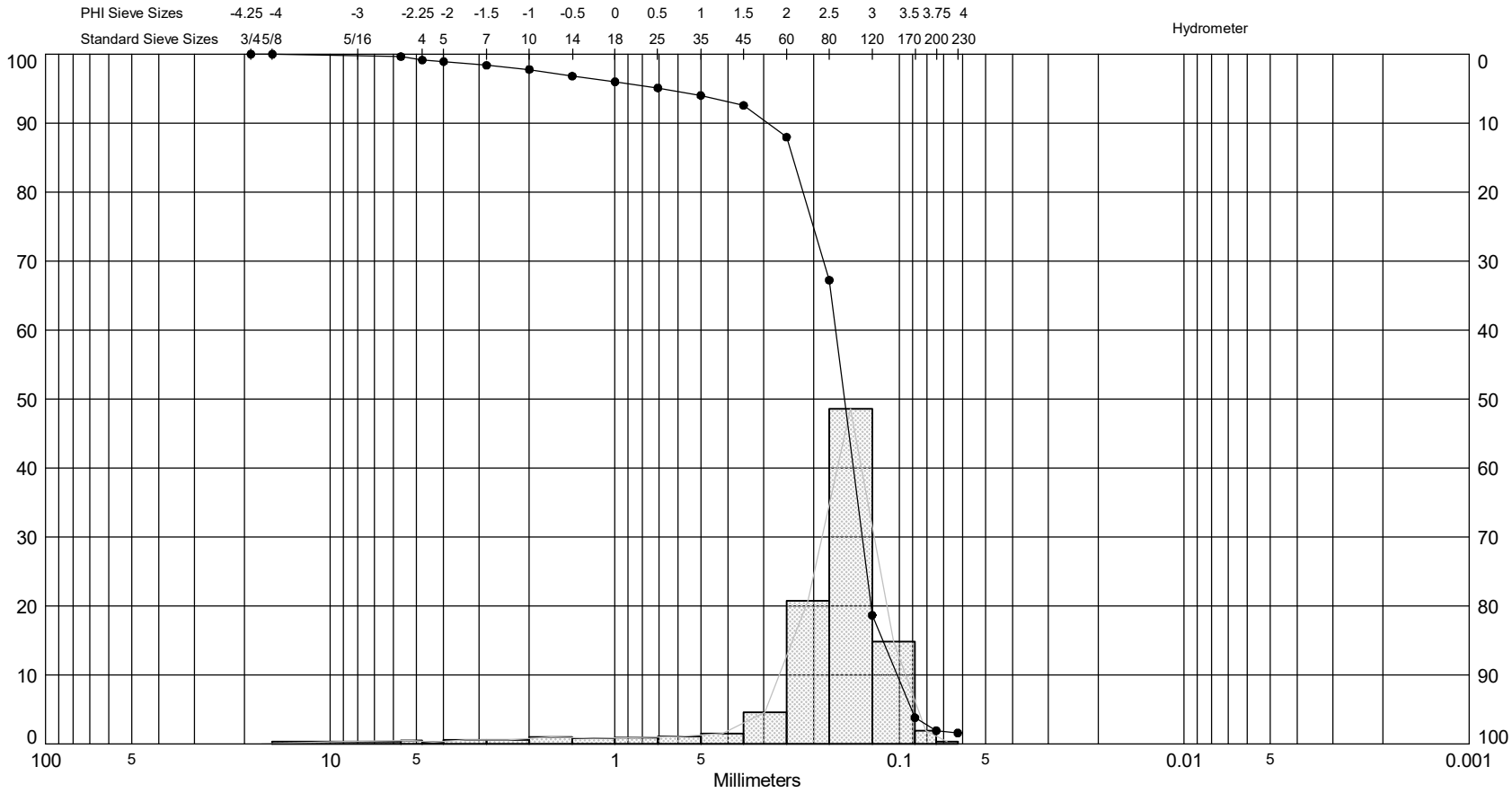
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-09
LOCATION COORDINATES	X = 525,856 Y = 2,249,778
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	21.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 3 — UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	20.3 Ft.
15. DATE BORING	STARTED: 02-21-17 11:30 — COMPLETED: 02-21-17
16. ELEVATION TOP OF BORING	-22.4 Ft.
17. TOTAL RECOVERY FOR BORING	20.9 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-22.4	0.0					
			Fine quartz SAND, few fine to coarse sand-size shell fragments, trace silt in burrows, poorly graded, subangular, loose; approximately 25-40% shell fragments in following intervals: 0.8-1.2', 2.5-2.7', 3.25-3.4', and 4.55-4.8', light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.26, Phi Sorting: 1.42 Shell: 22%, Fines (#200) - 1.40 (SP)
-27.2	4.8					
			Fine quartz SAND, trace silt in burrows and laminations, trace fine to medium sand-size shell fragments, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 15.0' Mean (mm): 0.18, Phi Sorting: 0.96 Shell: 9%, Carbonate: 7.1%, Fines (#200) - 1.91 (SP)
					B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 0.20, Phi Sorting: 0.72 Shell: 10%, Fines (#200) - 1.04 (SP)
-37.1	14.7					
			Fine to medium quartz SAND, little medium to coarse sand-size shell fragments (crassostrea virginica [eastern oyster] shells >2 between 16-16.25'), trace silt (between 16-16.25'), poorly graded, subangular, loose, color grades to gray (5Y 5/1) from, light gray (5Y-7/1), (SP).			
-38.7	16.3					
			Fine sandy SILT, little silty fine sand in layers/laminations and burrows, trace medium to coarse sand-size shell fragments (in layers at 17.6' and 19.3-19.5'), soft/loose, USCS = SM for silty fine sand layers/laminations, dark gray (5Y-4/1), (ML).			
-43.3	20.9					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-09 #COMP	—●—	-22.4	SP	#200 - 1.91 #230 - 1.59		7.10	2.68	2.46	-3.08	14.5	0.96

Comments: Sample Interval = 0 - 15.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,856
Northing (Y, ft):	2,249,778
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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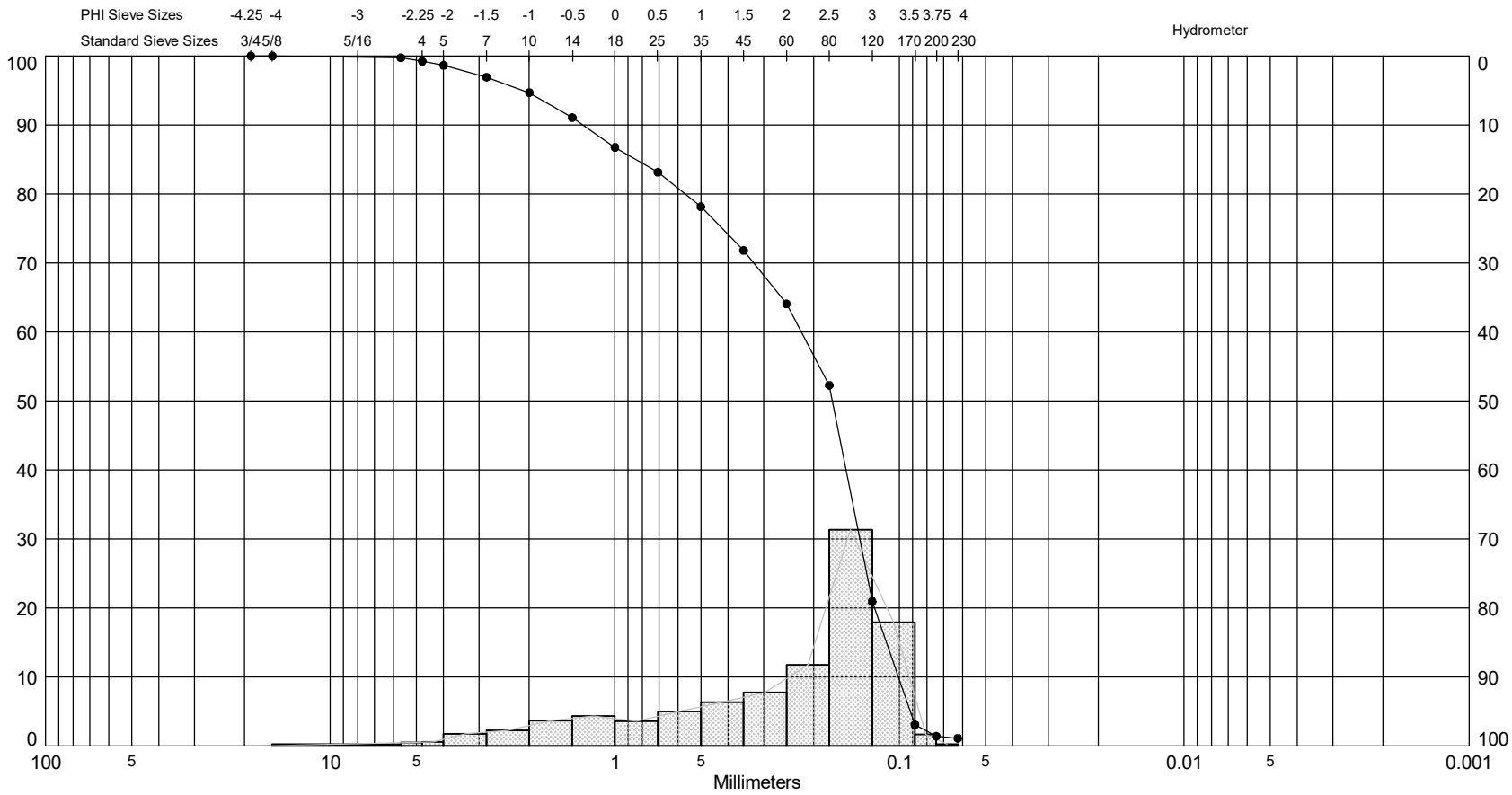
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-15'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-09**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.59	
Dry Wt. Before Washing (g):	216.27	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.59	99.65	100	0.59
#4	4.750	0.84	99.14	100	0.84
#5	4.000	0.36	98.93	100	0.36
#7	2.800	0.91	98.38	100	0.91
#10	2.000	0.98	97.79	90	0.88
#14	1.400	1.63	96.81	100	1.63
#18	1.000	1.35	96.00	100	1.35
#25	0.710	1.48	95.12	80	1.18
#35	0.500	1.82	94.02	60	1.09
#45	0.355	2.44	92.56	40	0.98
#60	0.250	7.66	87.96	30	2.30
#80	0.180	34.55	67.24	10	3.46
#120	0.125	80.97	18.66	0	0.00
#170	0.090	24.76	3.80	0	0.00
#200	0.075	3.15	1.91	0	0.00
#230	0.063	0.53	1.60	0	0.00
Total Shell Content:		**9**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-09 #A	—●—	-23.2	SP	#200 - 1.40 #230 - 1.11			2.54	1.93	-1.24	3.73	1.42

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,856
Northing (Y, ft):	2,249,778
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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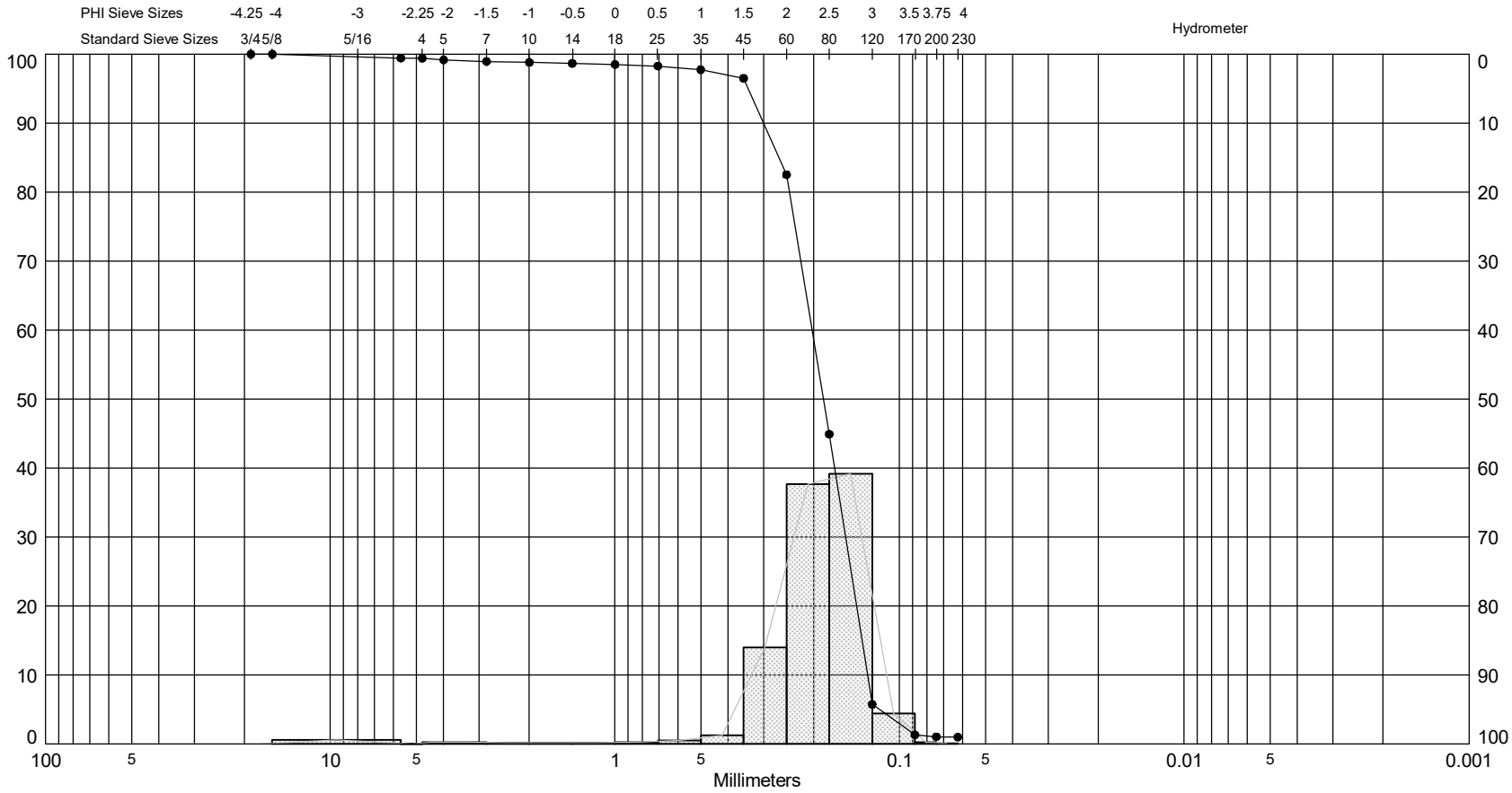
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-09**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.22	
Dry Wt. Before Washing (g):	204.92	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.40	99.74	100	0.40
#4	4.750	0.80	99.22	100	0.80
#5	4.000	0.89	98.65	100	0.89
#7	2.800	2.65	96.94	100	2.65
#10	2.000	3.47	94.69	100	3.47
#14	1.400	5.61	91.07	100	5.61
#18	1.000	6.68	86.75	100	6.68
#25	0.710	5.57	83.15	80	4.46
#35	0.500	7.72	78.16	60	4.63
#45	0.355	9.82	71.81	40	3.93
#60	0.250	11.96	64.08	10	1.20
#80	0.180	18.24	52.29	0	0.00
#120	0.125	48.47	20.96	0	0.00
#170	0.090	27.66	3.08	0	0.00
#200	0.075	2.59	1.40	0	0.00
#230	0.063	0.45	1.11	0	0.00
Total Shell Content:		**22**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-09 #B	—●—	-32.2	SP	#200 - 1.04 #230 - 0.98			2.43	2.34	-4.2	29.99	0.72

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,856
Northing (Y, ft):	2,249,778
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

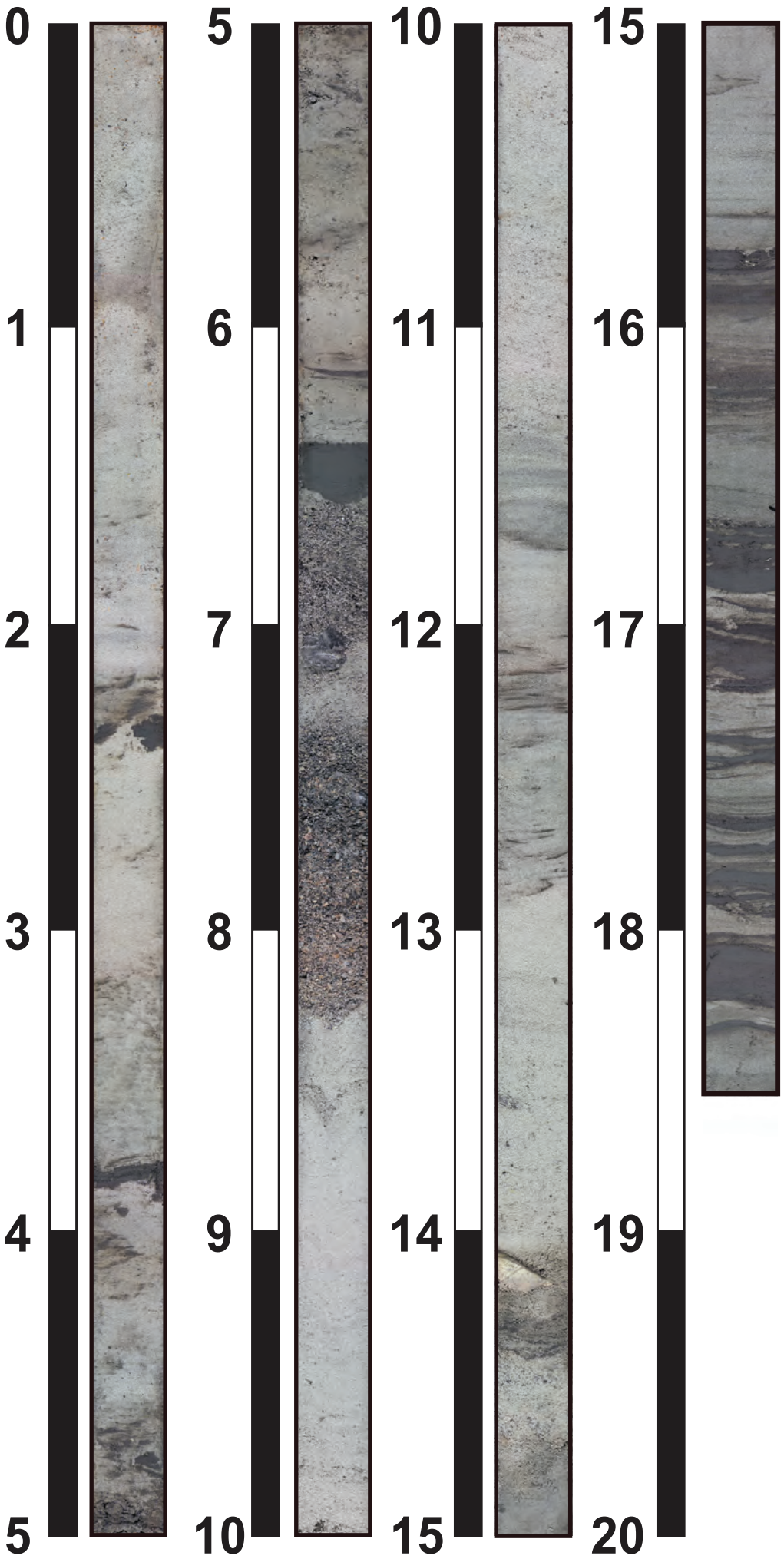
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-09**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.24	
Dry Wt. Before Washing (g):	204.87	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.88	99.43	100	0.88
#4	4.750	0.02	99.42	100	0.02
#5	4.000	0.37	99.18	100	0.37
#7	2.800	0.36	98.95	100	0.36
#10	2.000	0.22	98.80	100	0.22
#14	1.400	0.21	98.67	100	0.21
#18	1.000	0.23	98.52	90	0.21
#25	0.710	0.36	98.29	80	0.29
#35	0.500	0.84	97.74	60	0.50
#45	0.355	1.93	96.49	40	0.77
#60	0.250	21.58	82.54	30	6.47
#80	0.180	58.20	44.90	10	5.82
#120	0.125	60.58	5.72	0	0.00
#170	0.090	6.80	1.33	0	0.00
#200	0.075	0.43	1.05	0	0.00
#230	0.063	0.09	0.99	0	0.00
Total Shell Content:		**10**		**%**	



Nassau Sound
Florida
2016 - 2017

C-10

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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Boring Designation C-10

DRILLING LOG

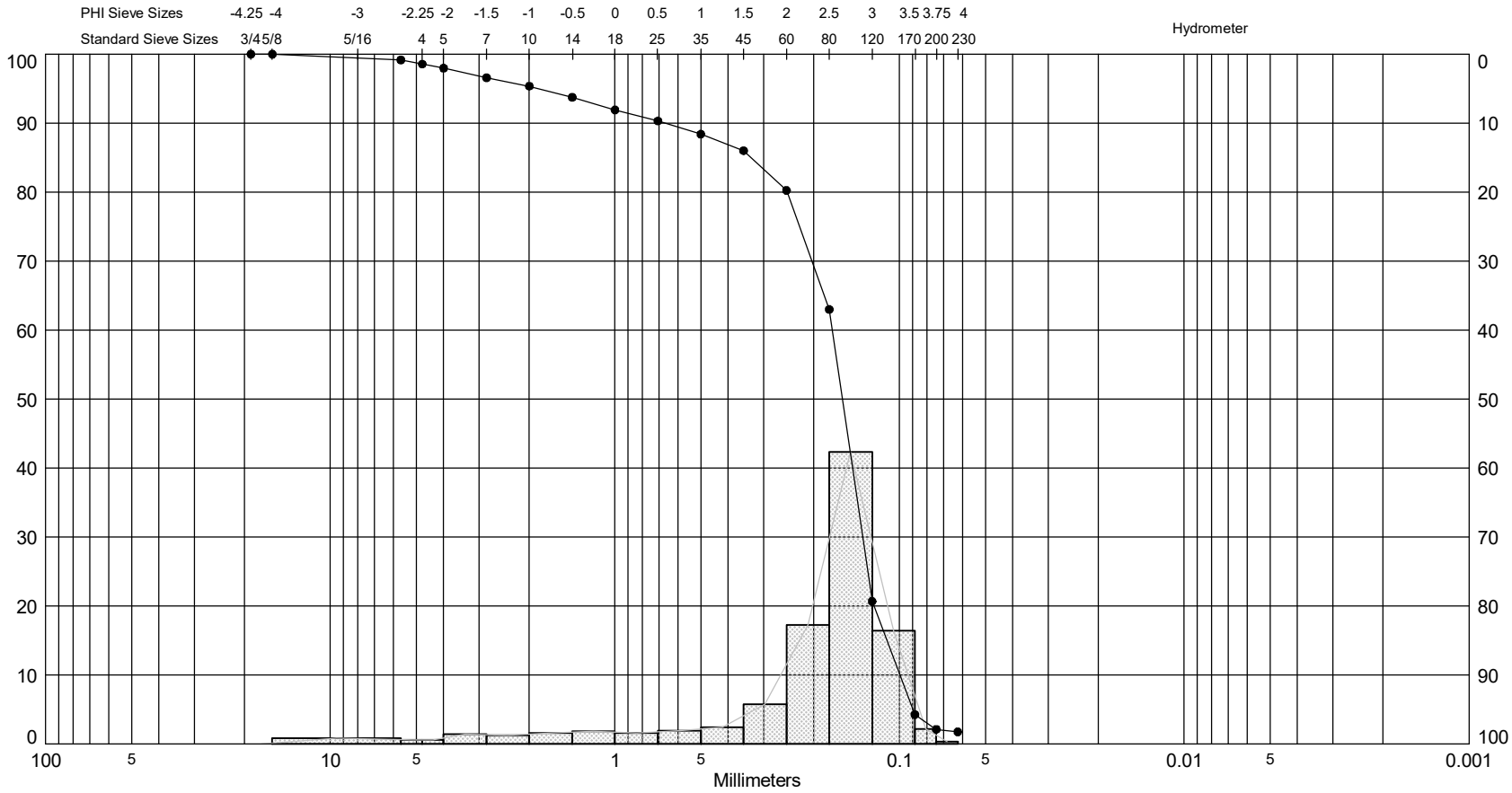
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-10
LOCATION COORDINATES	X = 525,899 Y = 2,248,988
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	16.7 Ft.
15. DATE BORING	STARTED: 02-21-17 12:43 / COMPLETED: 02-21-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-17.6 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	18.5 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-17.6	0.0					
			Fine quartz SAND, few fine to medium sand-size shell fragments, trace silt in burrows and laminations, poorly graded, subangular, loose, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.15, Phi Sorting: 0.56 Shell: 3%, Fines (#200) - 2.35 (SP)
-24.0	6.4					Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.41, Phi Sorting: 1.48 Shell: 46%, Fines (#200) - 1.63 (SP)
-24.2	6.6		SILT, few fine quartz sand, soft, dark gray (5Y-4/1), (ML).		B	
-25.9	8.3		Fine to medium quartz SAND, some medium sand to fine gravel-size shell fragments (crassostrea virginica [eastern oyster] shell fragments >2 in length also present), well graded, subangular, loose; shell percentage > 50% between 7.3-7.8', gray (5Y-6/1), (SW).		COMP	Sample #COMP, Depth = 0.0' - 14.5' Mean (mm): 0.21, Phi Sorting: 1.27 Shell: 11%, Carbonate: 11.6%, Fines (#200) - 2.11 (SP)
-28.9	11.3		Fine quartz SAND, few fine to medium sand-size shell fragments, trace heavy minerals, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).			
-30.5	12.9		Fine quartz SAND, trace silt in burrows and flaser beds, trace fine sand-size shell fragments, organic material present in flaser beds, poorly graded, subangular, loose, gray (5Y-6/1), (SP).		C	Sample #C, Depth = 12.8' - 13.3' Mean (mm): 0.17, Phi Sorting: 0.53 Shell: 2%, Fines (#200) - 10.42 (SP-SM)
-32.3	14.8		Fine quartz SAND, few fine to medium sand-size shell fragments, trace silt in burrows and laminations between 14.1-14.4', poorly graded, subangular, loose, mercenaria mercenaria (hard clam) shell fragment > 2 across at 14.1', light gray (5Y-7/1), (SP).			
-36.1	18.5		Fine quartz SAND, trace grading to few silt in laminations and layers, trace organic material in silt laminations, poorly graded, subangular, loose, gray (5Y-6/1), (SP-SM).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-10 #COMP	—●—	-17.6	SP	#200 - 2.11 #230 - 1.75		11.60	2.65	2.26	-2.26	8.05	1.27

Comments: Sample Interval = 0 - 14.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,899
Northing (Y, ft):	2,248,988
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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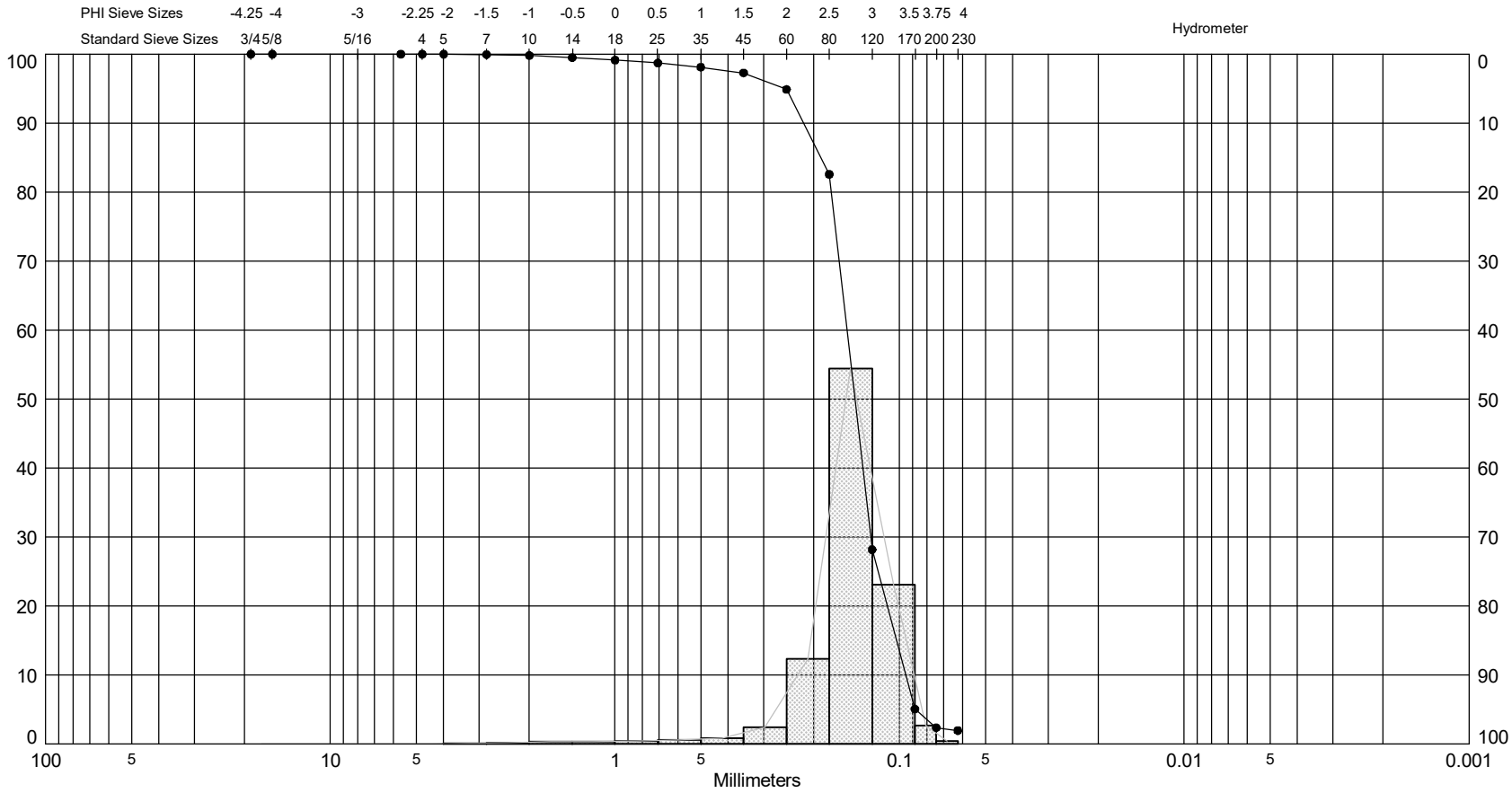
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14.5'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-10**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.27	
Dry Wt. Before Washing (g):	191.55	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.18	99.17	90	1.06
#4	4.750	0.85	98.57	90	0.77
#5	4.000	0.86	97.97	100	0.86
#7	2.800	1.96	96.59	100	1.96
#10	2.000	1.74	95.37	100	1.74
#14	1.400	2.30	93.75	100	2.30
#18	1.000	2.60	91.92	100	2.60
#25	0.710	2.27	90.33	70	1.59
#35	0.500	2.73	88.41	50	1.37
#45	0.355	3.38	86.03	30	1.01
#60	0.250	8.20	80.27	10	0.82
#80	0.180	24.57	63.00	1	0.25
#120	0.125	60.23	20.67	0	0.00
#170	0.090	23.34	4.27	0	0.00
#200	0.075	3.06	2.12	0	0.00
#230	0.063	0.51	1.76	0	0.00
Total Shell Content:		**11**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-10 #A	—●—	-18.4	SP	#200 - 2.35 #230 - 1.95			2.8	2.74	-2.8	17.09	0.56

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,899
Northing (Y, ft):	2,248,988
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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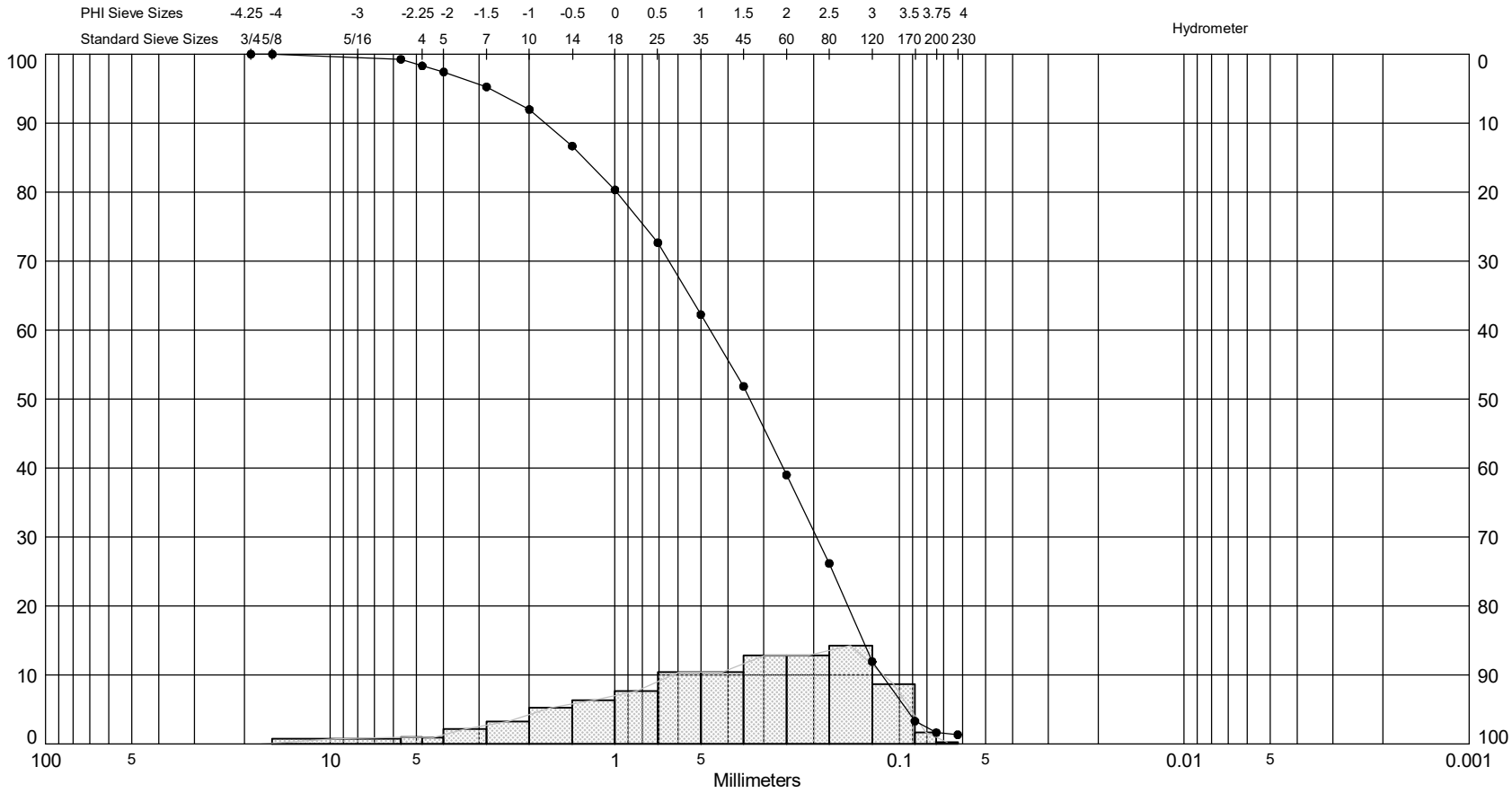
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-10**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.09	
Dry Wt. Before Washing (g):	205.66	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.08	99.95	100	0.08
#10	2.000	0.22	99.81	100	0.22
#14	1.400	0.47	99.51	100	0.47
#18	1.000	0.58	99.14	100	0.58
#25	0.710	0.66	98.72	80	0.53
#35	0.500	0.94	98.12	60	0.56
#45	0.355	1.30	97.29	40	0.52
#60	0.250	3.77	94.88	15	0.57
#80	0.180	19.26	82.58	2	0.39
#120	0.125	85.20	28.16	0	0.00
#170	0.090	36.18	5.05	0	0.00
#200	0.075	4.23	2.35	0	0.00
#230	0.063	0.62	1.95	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-10 #B	—●—	-24.4	SP	#200 - 1.63 #230 - 1.34			1.57	1.3	-0.63	2.81	1.48

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,899
Northing (Y, ft):	2,248,988
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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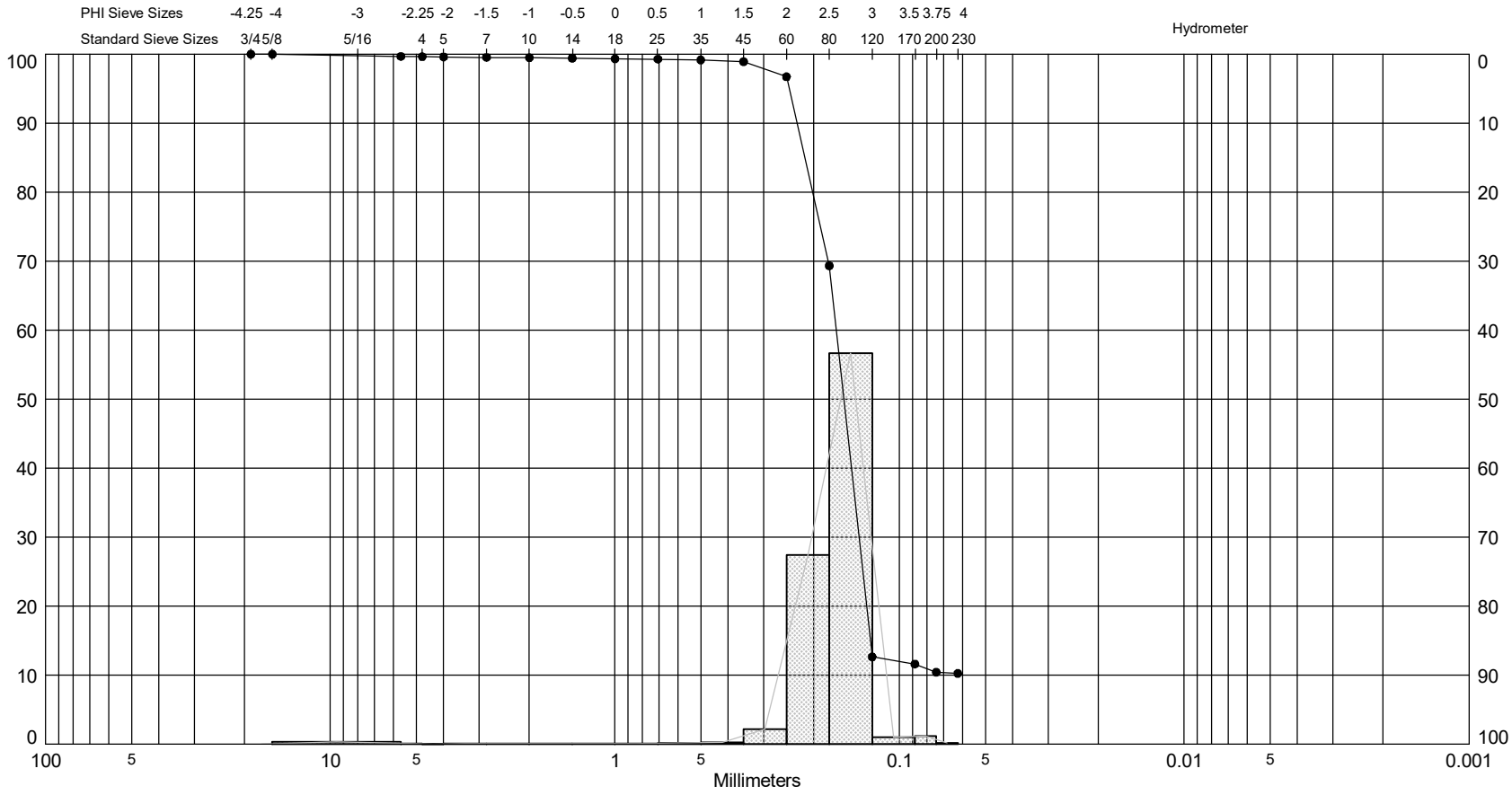
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-10**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.90	
Dry Wt. Before Washing (g):	222.03	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.28	99.26	100	1.28
#4	4.750	1.65	98.30	100	1.65
#5	4.000	1.51	97.42	100	1.51
#7	2.800	3.71	95.27	100	3.71
#10	2.000	5.66	91.98	100	5.66
#14	1.400	9.09	86.70	100	9.09
#18	1.000	10.97	80.32	100	10.97
#25	0.710	13.17	72.67	100	13.17
#35	0.500	17.97	62.23	80	14.38
#45	0.355	17.90	51.83	50	8.95
#60	0.250	22.11	38.99	30	6.63
#80	0.180	22.07	26.17	10	2.21
#120	0.125	24.49	11.94	0	0.00
#170	0.090	14.87	3.30	0	0.00
#200	0.075	2.88	1.63	0	0.00
#230	0.063	0.50	1.34	0	0.00
Total Shell Content:		**46**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-10 #C	—●—	-30.4	SP-SM	#200 - 10.42 #230 - 10.24			2.67	2.55	-6.24	63.51	0.53

Comments: Sample Depth = 13'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	525,899
Northing (Y, ft):	2,248,988
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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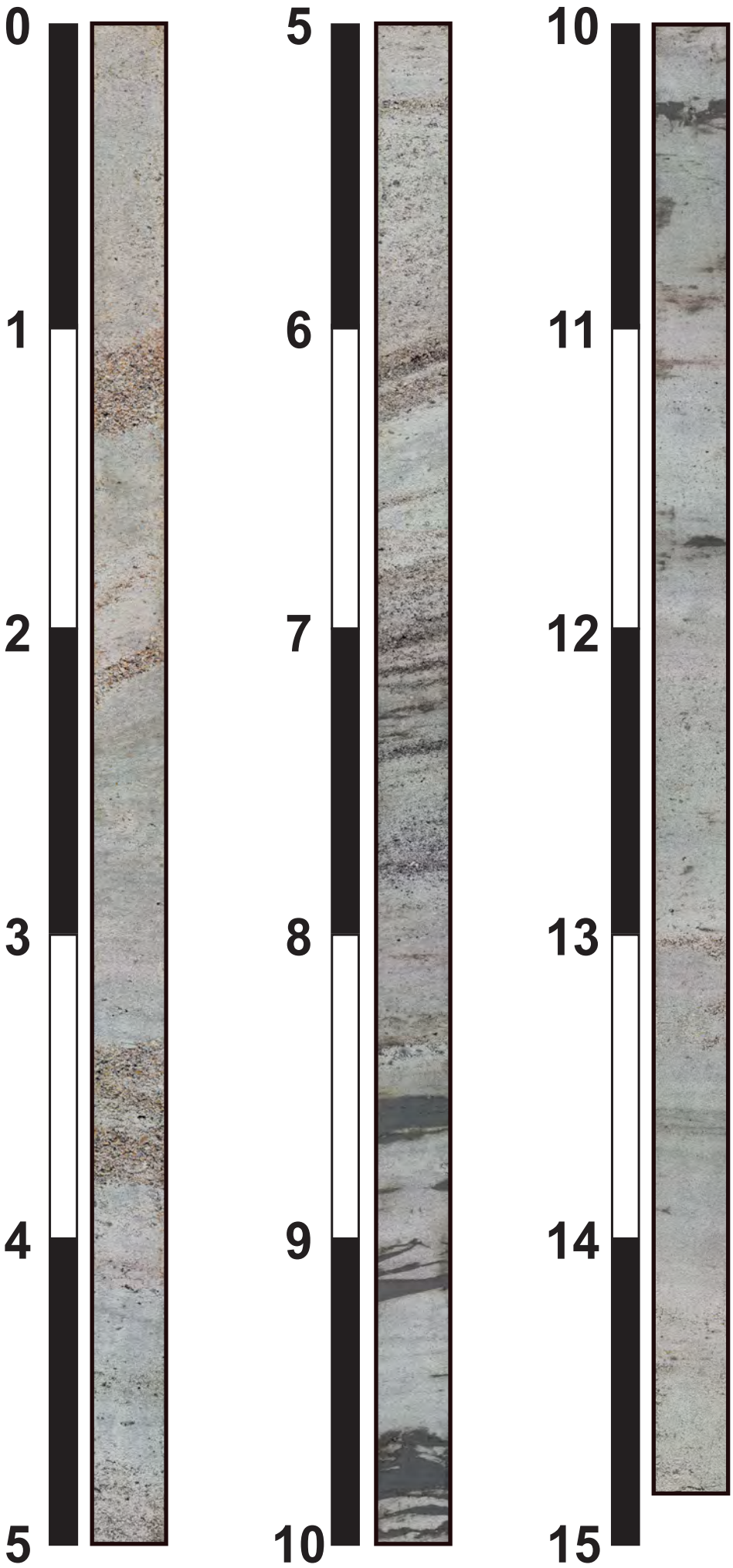
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-10**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.16	
Dry Wt. Before Washing (g):	228.96	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.55	99.69	100	0.55
#4	4.750	0.09	99.64	100	0.09
#5	4.000	0.06	99.61	100	0.06
#7	2.800	0.13	99.54	100	0.13
#10	2.000	0.11	99.47	100	0.11
#14	1.400	0.12	99.41	100	0.12
#18	1.000	0.12	99.34	100	0.12
#25	0.710	0.09	99.29	80	0.07
#35	0.500	0.23	99.16	60	0.14
#45	0.355	0.43	98.92	50	0.22
#60	0.250	3.93	96.72	30	1.18
#80	0.180	48.97	69.33	2	0.98
#120	0.125	101.36	12.65	0	0.00
#170	0.090	1.85	11.61	0	0.00
#200	0.075	2.12	10.43	0	0.00
#230	0.063	0.32	10.25	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-11

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-11

DRILLING LOG

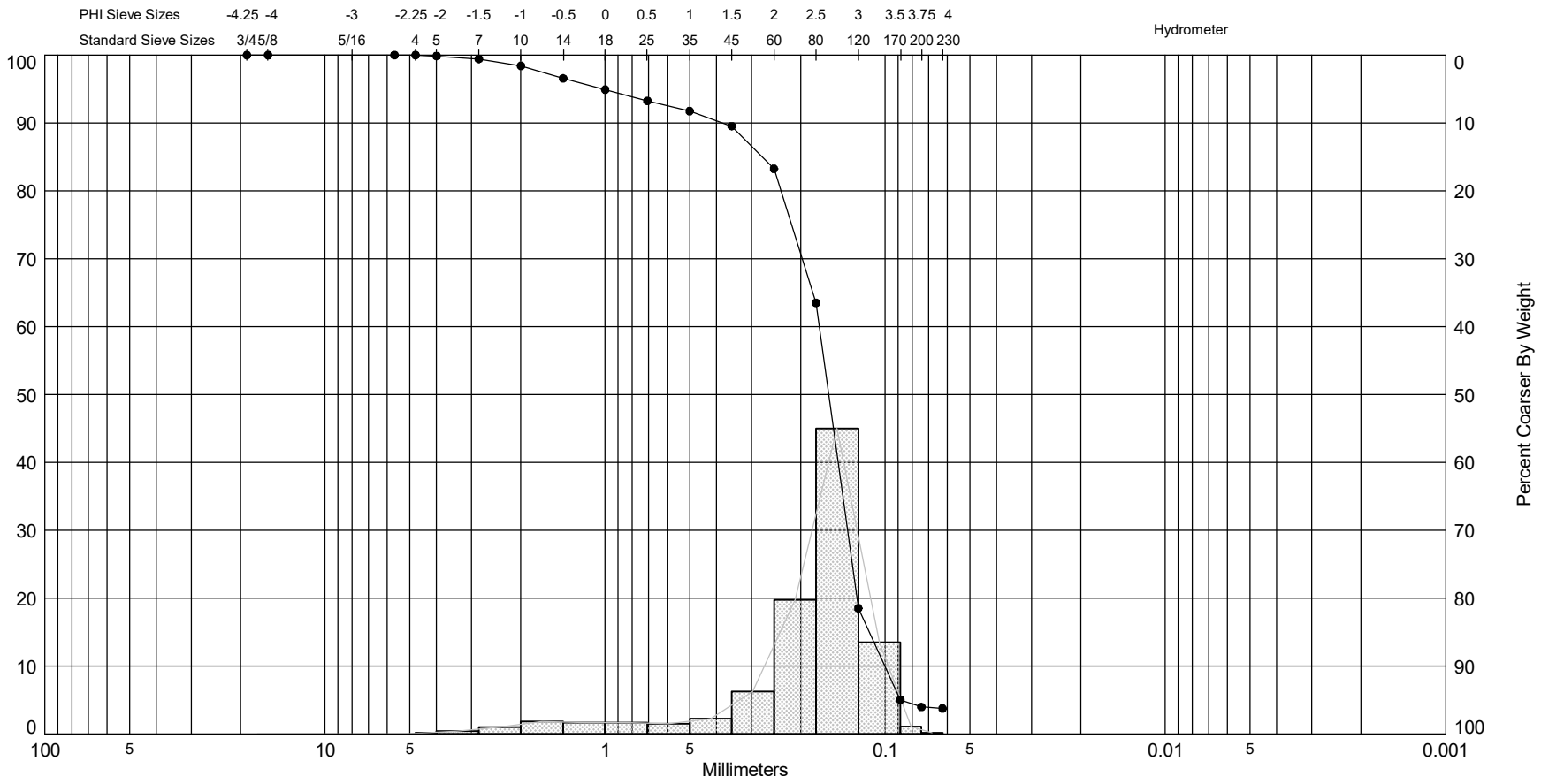
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-11
LOCATION COORDINATES	X = 525,903 Y = 2,248,095
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	10.9 Ft.
15. DATE BORING	STARTED: 03-17-17 15:18 / COMPLETED: 03-17-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-12.4 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	14.8 Ft.
8. TOTAL DEPTH OF BORING	15.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-12.4	0.0					
			Fine quartz SAND, few fine to coarse sand-size shell (primarily in layers at 1.0-1.3', 2.1-2.2', and 3.3-3.8'), trace silt in occasional burrow, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.25, Phi Sorting: 1.19 Shell: 13%, Fines (#200) - 0.79 (SP)
-17.1	4.7					
			Fine to medium quartz SAND, little medium to coarse sand-size shell (notable in layers at 6.1-6.3', 6.8-7.1', and 7.6-7.8'), trace silt in laminations between 7.1-7.3', poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.30, Phi Sorting: 1.68 Shell: 23%, Fines (#200) - 1.65 (SP)
-20.3	7.9					
-20.9	8.5		Fine quartz SAND, trace silt in burrows, trace fine to medium sand-size shell, poorly graded, loose, subangular, gray (5Y-6/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 14.5' Mean (mm): 0.19, Phi Sorting: 0.96 Shell: 8%, Carbonate: 9.4%, Fines (#200) - 3.96 (SP)
-22.4	10.0		Interbedded, fine quartz SAND (SP; light gray [5Y 7/1]) and SILT (ML; dark gray [5Y 4/1]), trace fine to medium sand-size shell, light gray (5Y-7/1), (SM).			
			Fine quartz SAND, trace silt in burrows, trace fine to medium sand-size shell, poorly graded, loose, subangular, gray (5Y-6/1), (SP).		C	Sample #C, Depth = 12.8' - 13.3' Mean (mm): 0.16, Phi Sorting: 0.84 Shell: 4%, Fines (#200) - 1.33 (SP)
-27.2	14.8					
			End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-11 #COMP	—●—	-12.4	SP	#200 - 3.96 #230 - 3.76		9.40	2.65	2.37	-2.21	8.15	0.96

Comments: Sample Interval = 0 - 14.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,903
Northing (Y, ft):	2,248,095
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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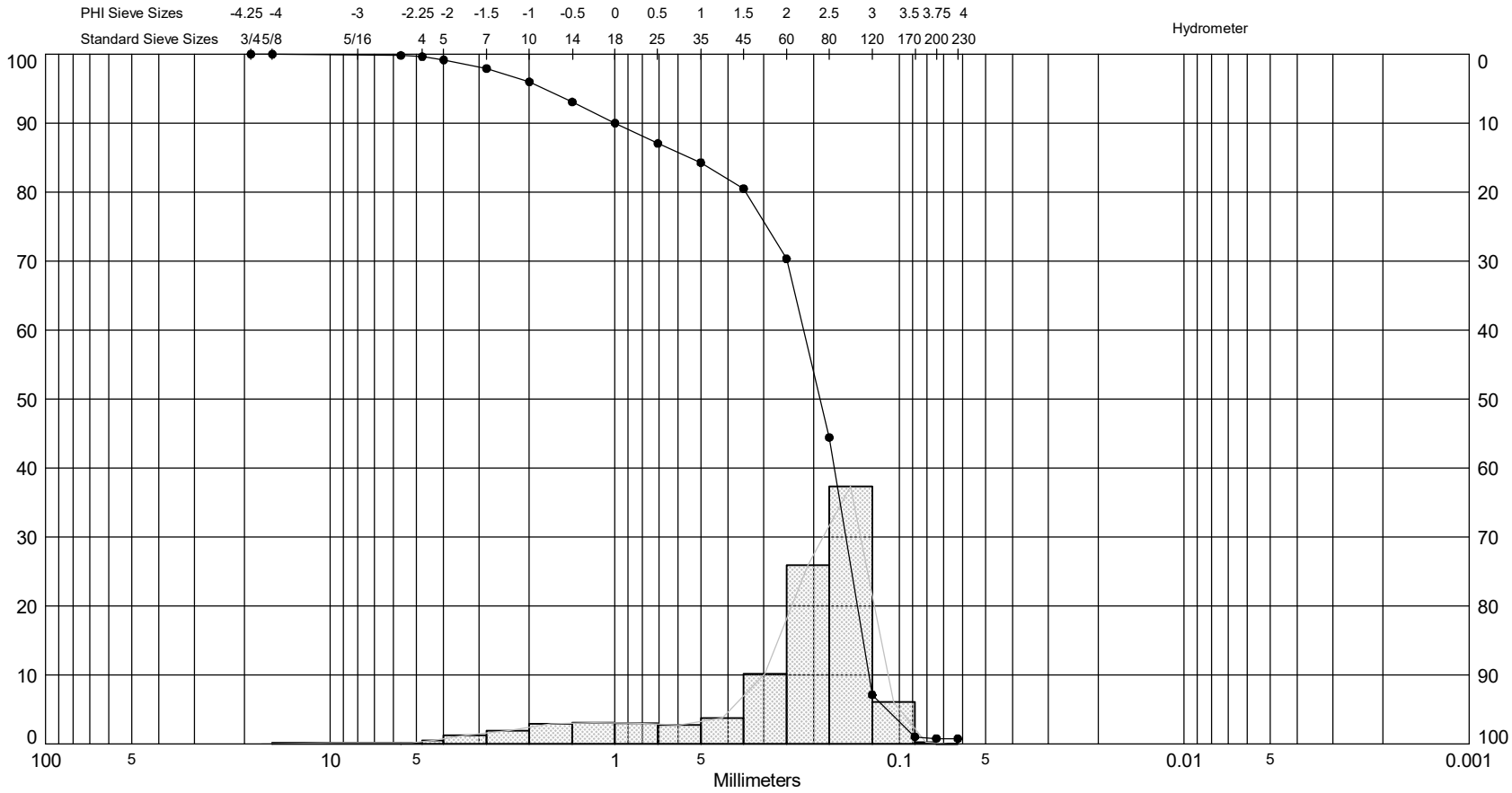
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-11**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.97	
Dry Wt. Before Washing (g):	173.23	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.16	99.87	100	0.16
#7	2.800	0.54	99.43	100	0.54
#10	2.000	1.24	98.43	100	1.24
#14	1.400	2.29	96.57	98	2.24
#18	1.000	2.02	94.93	90	1.82
#25	0.710	2.05	93.27	70	1.44
#35	0.500	1.86	91.76	50	0.93
#45	0.355	2.73	89.54	30	0.82
#60	0.250	7.75	83.25	10	0.78
#80	0.180	24.34	63.51	1	0.24
#120	0.125	55.43	18.54	0	0.00
#170	0.090	16.67	5.01	0	0.00
#200	0.075	1.29	3.97	0	0.00
#230	0.063	0.25	3.76	0	0.00
Total Shell Content:		**8**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-11 #A	—●—	-13.2	SP	#200 - 0.79 #230 - 0.77			2.39	1.99	-1.73	5.49	1.19

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,903
Northing (Y, ft):	2,248,095
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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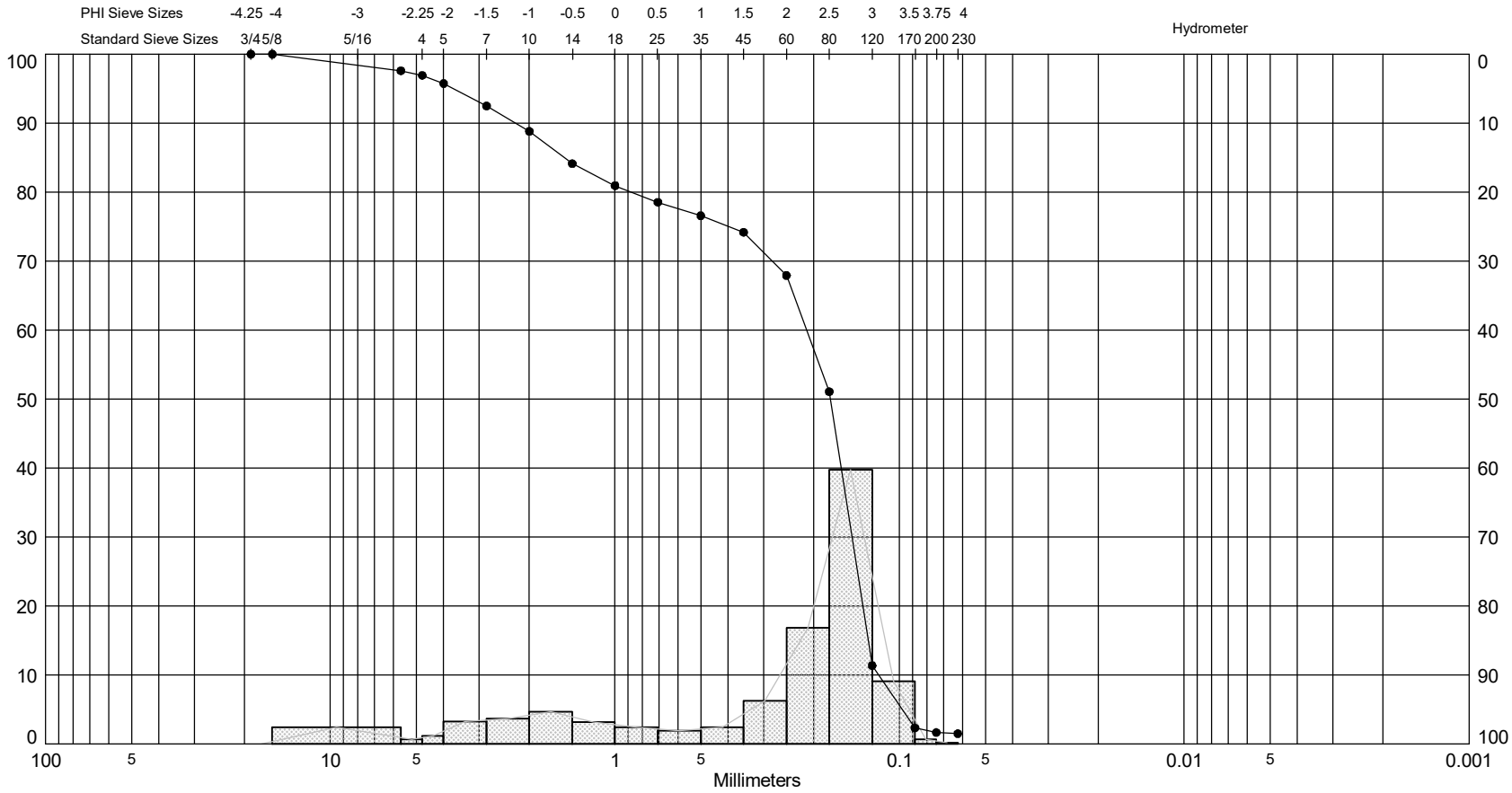
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-11**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.69	
Dry Wt. Before Washing (g):	179.83	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.23	99.82	100	0.23
#4	4.750	0.23	99.65	100	0.23
#5	4.000	0.63	99.16	100	0.63
#7	2.800	1.63	97.91	100	1.63
#10	2.000	2.51	95.98	100	2.51
#14	1.400	3.79	93.07	98	3.71
#18	1.000	3.98	90.01	90	3.58
#25	0.710	3.85	87.05	50	1.93
#35	0.500	3.60	84.29	30	1.08
#45	0.355	4.92	80.51	20	0.98
#60	0.250	13.22	70.35	1	0.13
#80	0.180	33.70	44.45	0	0.00
#120	0.125	48.57	7.13	0	0.00
#170	0.090	7.93	1.04	0	0.00
#200	0.075	0.31	0.80	0	0.00
#230	0.063	0.02	0.78	0	0.00
Total Shell Content:		**13**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-11 #B	—●—	-19.2	SP	#200 - 1.65 #230 - 1.48			2.51	1.72	-1.4	3.79	1.68

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,903
Northing (Y, ft):	2,248,095
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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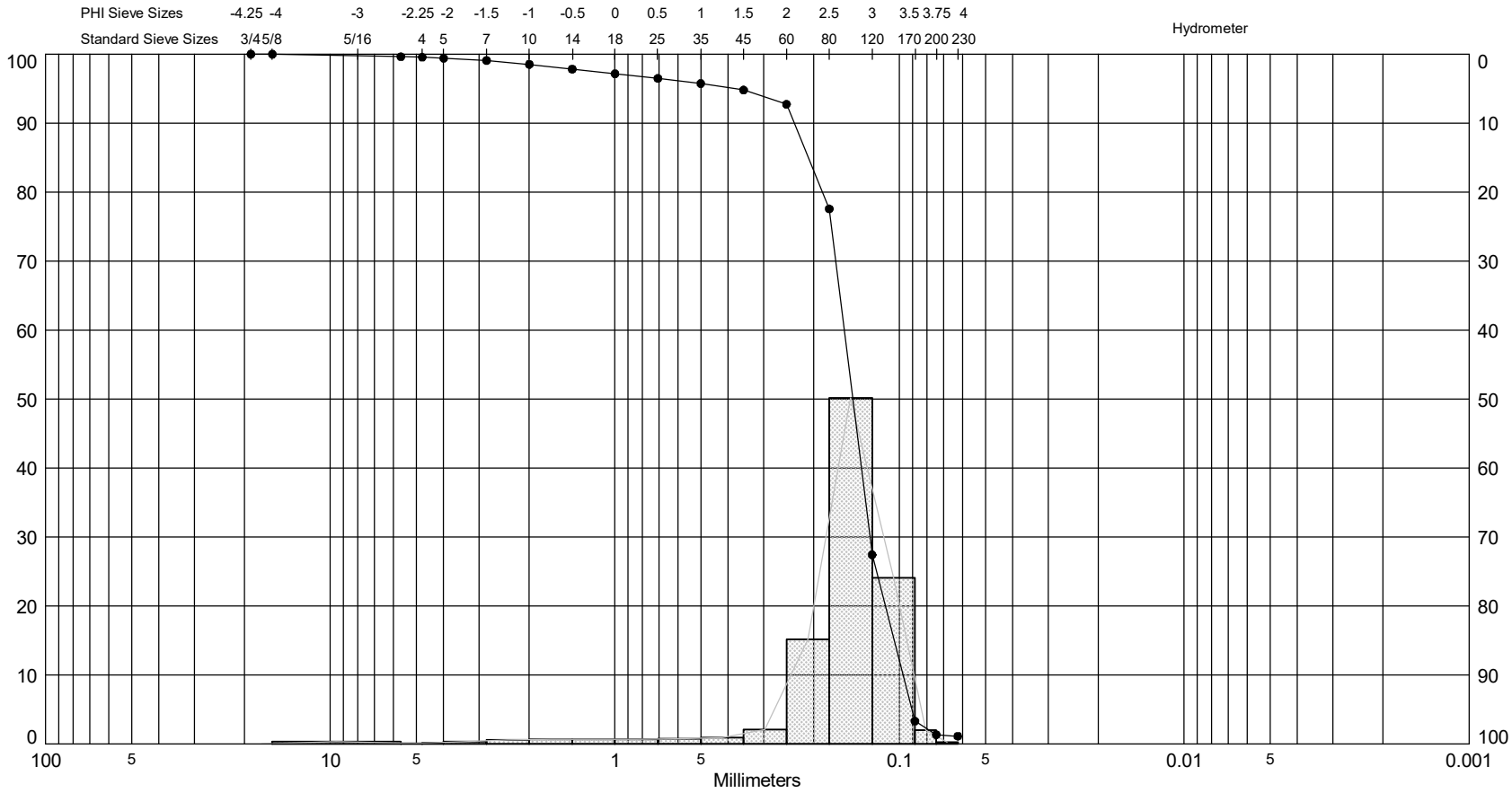
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-11**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.80	
Dry Wt. Before Washing (g):	197.59	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.50	97.60	100	3.50
#4	4.750	0.97	96.93	100	0.97
#5	4.000	1.74	95.74	100	1.74
#7	2.800	4.74	92.49	100	4.74
#10	2.000	5.36	88.81	100	5.36
#14	1.400	6.83	84.13	98	6.69
#18	1.000	4.63	80.95	90	4.17
#25	0.710	3.52	78.54	70	2.46
#35	0.500	2.84	76.59	50	1.42
#45	0.355	3.51	74.18	30	1.05
#60	0.250	9.13	67.92	10	0.91
#80	0.180	24.57	51.07	1	0.25
#120	0.125	57.90	11.35	0	0.00
#170	0.090	13.19	2.30	0	0.00
#200	0.075	0.96	1.65	0	0.00
#230	0.063	0.25	1.47	0	0.00
Total Shell Content:		**23**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-11 #C	—●—	-25.2	SP	#200 - 1.33 #230 - 1.12			2.77	2.63	-3.6	19.75	0.84

Comments: Sample Depth = 13'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,903
Northing (Y, ft):	2,248,095
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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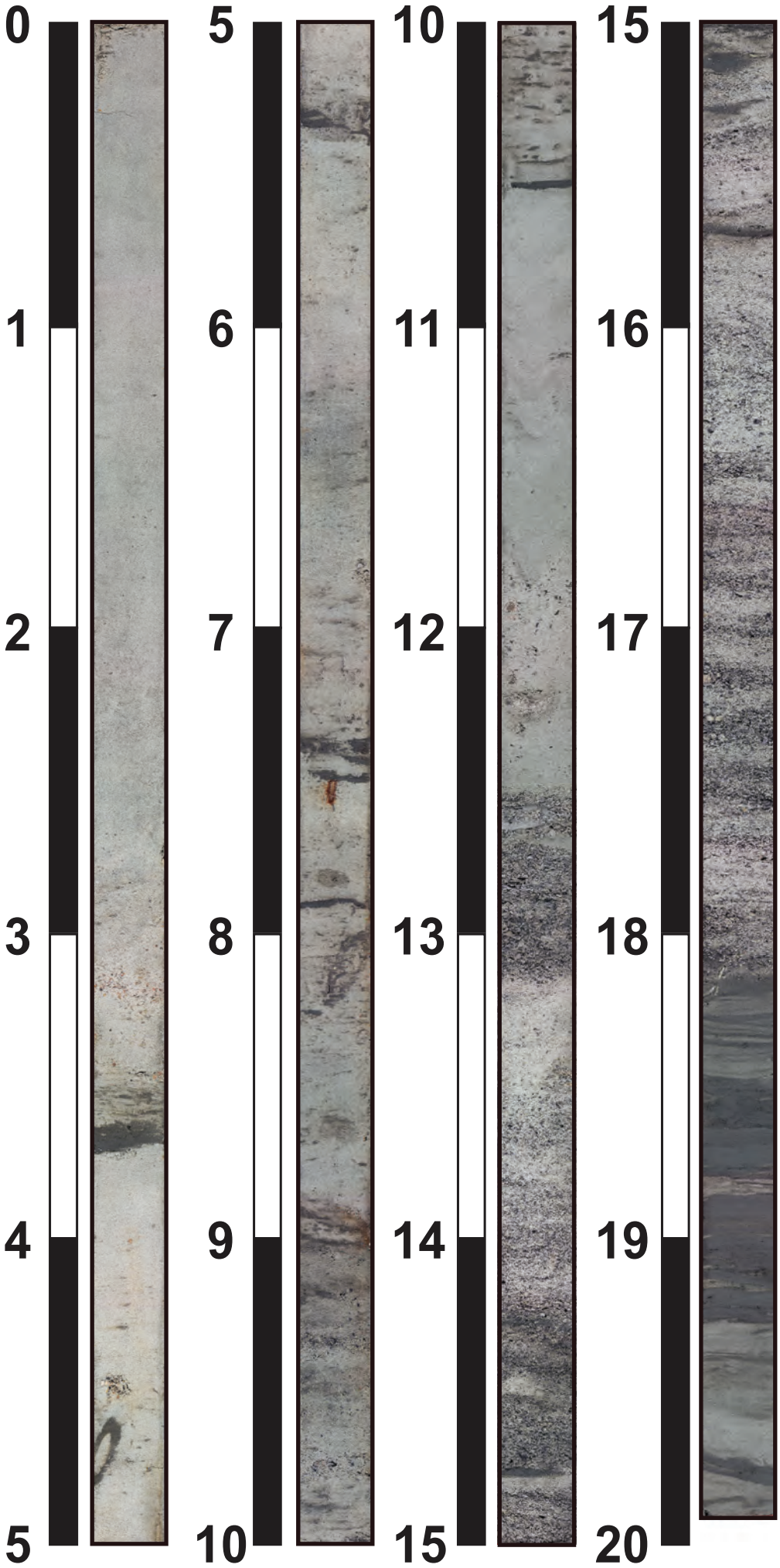
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-11**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.93	
Dry Wt. Before Washing (g):	169.47	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.44	99.63	100	0.44
#4	4.750	0.10	99.55	100	0.10
#5	4.000	0.18	99.40	100	0.18
#7	2.800	0.38	99.08	100	0.38
#10	2.000	0.66	98.53	100	0.66
#14	1.400	0.83	97.83	98	0.81
#18	1.000	0.80	97.16	80	0.64
#25	0.710	0.81	96.49	60	0.49
#35	0.500	0.90	95.73	30	0.27
#45	0.355	1.12	94.80	20	0.22
#60	0.250	2.48	92.72	5	0.12
#80	0.180	18.14	77.55	1	0.18
#120	0.125	59.94	27.41	0	0.00
#170	0.090	28.83	3.29	0	0.00
#200	0.075	2.35	1.32	0	0.00
#230	0.063	0.25	1.11	0	0.00
Total Shell Content:		**4**		**%**	



Nassau Sound
Florida
2016 - 2017

C-12

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-12

DRILLING LOG

CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	C-12
LOCATION COORDINATES	X = 526,611 Y = 2,248,984
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL / BEARING	
14. WATER DEPTH	14.8 Ft.
15. DATE BORING	STARTED: 02-21-17 10:13 / COMPLETED: 02-21-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-17.4 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	19.8 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-17.4	0.0					
			Fine quartz SAND, trace fine to medium sand-size shell fragments (shell percentage increases with depth to approximately 10%), trace silt, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.14, Phi Sorting: 0.45 Shell: 2%, Fines (#200) - 1.23 (SP)
-20.8	3.4					
-21.0	3.7		Silty fine quartz SAND grading to fine sandy SILT, gray (5Y-5/1), (SP-SM).			
-22.7	5.3		Fine quartz SAND, trace fine sand-size shell fragments, trace silt in burrows, poorly graded, subangular, loose, 4.6' = silt-lined callianassa major (mud shrimp) burrow, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.14, Phi Sorting: 0.57 Shell: 3%, Fines (#200) - 1.35 (SP)
			Fine quartz SAND, trace to few silt in burrows and laminations, trace fine to medium sand-size shell fragments, poorly graded, subangular, loose, 8.2' = silt-lined callianassa major (mud shrimp) burrow; color grades to light olive gray (5Y 6/2) from, light gray (5Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 18.0' Mean (mm): 0.21, Phi Sorting: 1.33 Shell: 14%, Carbonate: 12.1%, Fines (#200) - 1.56 (SP)
-28.0	10.6					
-29.9	12.5		Fine quartz SAND, trace fine to medium sand-size shell (shell percentage increases to approximately 10-15% at 11.75'), trace silt, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).			
			Medium quartz SAND, little coarse sand to fine gravel-size shell fragments, trace to few silt in laminations and burrows, poorly graded, subangular, loose, gray (5Y-6/1), (SP).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 0.50, Phi Sorting: 1.41 Shell: 43%, Fines (#200) - 1.31 (SP)
-35.6	18.2					
-37.1	19.8		Silty fine quartz SAND, little silt (primarily in laminations), trace fine sand-size shell, soft/loose, gray (5Y-5/1), (SM).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

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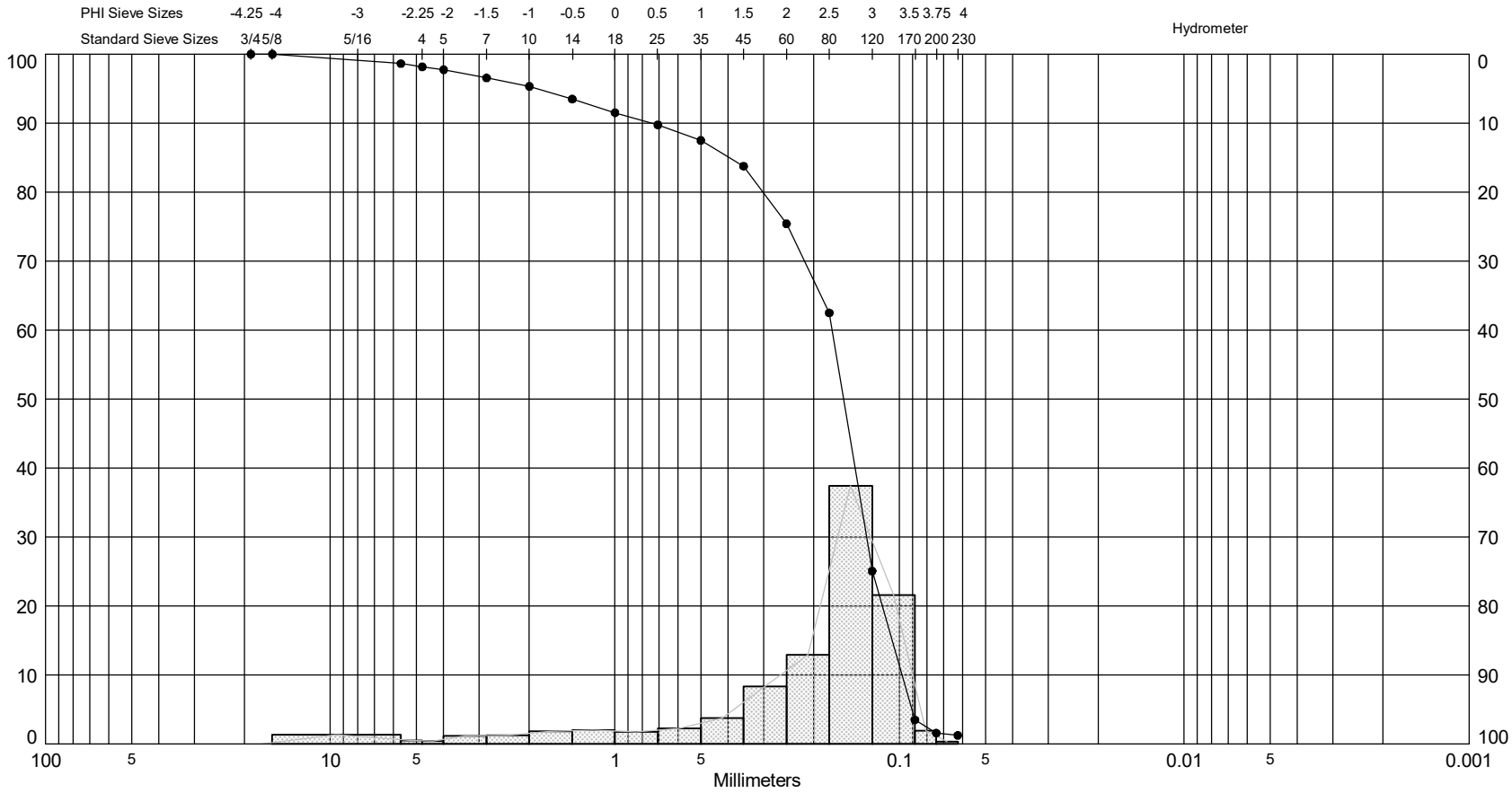

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-12 #COMP	—●—	-17.4	SP	#200 - 1.56 #230 - 1.23		12.10	2.67	2.23	-2.13	7.56	1.33

Comments: Sample Interval = 0 - 18.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,611
Northing (Y, ft):	2,248,984
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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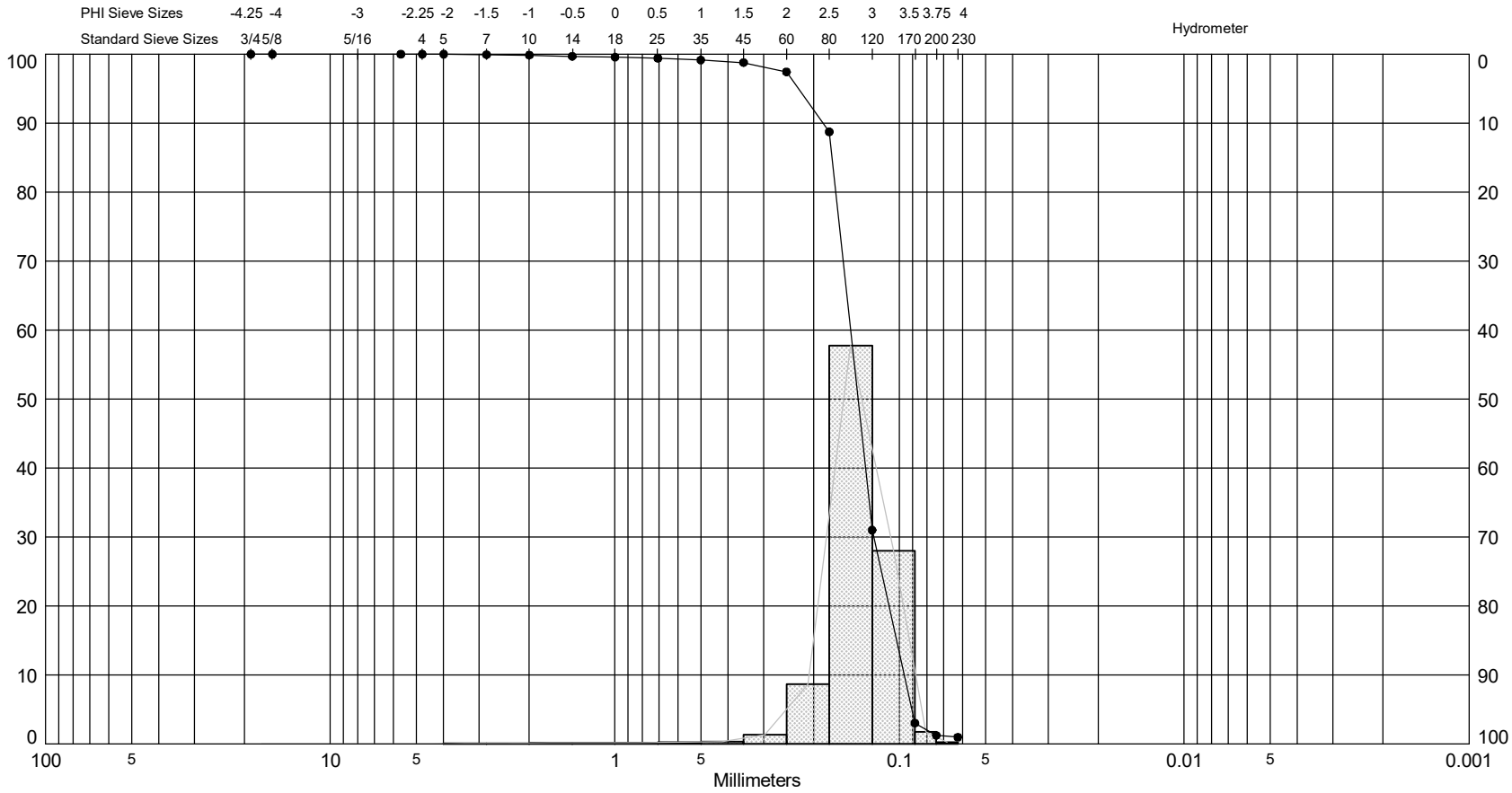
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-18'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-12**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	50.20	
Dry Wt. Before Washing (g):	220.69	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.34	98.63	100	2.34
#4	4.750	0.78	98.17	100	0.78
#5	4.000	0.73	97.74	100	0.73
#7	2.800	2.03	96.55	100	2.03
#10	2.000	2.07	95.34	100	2.07
#14	1.400	3.16	93.48	100	3.16
#18	1.000	3.36	91.51	100	3.36
#25	0.710	3.02	89.74	70	2.11
#35	0.500	3.86	87.48	50	1.93
#45	0.355	6.34	83.76	40	2.54
#60	0.250	14.25	75.40	20	2.85
#80	0.180	22.04	62.47	2	0.44
#120	0.125	63.82	25.04	0	0.00
#170	0.090	36.77	3.47	0	0.00
#200	0.075	3.28	1.55	0	0.00
#230	0.063	0.57	1.21	0	0.00
Total Shell Content:		**14**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-12 #A	—●—	-18.2	SP	#200 - 1.23 #230 - 0.96			2.84	2.82	-3.13	25.36	0.45

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,611
Northing (Y, ft):	2,248,984
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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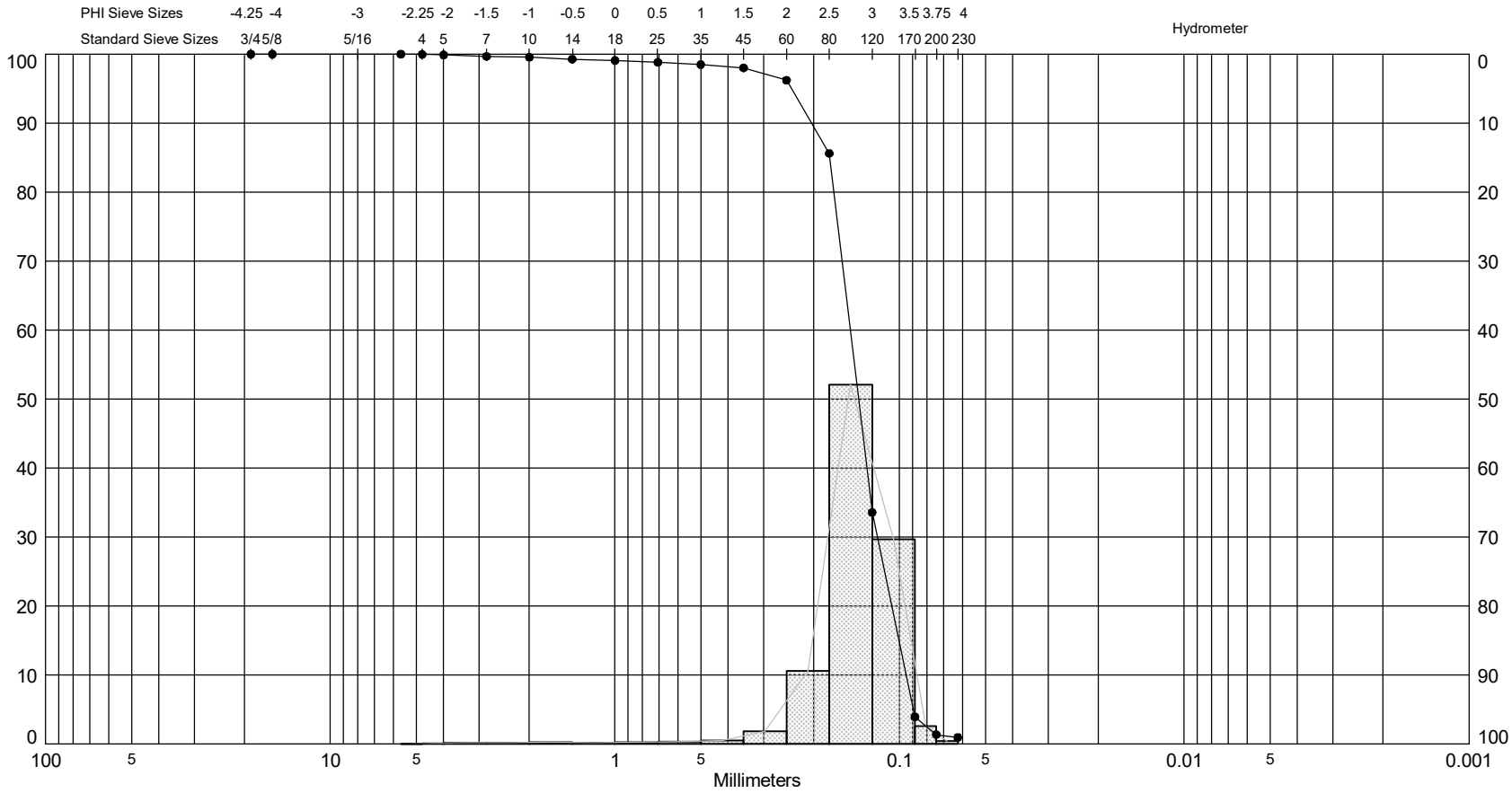
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-12**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.64	
Dry Wt. Before Washing (g):	199.95	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.09	99.94	100	0.09
#10	2.000	0.11	99.87	100	0.11
#14	1.400	0.25	99.70	100	0.25
#18	1.000	0.19	99.57	100	0.19
#25	0.710	0.24	99.41	80	0.19
#35	0.500	0.39	99.14	60	0.23
#45	0.355	0.53	98.79	40	0.21
#60	0.250	2.00	97.44	20	0.40
#80	0.180	12.91	88.73	10	1.29
#120	0.125	85.64	30.99	0	0.00
#170	0.090	41.49	3.01	0	0.00
#200	0.075	2.65	1.23	0	0.00
#230	0.063	0.40	0.96	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-12 #B	—●—	-24.2	SP	#200 - 1.35 #230 - 0.95			2.84	2.8	-3.7	26.59	0.57

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,611
Northing (Y, ft):	2,248,984
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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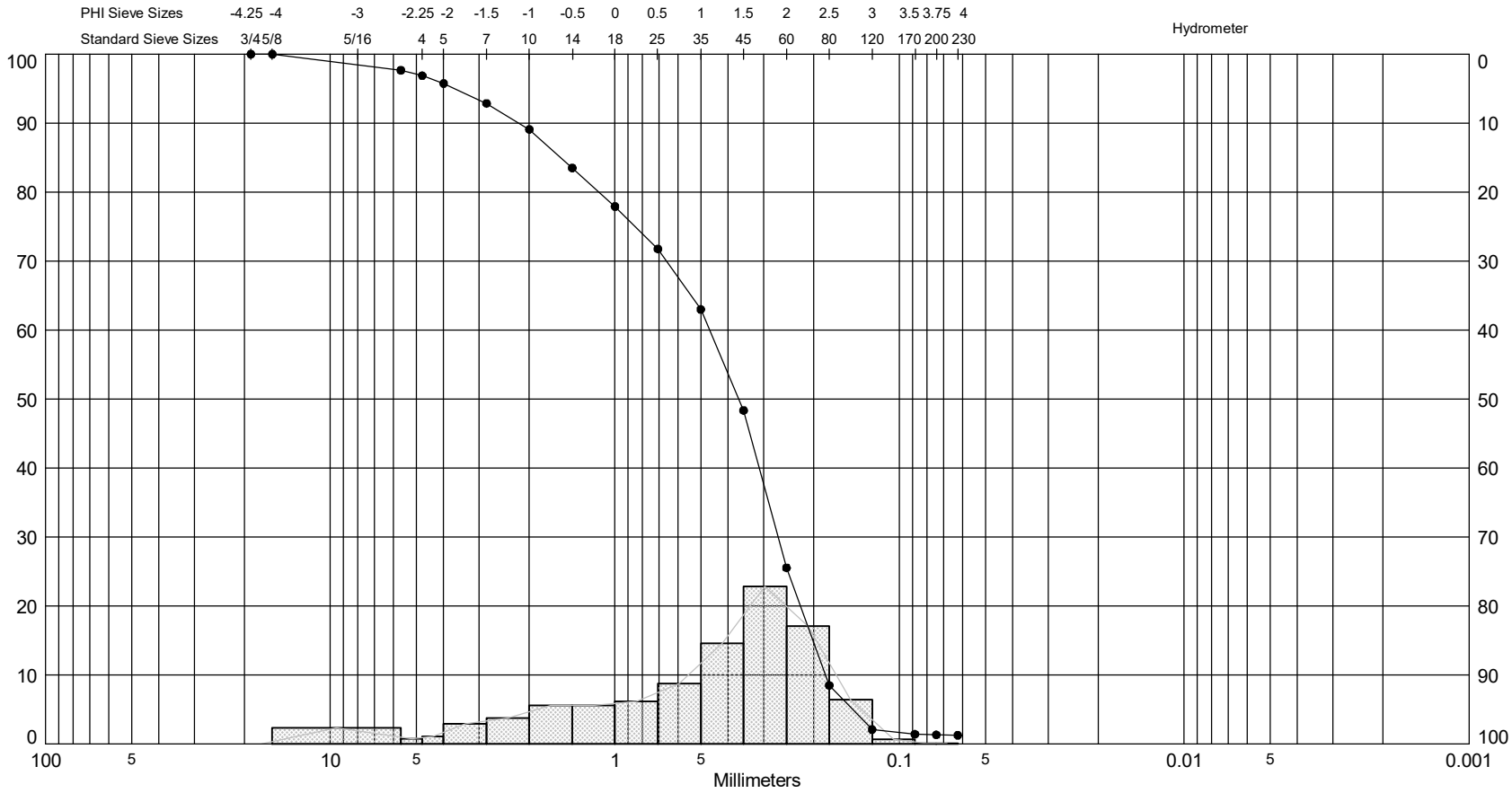
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-12**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.23	
Dry Wt. Before Washing (g):	170.31	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.04	99.97	100	0.04
#5	4.000	0.10	99.88	100	0.10
#7	2.800	0.24	99.68	100	0.24
#10	2.000	0.16	99.55	100	0.16
#14	1.400	0.34	99.27	100	0.34
#18	1.000	0.24	99.07	100	0.24
#25	0.710	0.32	98.80	80	0.26
#35	0.500	0.39	98.48	60	0.23
#45	0.355	0.56	98.01	40	0.22
#60	0.250	2.17	96.20	30	0.65
#80	0.180	12.72	85.61	10	1.27
#120	0.125	62.51	33.55	0	0.00
#170	0.090	35.60	3.91	0	0.00
#200	0.075	3.07	1.35	0	0.00
#230	0.063	0.48	0.95	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-12 #C	—●—	-31.2	SP	#200 - 1.31 #230 - 1.26			1.44	0.99	-1.06	3.61	1.41

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,611
Northing (Y, ft):	2,248,984
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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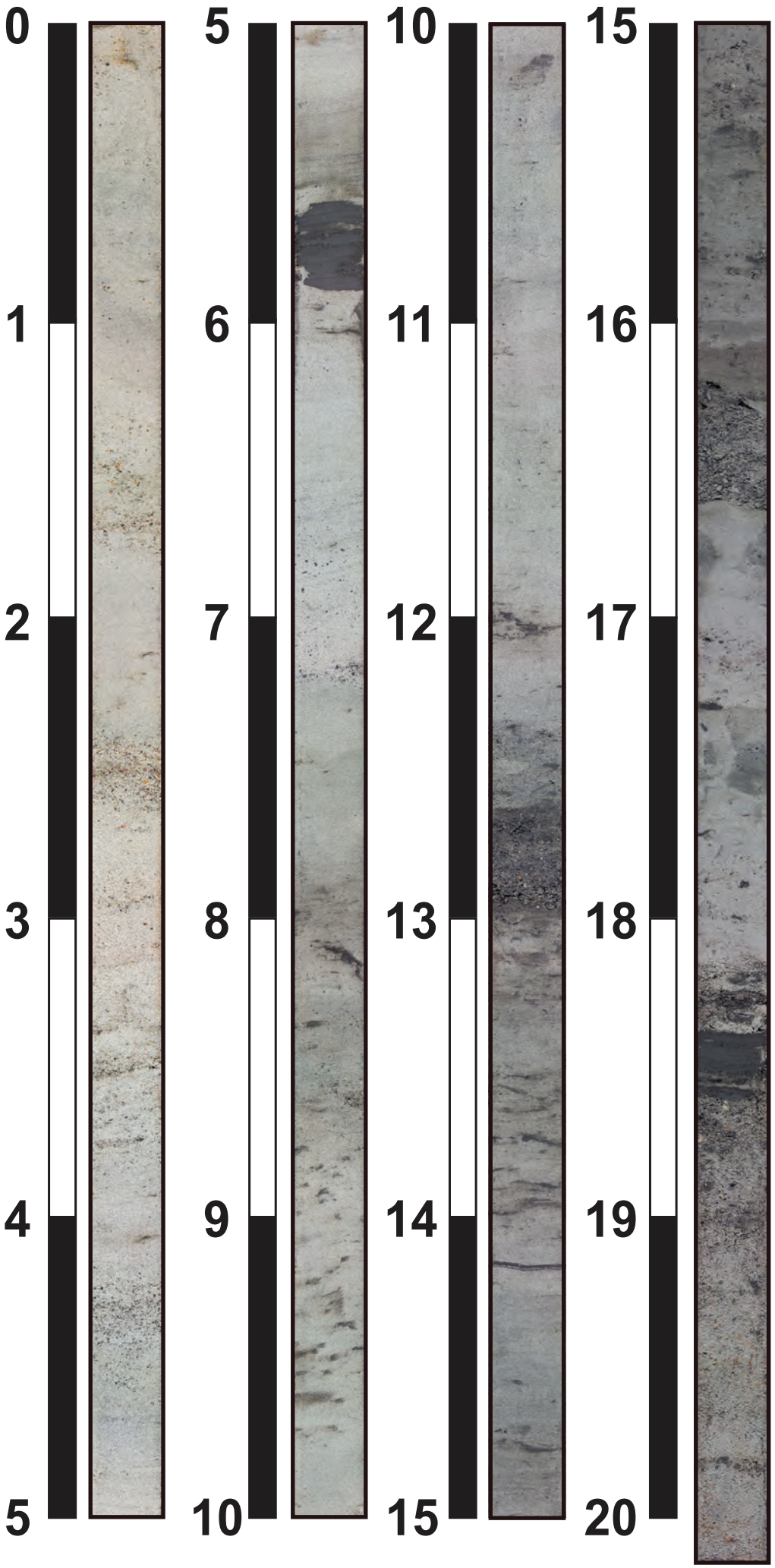
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-12**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) Gley1 7/N**		

Tare Weight, (g):	50.17	
Dry Wt. Before Washing (g):	218.55	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.94	97.66	100	3.94
#4	4.750	1.32	96.88	100	1.32
#5	4.000	1.88	95.76	100	1.88
#7	2.800	4.87	92.87	100	4.87
#10	2.000	6.35	89.10	100	6.35
#14	1.400	9.41	83.51	100	9.41
#18	1.000	9.43	77.91	100	9.43
#25	0.710	10.34	71.77	90	9.31
#35	0.500	14.80	62.98	70	10.36
#45	0.355	24.61	48.36	50	12.31
#60	0.250	38.42	25.54	10	3.84
#80	0.180	28.73	8.48	0	0.00
#120	0.125	10.78	2.08	0	0.00
#170	0.090	1.14	1.40	0	0.00
#200	0.075	0.15	1.31	0	0.00
#230	0.063	0.09	1.26	0	0.00
Total Shell Content:		**43**		**%**	



Nassau Sound
Florida
2016 - 2017

C-13

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-13

DRILLING LOG

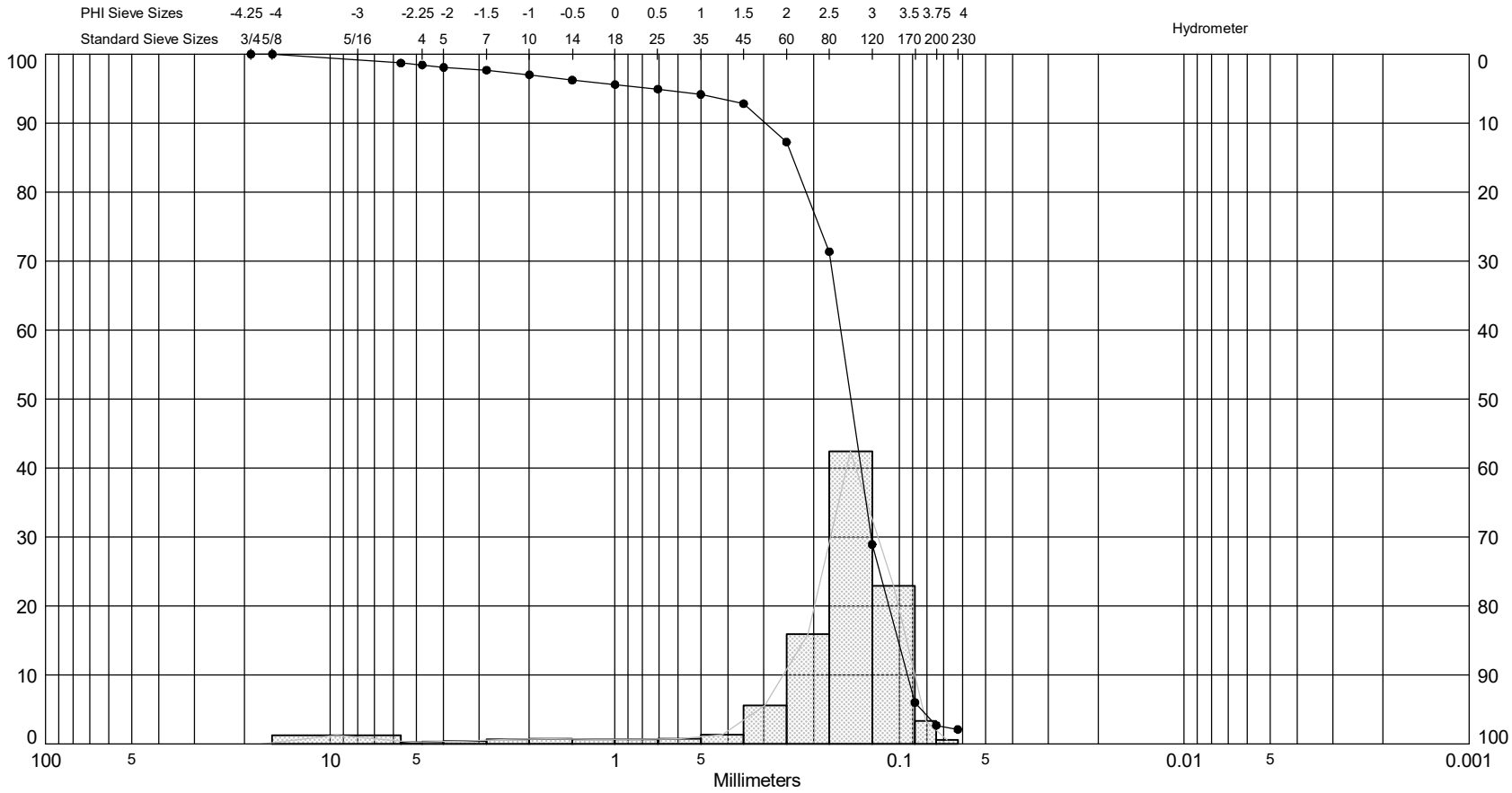
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-13
LOCATION COORDINATES	X = 526,637 Y = 2,248,115
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	21.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	12.9 Ft.
15. DATE BORING	STARTED: 02-21-17 14:12 / COMPLETED: 02-21-17
16. ELEVATION TOP OF BORING	-12.0 Ft.
17. TOTAL RECOVERY FOR BORING	20.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-12.0	0.0				
		Fine quartz SAND, trace fine to medium sand-size shell fragments (in layers), trace silt in occasional burrows, poorly graded, subangular, loose, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 1.8' - 2.3' Mean (mm): 0.15, Phi Sorting: 0.41 Shell: 1%, Fines (#200) - 0.91 (SP)
-17.6	5.6				
-17.9	5.9	Fine sandy SILT, little fine quartz sand in burrows and laminations, soft, dark gray (5Y-4/1), (ML).			
-19.5	7.5	Fine quartz SAND, trace medium sand-size shell fragments, trace silt, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).			
		Fine quartz SAND, trace silt in burrows, poorly graded, subangular, loose; color grades to light gray (5Y 7/1) from, gray (5Y-6/1), (SP).		B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 0.14, Phi Sorting: 0.50 Shell: 3%, Fines (#200) - 1.43 (SP)
-24.6	12.6			COMP	Sample #COMP, Depth = 0.0' - 20.2' Mean (mm): 0.18, Phi Sorting: 1.10 Shell: 7%, Carbonate: 6.6%, Fines (#200) - 2.69 (SP)
-25.0	13.0	Silty fine to medium SAND, little silt, little fine to coarse sand-size shell fragments, loose, olive gray (5Y-5/2), (SM).			
-28.2	16.3	Fine quartz SAND, trace to grading to few silt in burrows and laminations, trace medium sand to fine gravel-size shell fragments (primarily below 15'), poorly graded, subangular, loose, gray (5Y-6/1), (SP-SM).			Sample #C, Depth = 16.8' - 17.3' Mean (mm): 0.20, Phi Sorting: 1.22 Shell: 5%, Fines (#200) - 1.72 (SP)
-28.6	16.6	Fine to medium quartz SAND, some medium sand to fine gravel-size shell fragments, trace silt, well graded, subangular, loose, light olive gray (5Y-6/2), (SW).		C	
-30.2	18.3				
-30.6	18.6	Fine quartz SAND, trace silt in burrows, trace medium to coarse sand-size shell fragments, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).			
-32.2	20.2	Fine sandy SILT, little fine quartz sand in laminations, soft/loose, dark gray (5Y-4/1), (ML).			
		Fine to medium quartz SAND, few medium to coarse sand-size shell fragments, trace silt in burrows, poorly graded, subangular, loose, light gray (5Y-7/2), (SP).			
		End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-13 #COMP	—●—	-12.0	SP	#200 - 2.69 #230 - 2.10		6.60	2.75	2.51	-3.2	14.96	1.1

Comments: Sample Interval = 0 - 20.2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,637
Northing (Y, ft):	2,248,115
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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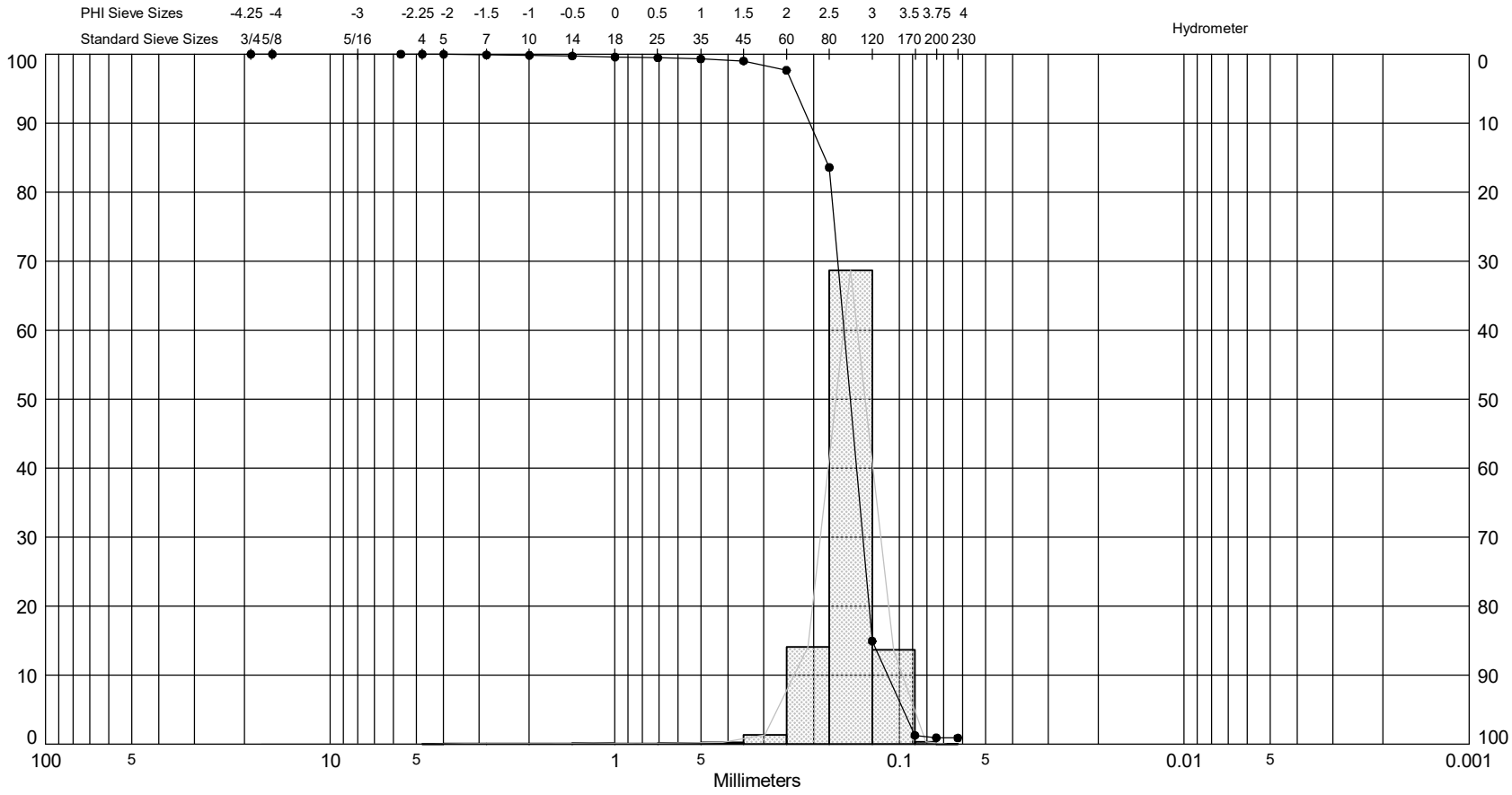
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-20.2'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-13**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 2.5Y 7/1**		

Tare Weight, (g):	51.64	
Dry Wt. Before Washing (g):	214.38	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.10	98.71	100	2.10
#4	4.750	0.43	98.45	100	0.43
#5	4.000	0.58	98.09	100	0.58
#7	2.800	0.67	97.68	100	0.67
#10	2.000	1.07	97.02	100	1.07
#14	1.400	1.27	96.24	100	1.27
#18	1.000	1.04	95.60	100	1.04
#25	0.710	1.08	94.94	80	0.86
#35	0.500	1.26	94.16	70	0.88
#45	0.355	2.20	92.81	50	1.10
#60	0.250	9.03	87.26	20	1.81
#80	0.180	25.87	71.37	0	0.00
#120	0.125	69.09	28.91	0	0.00
#170	0.090	37.28	6.00	0	0.00
#200	0.075	5.41	2.68	0	0.00
#230	0.063	0.96	2.09	0	0.00
Total Shell Content:		**7**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-13 #A	—●—	-13.8	SP	#200 - 0.91 #230 - 0.88			2.74	2.71	-3.94	36.91	0.41

Comments: Sample Depth = 2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,637
Northing (Y, ft):	2,248,115
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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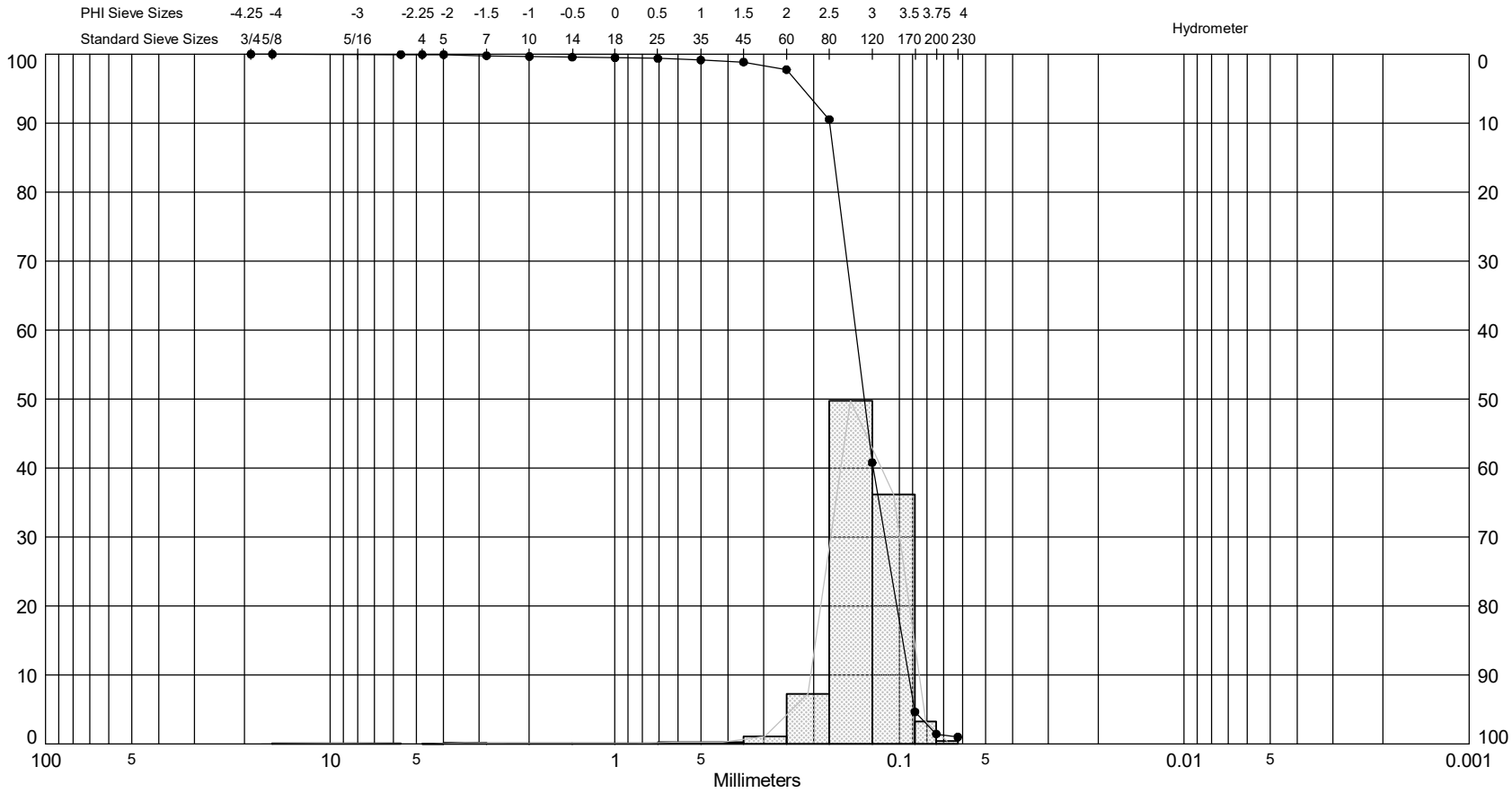
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**2'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-13**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 2.5Y 8/1**		

Tare Weight, (g):	49.50	
Dry Wt. Before Washing (g):	204.05	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.03	99.98	100	0.03
#7	2.800	0.14	99.89	100	0.14
#10	2.000	0.10	99.83	90	0.09
#14	1.400	0.15	99.73	100	0.15
#18	1.000	0.23	99.58	100	0.23
#25	0.710	0.17	99.47	70	0.12
#35	0.500	0.24	99.31	50	0.12
#45	0.355	0.45	99.02	30	0.14
#60	0.250	2.09	97.67	15	0.31
#80	0.180	21.76	83.59	0	0.00
#120	0.125	106.10	14.94	0	0.00
#170	0.090	21.13	1.27	0	0.00
#200	0.075	0.56	0.91	0	0.00
#230	0.063	0.05	0.87	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-13 #B	—●—	-21.8	SP	#200 - 1.43 #230 - 0.99			2.91	2.88	-4.15	38.15	0.5

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,637
Northing (Y, ft):	2,248,115
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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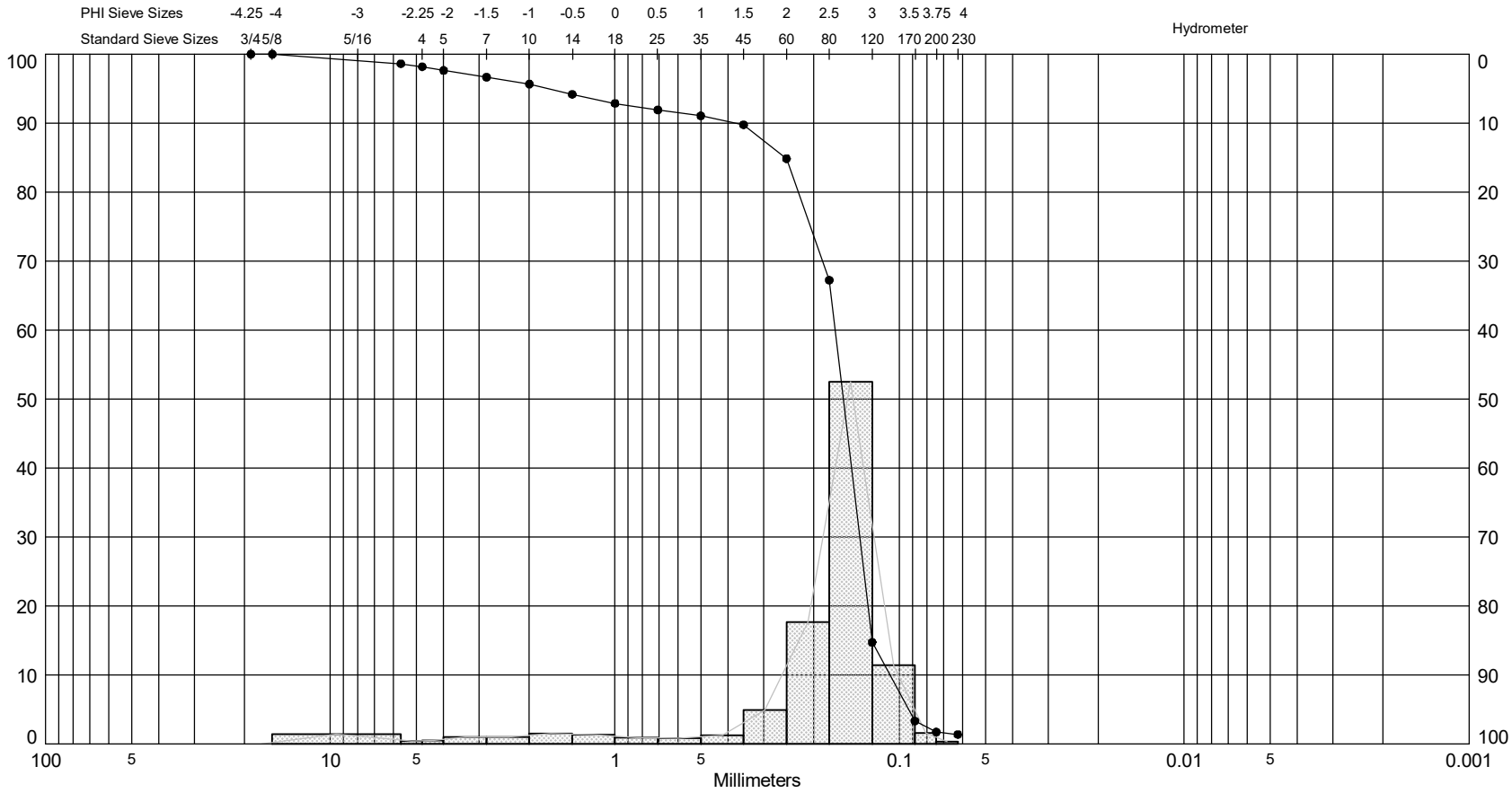
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-13**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 2.5Y 7/1**		

Tare Weight, (g):	50.74	
Dry Wt. Before Washing (g):	196.54	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.08	99.95	100	0.08
#4	4.750	0.00	99.95	0	0.00
#5	4.000	0.01	99.94	100	0.01
#7	2.800	0.24	99.77	100	0.24
#10	2.000	0.18	99.65	100	0.18
#14	1.400	0.15	99.55	100	0.15
#18	1.000	0.09	99.49	100	0.09
#25	0.710	0.17	99.37	100	0.17
#35	0.500	0.34	99.14	80	0.27
#45	0.355	0.42	98.85	60	0.25
#60	0.250	1.59	97.76	50	0.80
#80	0.180	10.54	90.53	20	2.11
#120	0.125	72.53	40.78	0	0.00
#170	0.090	52.70	4.64	0	0.00
#200	0.075	4.68	1.43	0	0.00
#230	0.063	0.64	0.99	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-13 #C	—●—	-28.8	SP	#200 - 1.72 #230 - 1.37			2.66	2.32	-2.79	10.95	1.22

Comments: Sample Depth = 17'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	526,637
Northing (Y, ft):	2,248,115
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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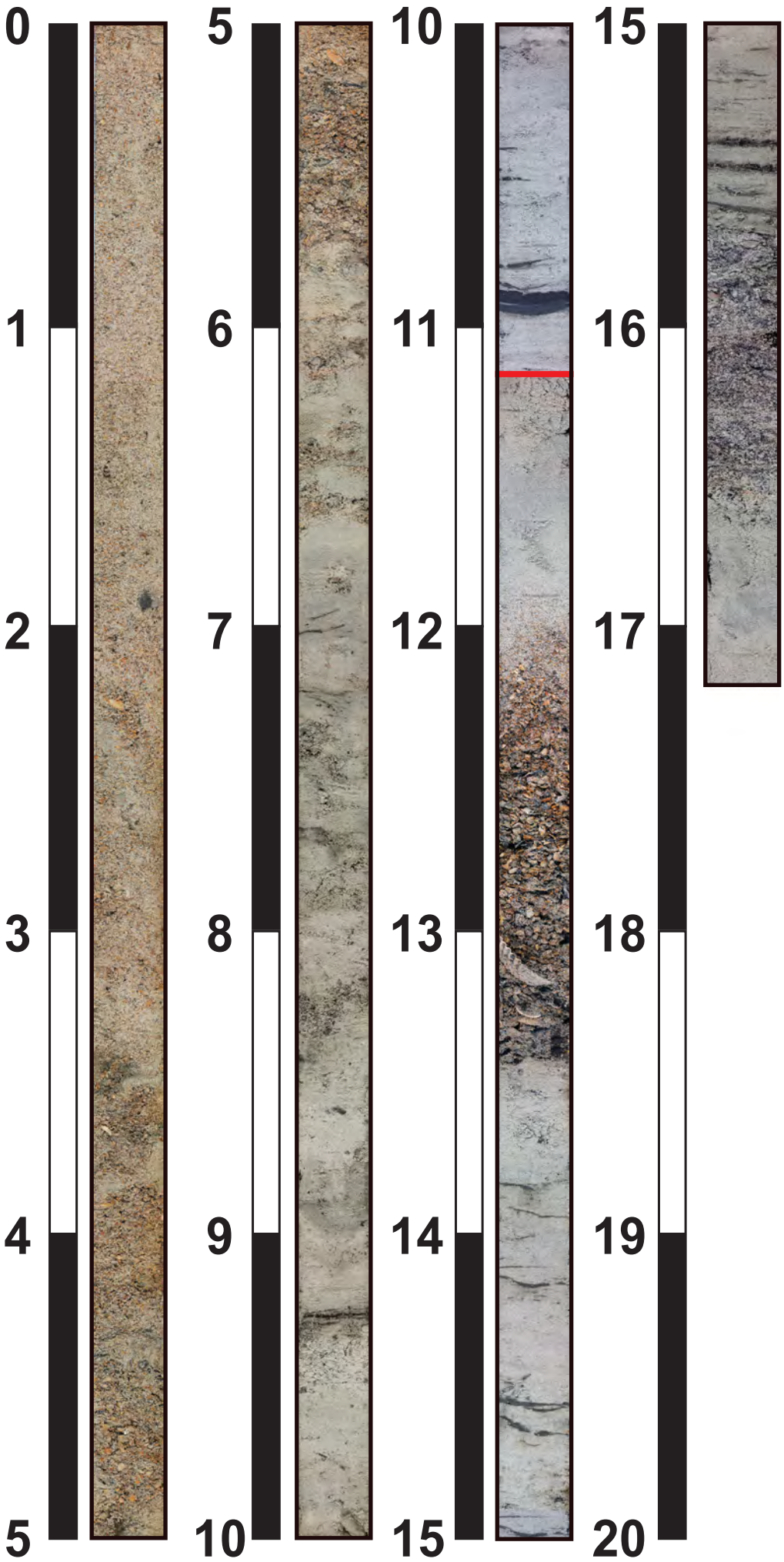
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**17'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-13**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 2.5Y 7/1**		

Tare Weight, (g):	50.21	
Dry Wt. Before Washing (g):	185.31	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.86	98.62	70	1.30
#4	4.750	0.59	98.19	80	0.47
#5	4.000	0.73	97.65	100	0.73
#7	2.800	1.32	96.67	70	0.92
#10	2.000	1.35	95.67	60	0.81
#14	1.400	1.98	94.20	50	0.99
#18	1.000	1.79	92.88	40	0.72
#25	0.710	1.28	91.93	30	0.38
#35	0.500	1.16	91.07	30	0.35
#45	0.355	1.74	89.79	10	0.17
#60	0.250	6.64	84.87	2	0.13
#80	0.180	23.82	67.24	0	0.00
#120	0.125	70.94	14.73	0	0.00
#170	0.090	15.41	3.32	0	0.00
#200	0.075	2.15	1.73	0	0.00
#230	0.063	0.47	1.38	0	0.00
Total Shell Content:		**5**		**%**	



Nassau Sound
Florida
2016 - 2017

C-14

Notes:
Scale in Feet
Photo Mosaic Image
= Jet Depth

ATHENA TECHNOLOGIES, INC.

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1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-14

DRILLING LOG

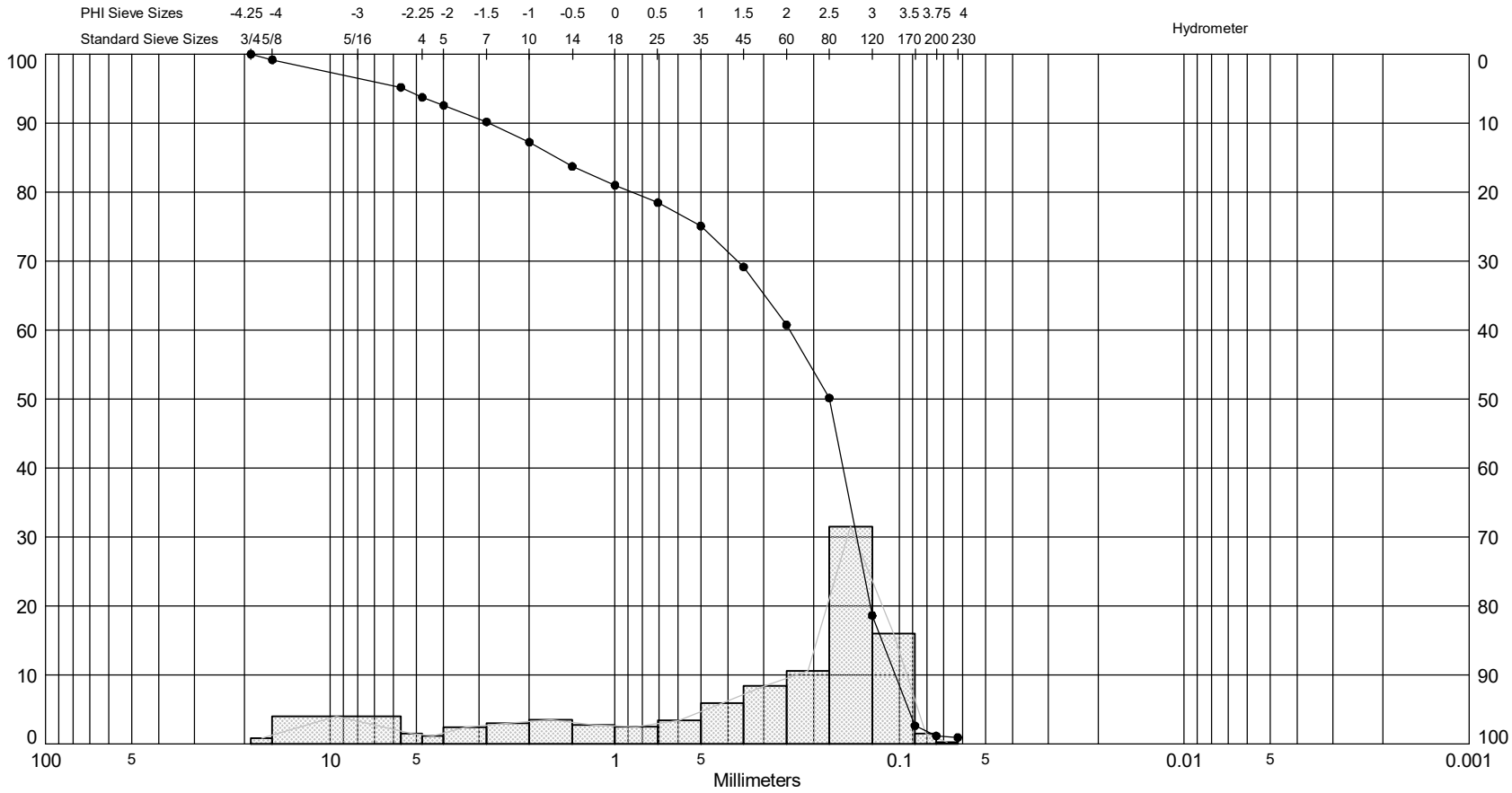
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-14
LOCATION COORDINATES	X = 522,188 Y = 2,247,777
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	19.8 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 4 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	11.7 Ft.
15. DATE BORING	STARTED 07-24-16 12:44 / COMPLETED 07-24-16
16. ELEVATION TOP OF BORING	-9.5 Ft.
17. TOTAL RECOVERY FOR BORING	17.3 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-9.5	0.0					
			Fine SAND, trace shell fragments <1.0cm, light gray (2.5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.38, Phi Sorting: 1.07 Shell: 30%, Fines (#200) - 0.70 (SP)
-13.3	3.8					
			Fine SAND, little shell fragments <1.0cm (coarser than unit above), coarsening to <3.0cm downcore, light gray (2.5Y-7/1), (SW).			
-15.2	5.7					
			Fine SAND, trace shell fragments in thin layers/lenses, trace silt in thin layers/lenses, light gray (5Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 17.3' Mean (mm): 0.33, Phi Sorting: 1.86 Shell: 29%, Carbonate: 23.9%, Fines (#200) - 1.15 (SP)
					B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.15, Phi Sorting: 0.83 Shell: 4%, Fines (#200) - 2.09 (SP)
-21.8	12.3					
-22.9	13.4		SHELL HASH, gravel sized shell fragments <8.0cm and fine to medium sand, gray (2.5Y-6/1), (GP).			
			Fine SAND, trace silt in thin lenses, white (5Y-8/1), (SP).			Sample #C, Depth = 15.8' - 16.3' Mean (mm): 0.65, Phi Sorting: 1.73 Shell: 52%, Fines (#200) - 1.18 (SP)
-25.3	15.8					
-26.2	16.7		Fine to medium SAND, little shell fragments <1.0cm, intact shells <6.0cm at 15.8', (N-7/1), (SW).		C	
-26.8	17.3		Fine SAND, clean, white (5Y-8/1), (SP).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-14 #COMP	—●—	-9.5	SP	#200 - 1.15 #230 - 0.93		23.90	2.5	1.62	-1.36	3.84	1.86

Comments: Sample Interval = 0 - 17.3'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	522,188
Northing (Y, ft):	2,247,777
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

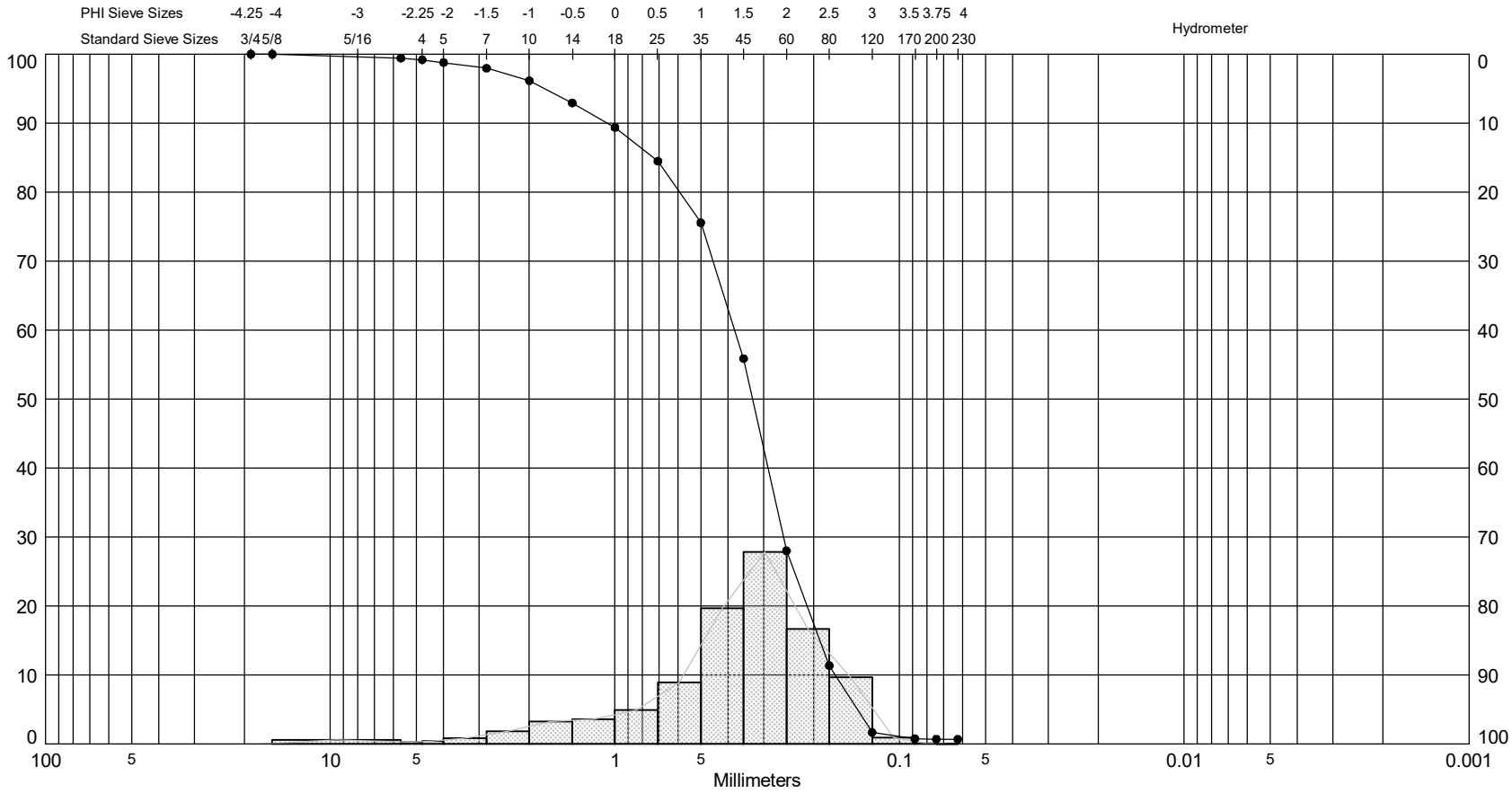
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-17.3'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-14**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 2.5Y 6/1**		

Tare Weight, (g):	51.42	
Dry Wt. Before Washing (g):	206.66	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	1.26	99.19	100	1.26
#3.5	5.600	6.20	95.19	100	6.20
#4	4.750	2.27	93.73	100	2.27
#5	4.000	1.82	92.56	100	1.82
#7	2.800	3.69	90.18	100	3.69
#10	2.000	4.60	87.22	100	4.60
#14	1.400	5.45	83.71	100	5.45
#18	1.000	4.24	80.98	100	4.24
#25	0.710	3.91	78.46	90	3.52
#35	0.500	5.27	75.06	70	3.69
#45	0.355	9.20	69.14	50	4.60
#60	0.250	13.04	60.74	30	3.91
#80	0.180	16.45	50.14	1	0.16
#120	0.125	48.95	18.61	0	0.00
#170	0.090	24.83	2.62	0	0.00
#200	0.075	2.29	1.14	0	0.00
#230	0.063	0.34	0.92	0	0.00
Total Shell Content:		**29**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-14 #A	—●—	-10.3	SP	#200 - 0.70 #230 - 0.67			1.61	1.39	-1.32	5.41	1.07

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	522,188
Northing (Y, ft):	2,247,777
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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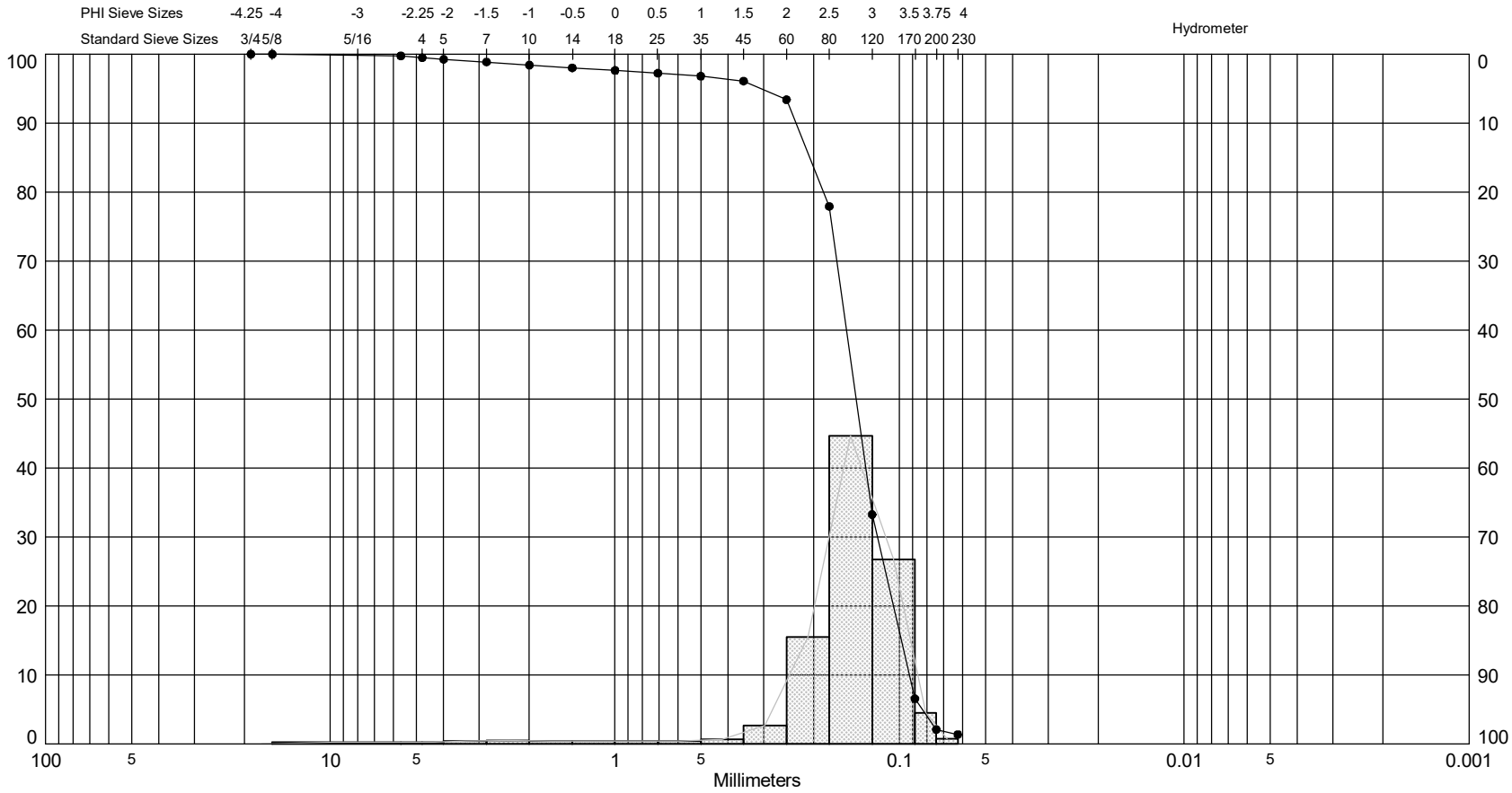
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-14**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.96	
Dry Wt. Before Washing (g):	197.33	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.84	99.43	100	0.84
#4	4.750	0.34	99.20	100	0.34
#5	4.000	0.60	98.79	100	0.60
#7	2.800	1.23	97.96	100	1.23
#10	2.000	2.67	96.15	100	2.67
#14	1.400	4.73	92.94	100	4.73
#18	1.000	5.26	89.37	100	5.26
#25	0.710	7.20	84.48	75	5.40
#35	0.500	13.16	75.55	60	7.90
#45	0.355	29.00	55.87	40	11.60
#60	0.250	41.05	28.02	10	4.11
#80	0.180	24.53	11.37	0	0.00
#120	0.125	14.29	1.68	0	0.00
#170	0.090	1.33	0.77	0	0.00
#200	0.075	0.09	0.71	0	0.00
#230	0.063	0.04	0.69	0	0.00
Total Shell Content:		**30**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-14 #B	—●—	-18.3	SP	#200 - 2.09 #230 - 1.37			2.81	2.7	-3.65	21.16	0.83

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	522,188
Northing (Y, ft):	2,247,777
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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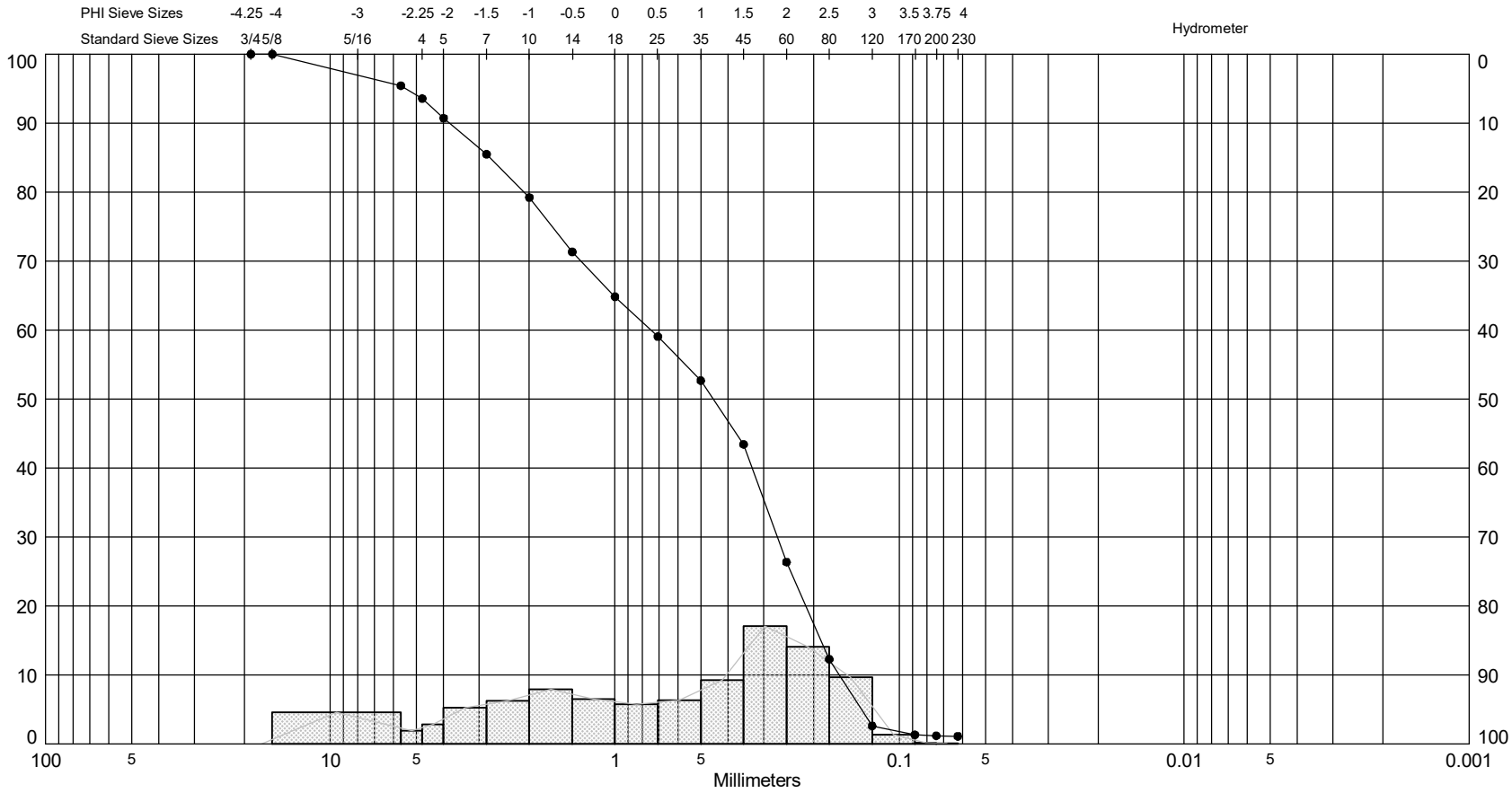
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-14**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	51.25	
Dry Wt. Before Washing (g):	170.89	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.30	99.75	100	0.30
#4	4.750	0.32	99.48	100	0.32
#5	4.000	0.25	99.27	100	0.25
#7	2.800	0.48	98.87	100	0.48
#10	2.000	0.55	98.41	100	0.55
#14	1.400	0.47	98.02	90	0.42
#18	1.000	0.46	97.63	80	0.37
#25	0.710	0.48	97.23	60	0.29
#35	0.500	0.53	96.79	50	0.27
#45	0.355	0.84	96.09	30	0.25
#60	0.250	3.23	93.39	15	0.48
#80	0.180	18.50	77.93	2	0.37
#120	0.125	53.45	33.25	0	0.00
#170	0.090	31.95	6.54	0	0.00
#200	0.075	5.34	2.08	0	0.00
#230	0.063	0.86	1.36	0	0.00
Total Shell Content:		**4**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-14 #C	—●—	-25.3	SP	#200 - 1.18 #230 - 1.11			1.14	0.62	-0.58	2.27	1.73

Comments: Sample Depth = 16'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	522,188
Northing (Y, ft):	2,247,777
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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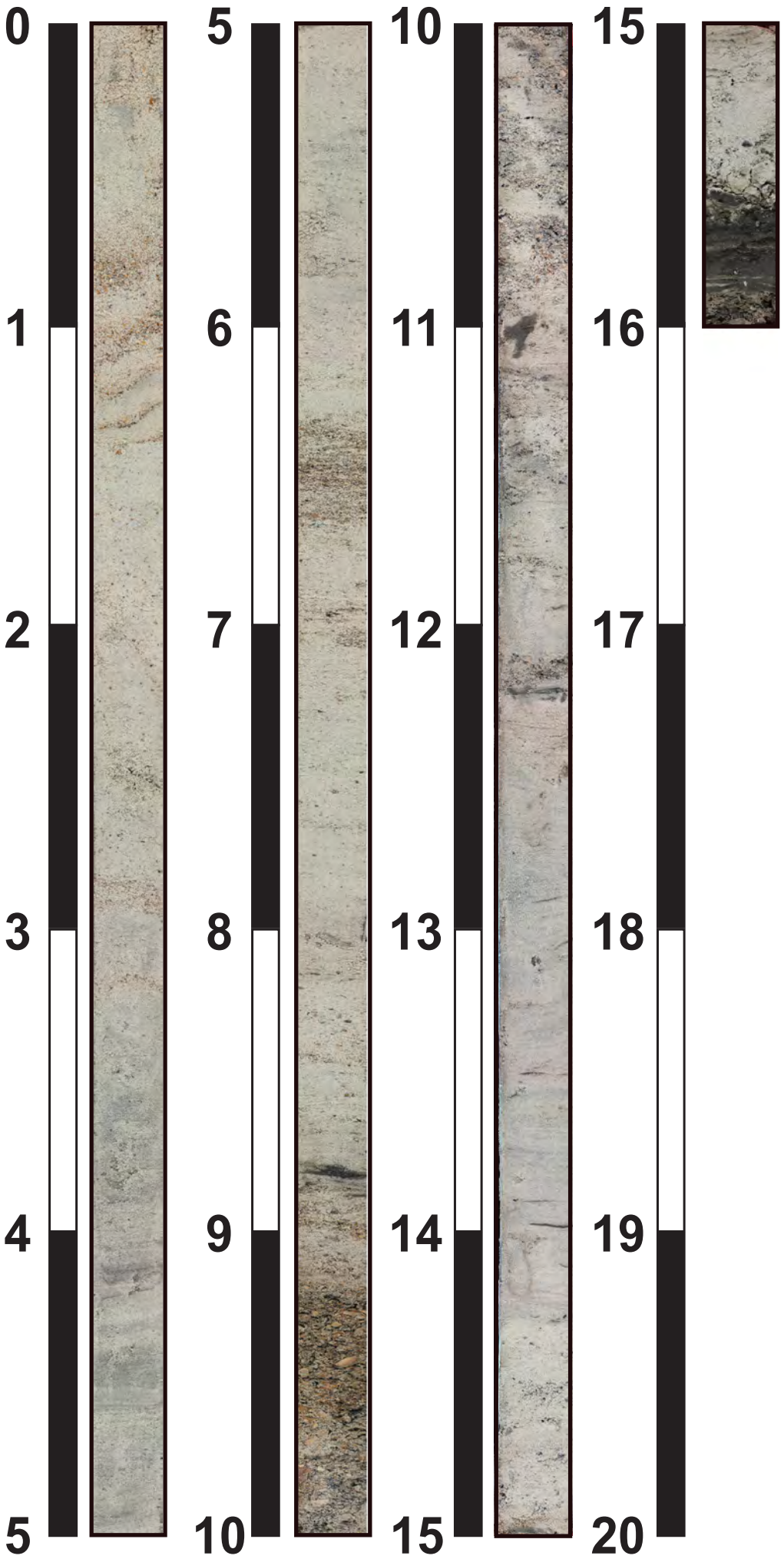
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**16'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-14**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) Gley 1 6/N**		

Tare Weight, (g):	49.93	
Dry Wt. Before Washing (g):	208.27	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.22	95.44	100	7.22
#4	4.750	2.98	93.56	100	2.98
#5	4.000	4.52	90.70	100	4.52
#7	2.800	8.26	85.49	100	8.26
#10	2.000	9.95	79.20	100	9.95
#14	1.400	12.47	71.33	100	12.47
#18	1.000	10.29	64.83	90	9.26
#25	0.710	9.15	59.05	80	7.32
#35	0.500	10.08	52.68	70	7.06
#45	0.355	14.64	43.44	50	7.32
#60	0.250	27.01	26.38	20	5.40
#80	0.180	22.31	12.29	1	0.22
#120	0.125	15.31	2.62	0	0.00
#170	0.090	2.06	1.32	0	0.00
#200	0.075	0.21	1.19	0	0.00
#230	0.063	0.11	1.12	0	0.00
Total Shell Content:		**52**		**%**	



Nassau Sound
Florida
2016 - 2017

C-15

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-15

DRILLING LOG

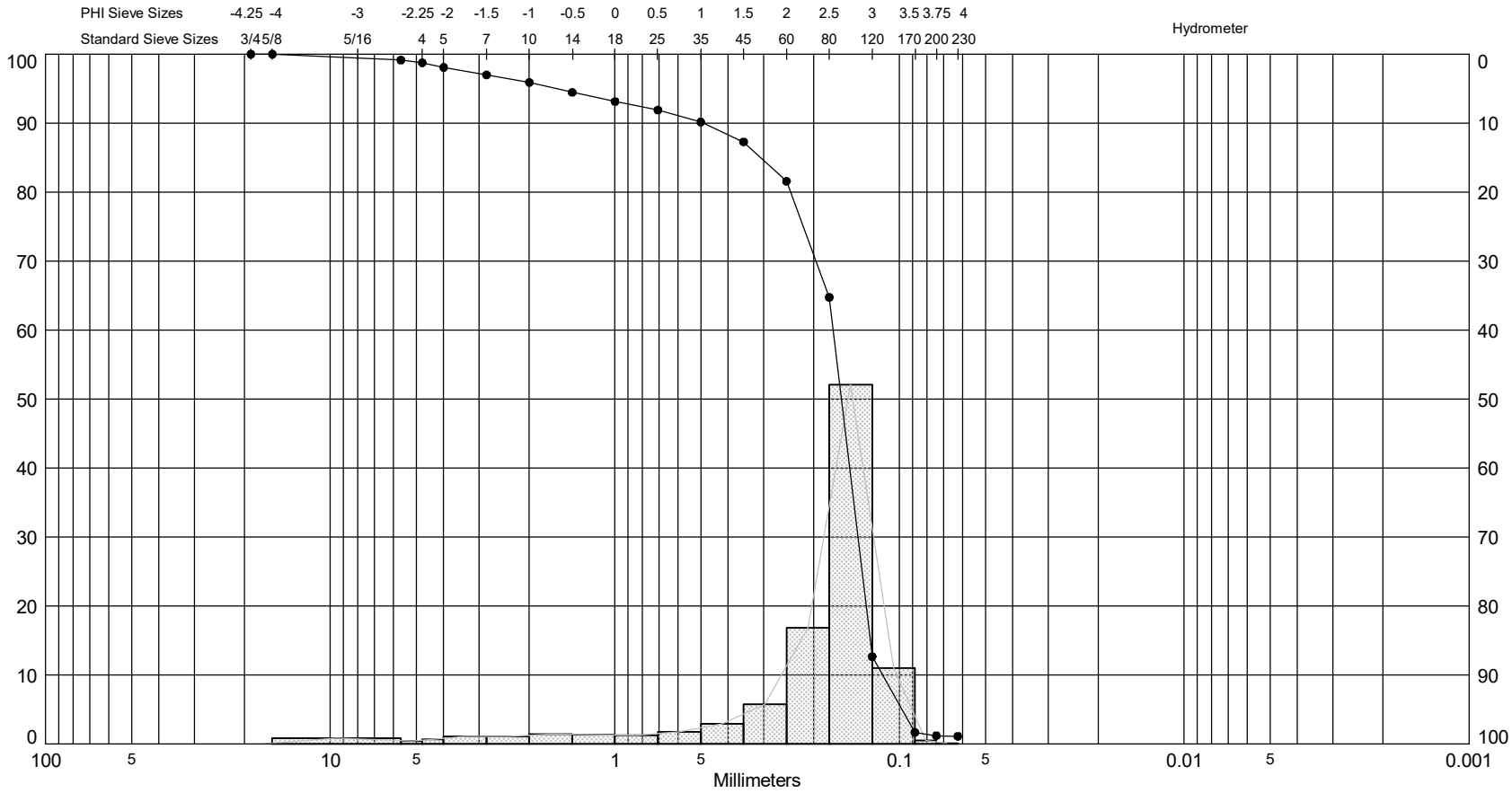
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-15
LOCATION COORDINATES	X = 522,083 Y = 2,249,178
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	5.6 Ft.
15. DATE BORING	STARTED: 07-27-16 10:19 / COMPLETED: 07-27-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-8.3 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	16 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-8.3	0.0					
			Fine SAND, trace shell fragments, bedding present, trace silt in lenses at base, white (2.5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.26, Phi Sorting: 0.87 Shell: 18%, Fines (#200) - 0.63 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 15.0' Mean (mm): 0.21, Phi Sorting: 1.18 Shell: 11%, Carbonate: 10.2%, Fines (#200) - 1.20 (SP)
-17.5	9.2					
-18.1	9.8		Fine to medium sand, little shell fragments <2.0cm, light gray (2.5Y-7/2), (SW).			
-19.1	10.8		Fine SAND, trace shell fragments, light greenish gray (10Y-8/1), (SP).			
			Fine SAND, trace silt in thin lenses and burrows, light greenish gray (10Y-8/1), (SP).		B	Sample #B, Depth = 12.8' - 13.3' Mean (mm): 0.15, Phi Sorting: 0.51 Shell: 3%, Fines (#200) - 0.95 (SP)
-23.9	15.6					
-24.3	16.0		SILTY SAND, shell fragments at base, very dark gray (2.5Y-3/1), (SM).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-15 #COMP	—●—	-8.3	SP	#200 - 1.20 #230 - 1.11		10.20	2.64	2.27	-2.6	9.94	1.18

Comments: Sample Interval = 0 - 15.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-27-17
Analyzed By:	CM
Easting (X, ft):	522,083
Northing (Y, ft):	2,249,178
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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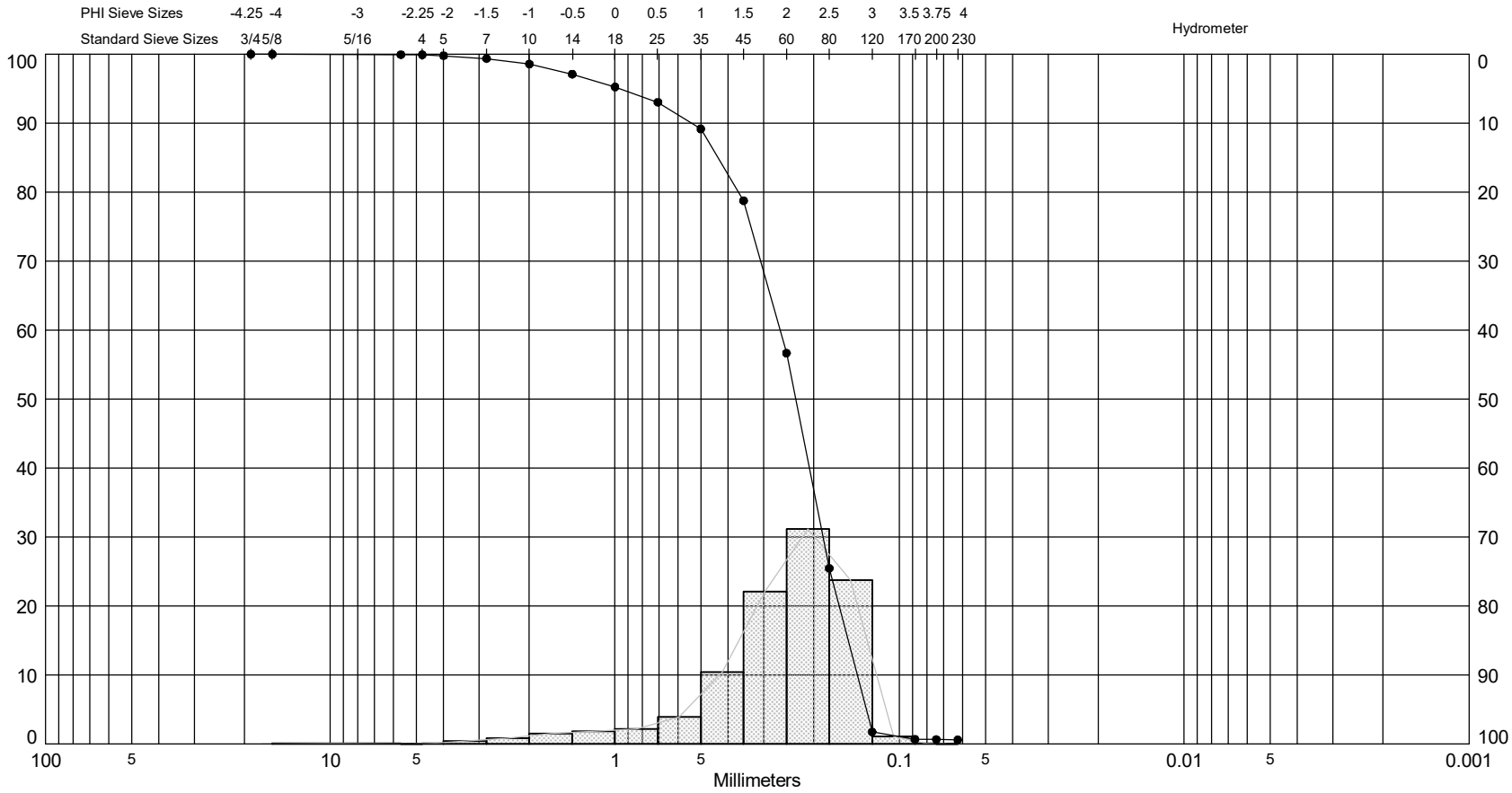
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-15'**
Project No.:	**EQ175023**	**Date:**	**3/27/2017**
Boring No.:	**C-15**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.45	
Dry Wt. Before Washing (g):	206.20	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.34	99.14	100	1.34
#4	4.750	0.59	98.76	100	0.59
#5	4.000	1.05	98.09	100	1.05
#7	2.800	1.71	96.99	100	1.71
#10	2.000	1.70	95.90	100	1.70
#14	1.400	2.24	94.46	100	2.24
#18	1.000	2.07	93.13	100	2.07
#25	0.710	1.93	91.89	80	1.54
#35	0.500	2.68	90.17	60	1.61
#45	0.355	4.48	87.29	30	1.34
#60	0.250	8.91	81.57	20	1.78
#80	0.180	26.19	64.76	2	0.52
#120	0.125	81.16	12.65	0	0.00
#170	0.090	17.08	1.68	0	0.00
#200	0.075	0.73	1.21	0	0.00
#230	0.063	0.14	1.12	0	0.00
Total Shell Content:		**11**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-15 #A	—●—	-9.1	SP	#200 - 0.63 #230 - 0.59			2.11	1.92	-1.72	6.99	0.87

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	522,083
Northing (Y, ft):	2,249,178
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
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Jacksonville, Florida 32257
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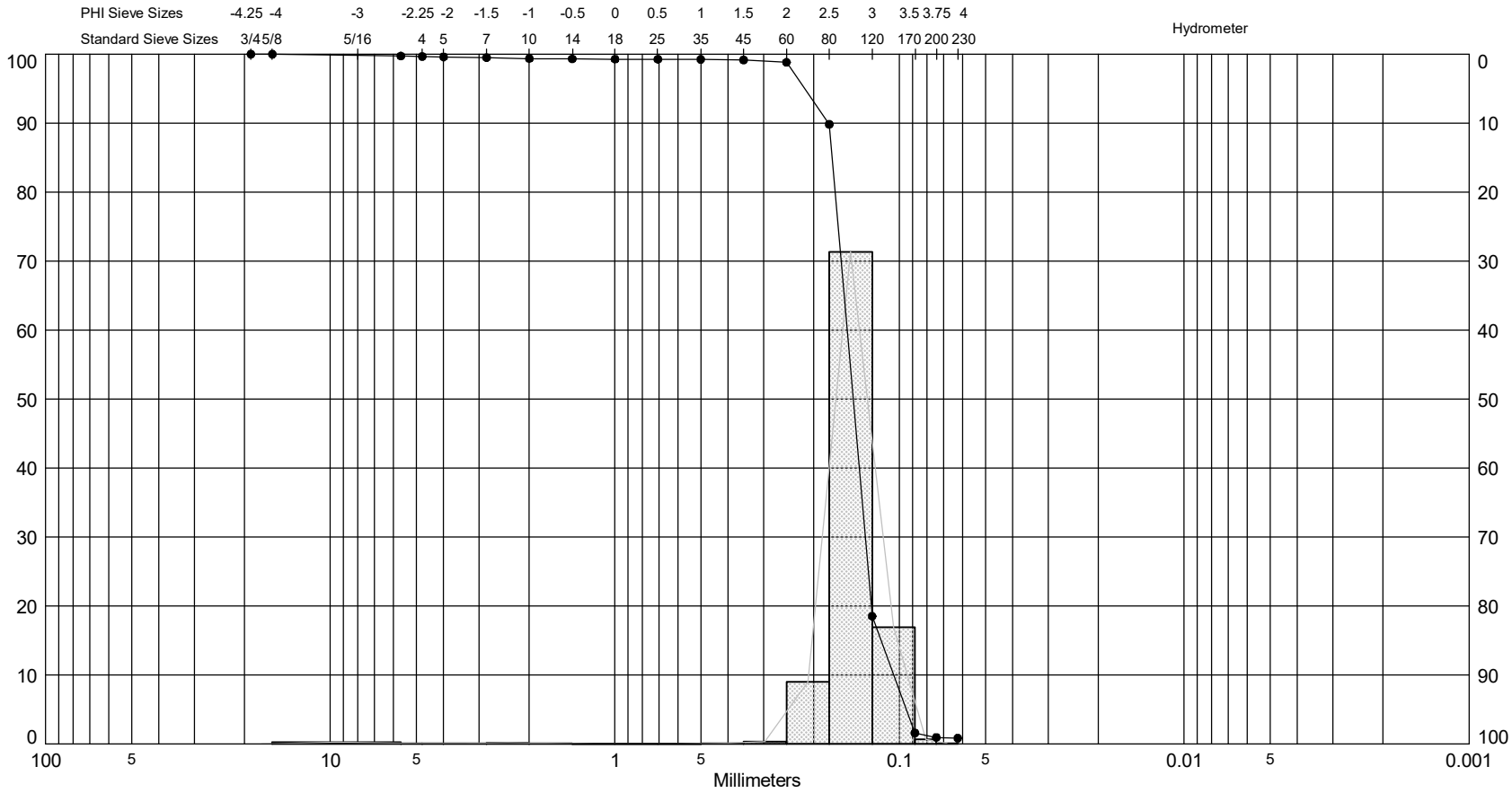
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-15**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.38	
Dry Wt. Before Washing (g):	170.13	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.09	99.93	100	0.09
#4	4.750	0.02	99.91	100	0.02
#5	4.000	0.14	99.79	100	0.14
#7	2.800	0.51	99.37	100	0.51
#10	2.000	0.96	98.58	100	0.96
#14	1.400	1.76	97.12	100	1.76
#18	1.000	2.26	95.25	100	2.26
#25	0.710	2.66	93.04	80	2.13
#35	0.500	4.68	89.17	60	2.81
#45	0.355	12.56	78.77	40	5.02
#60	0.250	26.70	56.65	20	5.34
#80	0.180	37.66	25.47	2	0.75
#120	0.125	28.65	1.74	0	0.00
#170	0.090	1.27	0.69	0	0.00
#200	0.075	0.06	0.64	0	0.00
#230	0.063	0.05	0.60	0	0.00
Total Shell Content:		**18**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-15 #B	—●—	-21.1	SP	#200 - 0.95 #230 - 0.83			2.78	2.76	-7.2	77.24	0.51

Comments: Sample Depth = 13'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	522,083
Northing (Y, ft):	2,249,178
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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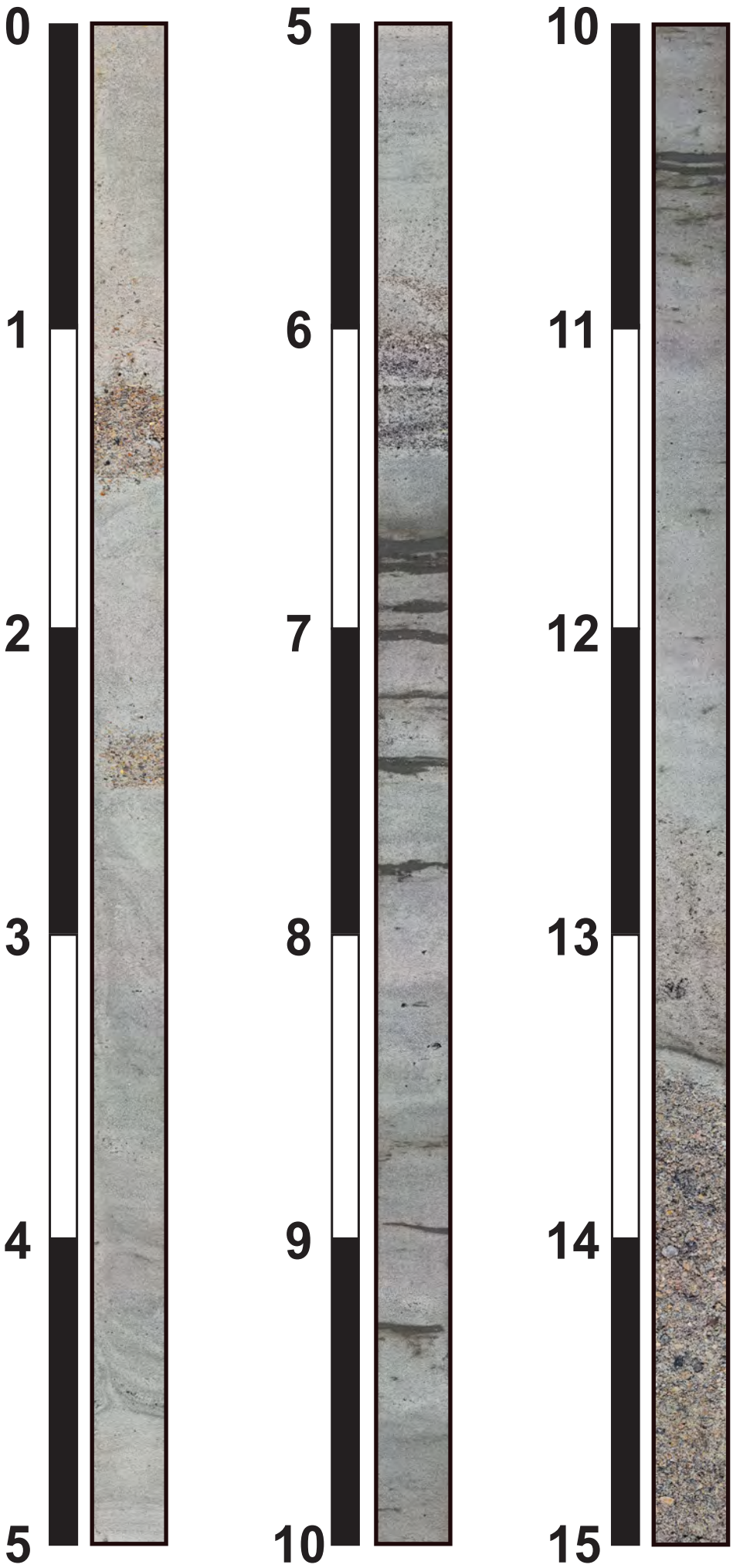
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-15**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.10	
Dry Wt. Before Washing (g):	218.05	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.46	99.73	100	0.46
#4	4.750	0.12	99.65	100	0.12
#5	4.000	0.09	99.60	100	0.09
#7	2.800	0.16	99.51	100	0.16
#10	2.000	0.24	99.36	100	0.24
#14	1.400	0.09	99.31	100	0.09
#18	1.000	0.05	99.28	80	0.04
#25	0.710	0.03	99.26	70	0.02
#35	0.500	0.05	99.23	60	0.03
#45	0.355	0.12	99.16	50	0.06
#60	0.250	0.59	98.81	30	0.18
#80	0.180	15.08	89.83	20	3.02
#120	0.125	119.78	18.51	0	0.00
#170	0.090	28.44	1.58	0	0.00
#200	0.075	1.08	0.93	0	0.00
#230	0.063	0.20	0.82	0	0.00
Total Shell Content:		**3**		**%**	



Nassau Sound
Florida
2016 - 2017

C-16

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-16

DRILLING LOG

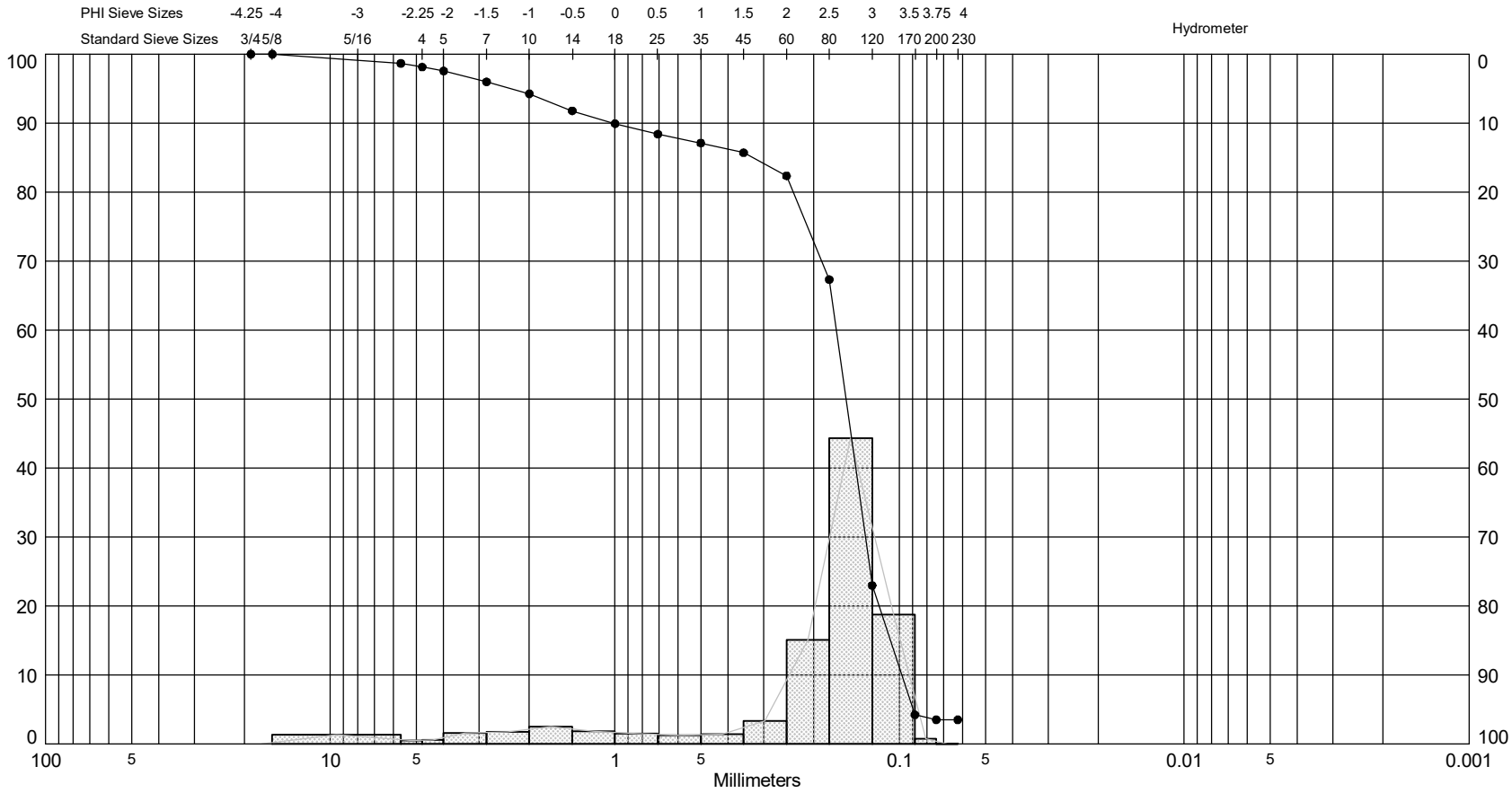
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-16
LOCATION COORDINATES	X = 526,636 Y = 2,247,427
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	13.6 Ft.
15. DATE BORING	STARTED: 03-17-17 13:59 / COMPLETED: 03-17-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-14.1 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	15 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-14.1	0.0				
		Fine quartz SAND, trace fine to medium sand-size shell (primarily in layers at 1.2-1.5', 2.3-2.5', and 5.9-6.4'), poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.19, Phi Sorting: 0.87 Shell: 6%, Fines (#200) - 0.70 (SP)
-20.5	6.4			COMP	Sample #COMP, Depth = 0.0' - 15.0' Mean (mm): 0.21, Phi Sorting: 1.39 Shell: 11%, Carbonate: 12.1%, Fines (#200) - 3.50 (SP)
-21.9	7.8	Interbedded, fine quartz SAND (SP; light gray [5Y 6/1]) and SILT (ML; dark gray [5Y 4/1]), trace fine to medium sand-size shell, gray (5Y-6/1), (SP-SM).		B	Sample #B, Depth = 8.3' - 8.8' Mean (mm): 0.14, Phi Sorting: 0.40 Shell: 1%, Fines (#200) - 2.26 (SP)
		Fine quartz SAND, trace silt in burrows and laminations, trace fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
-26.7	12.6				
-27.6	13.5	Fine to medium quartz SAND, few fine sand to fine gravel-size shell, trace silt, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 1.08, Phi Sorting: 2.12 Shell: 56%, Fines (#200) - 1.12 (SP)
-29.1	15.0	Fine to medium quartz SAND, some medium sand to fine gravel-size shell, well graded, very loose, subangular, light gray (5Y-7/2), (SW).			
		Loss of recovery during core barrel retrieval.			
-31.6	17.5				
		End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-16 #COMP	—●—	-14.1	SP	#200 - 3.50 #230 - 3.49		12.10	2.7	2.22	-2.22	7.3	1.39

Comments: Sample Interval = 0 - 15.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,636
Northing (Y, ft):	2,247,427
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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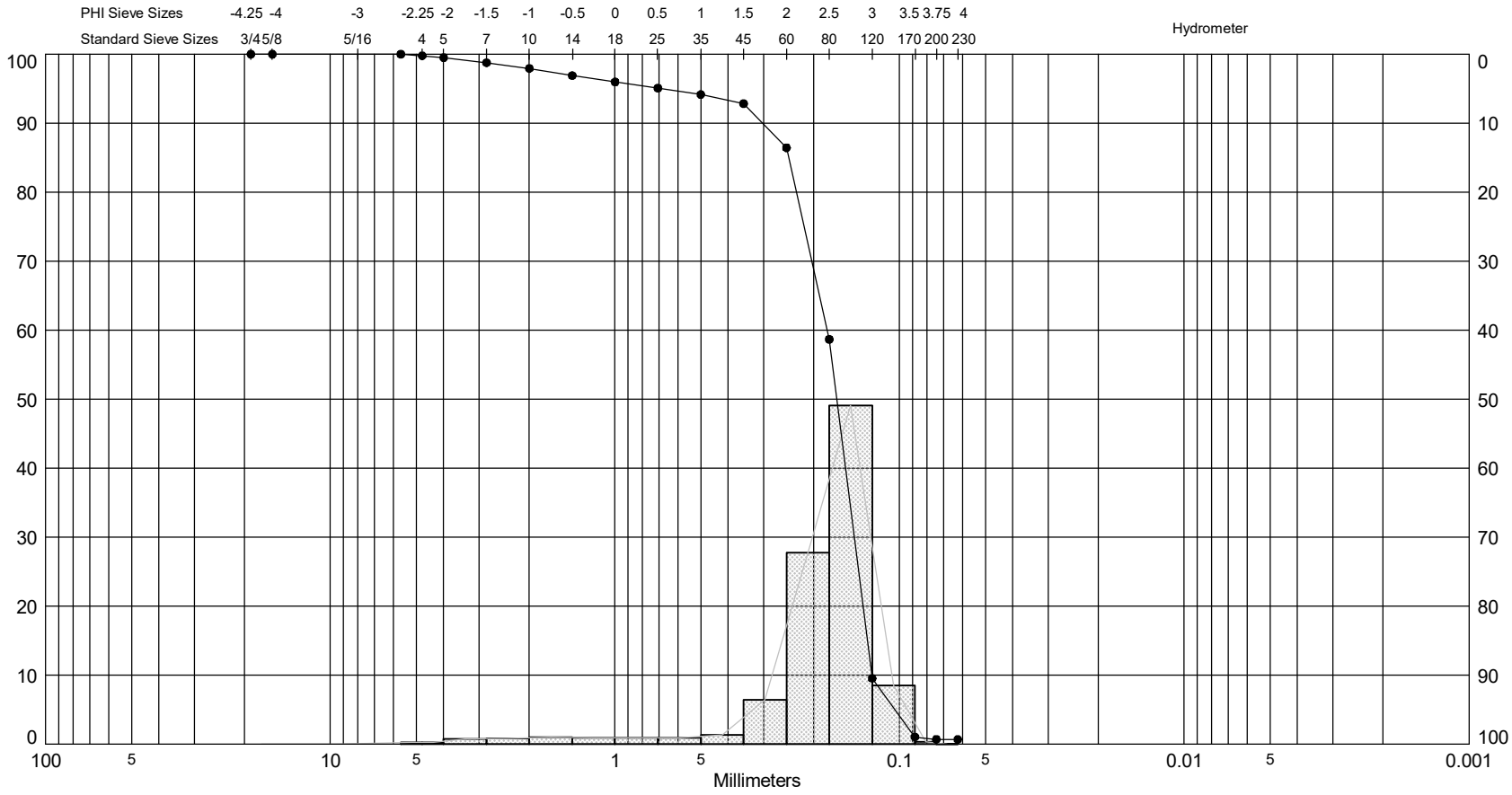
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-15'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-16**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.19	
Dry Wt. Before Washing (g):	184.96	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.81	98.67	100	1.81
#4	4.750	0.73	98.13	100	0.73
#5	4.000	0.78	97.55	100	0.78
#7	2.800	2.14	95.98	100	2.14
#10	2.000	2.34	94.25	100	2.34
#14	1.400	3.36	91.78	98	3.29
#18	1.000	2.52	89.92	90	2.27
#25	0.710	2.08	88.39	50	1.04
#35	0.500	1.74	87.11	30	0.52
#45	0.355	1.92	85.70	10	0.19
#60	0.250	4.54	82.35	1	0.05
#80	0.180	20.45	67.29	1	0.20
#120	0.125	60.21	22.94	0	0.00
#170	0.090	25.44	4.21	0	0.00
#200	0.075	0.98	3.48	0	0.00
#230	0.063	0.01	3.48	0	0.00
Total Shell Content:		**11**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-16 #A	—●—	-14.9	SP	#200 - 0.70 #230 - 0.68			2.59	2.38	-2.96	13.22	0.87

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,636
Northing (Y, ft):	2,247,427
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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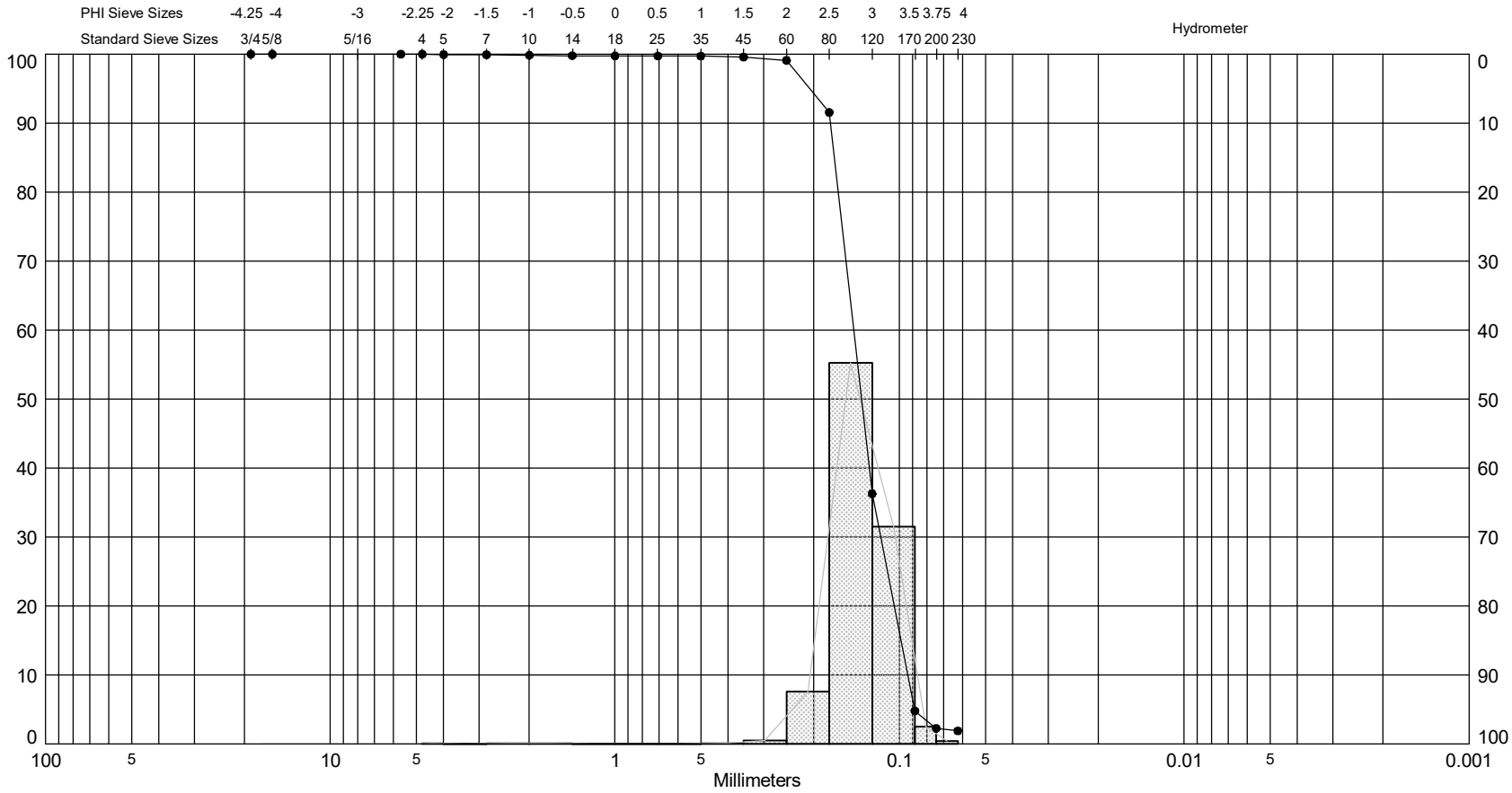
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-16**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.81	
Dry Wt. Before Washing (g):	179.06	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.28	99.78	100	0.28
#5	4.000	0.36	99.50	100	0.36
#7	2.800	0.94	98.78	100	0.94
#10	2.000	1.07	97.95	100	1.07
#14	1.400	1.34	96.91	100	1.34
#18	1.000	1.20	95.98	90	1.08
#25	0.710	1.14	95.10	50	0.57
#35	0.500	1.21	94.17	50	0.61
#45	0.355	1.69	92.86	30	0.51
#60	0.250	8.26	86.47	5	0.41
#80	0.180	35.92	58.68	1	0.36
#120	0.125	63.49	9.56	0	0.00
#170	0.090	10.98	1.06	0	0.00
#200	0.075	0.44	0.72	0	0.00
#230	0.063	0.02	0.70	0	0.00
Total Shell Content:		**6**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-16 #B	—●—	-22.4	SP	#200 - 2.26 #230 - 1.88			2.88	2.88	-3.19	36.22	0.4

Comments: Sample Depth = 8.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,636
Northing (Y, ft):	2,247,427
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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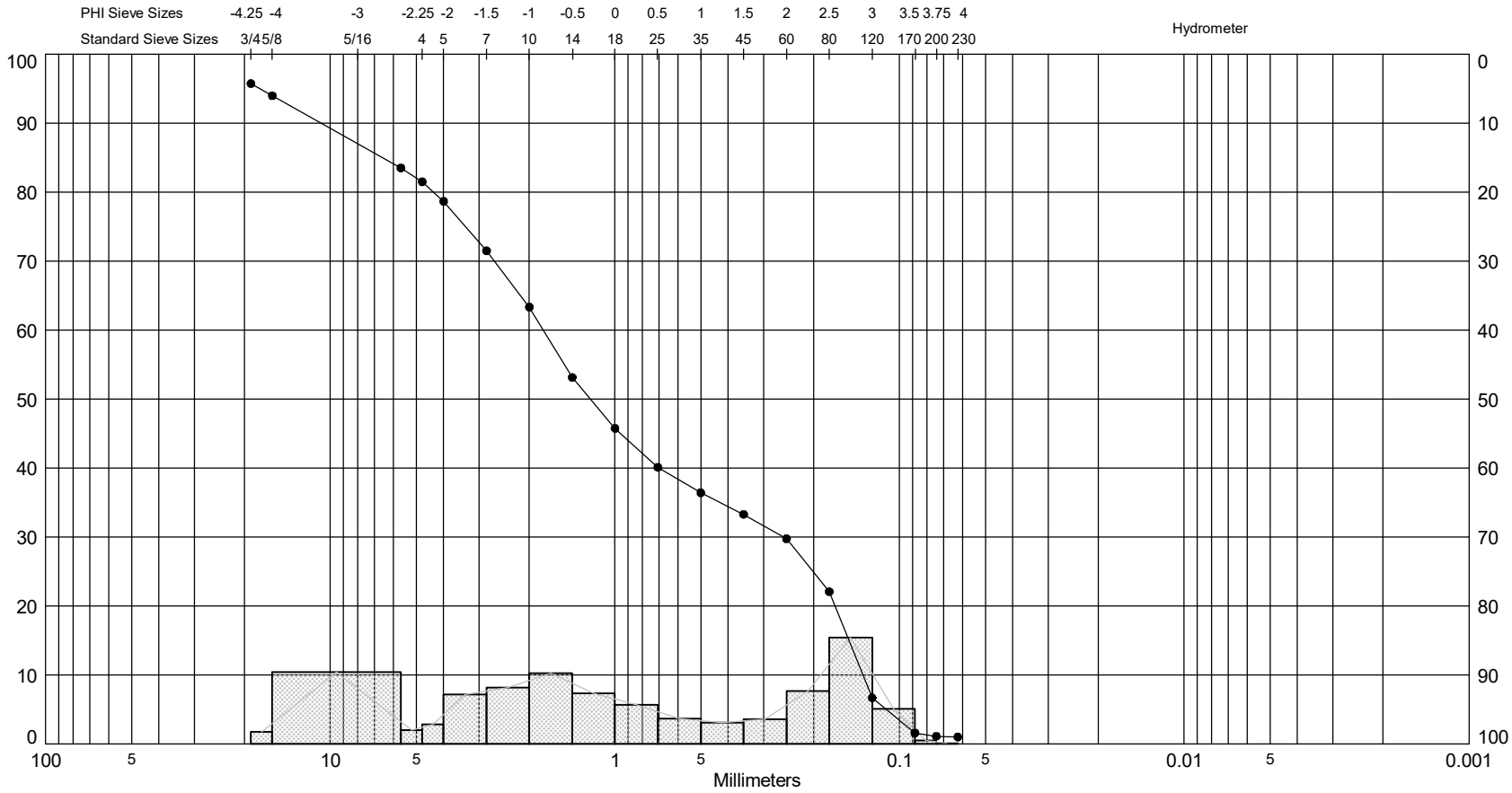
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-16**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.12	
Dry Wt. Before Washing (g):	180.40	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.07	99.95	100	0.07
#7	2.800	0.05	99.91	100	0.05
#10	2.000	0.08	99.85	100	0.08
#14	1.400	0.08	99.79	100	0.08
#18	1.000	0.05	99.75	100	0.05
#25	0.710	0.03	99.72	100	0.03
#35	0.500	0.02	99.71	90	0.02
#45	0.355	0.15	99.59	70	0.11
#60	0.250	0.63	99.11	30	0.19
#80	0.180	9.85	91.55	1	0.10
#120	0.125	72.00	36.28	0	0.00
#170	0.090	41.03	4.79	0	0.00
#200	0.075	3.29	2.26	0	0.00
#230	0.063	0.50	1.88	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-16 #C	—●—	-27.9	SP	#200 - 1.12 #230 - 1.01				-0.11	0.19	1.88	2.12

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,636
Northing (Y, ft):	2,247,427
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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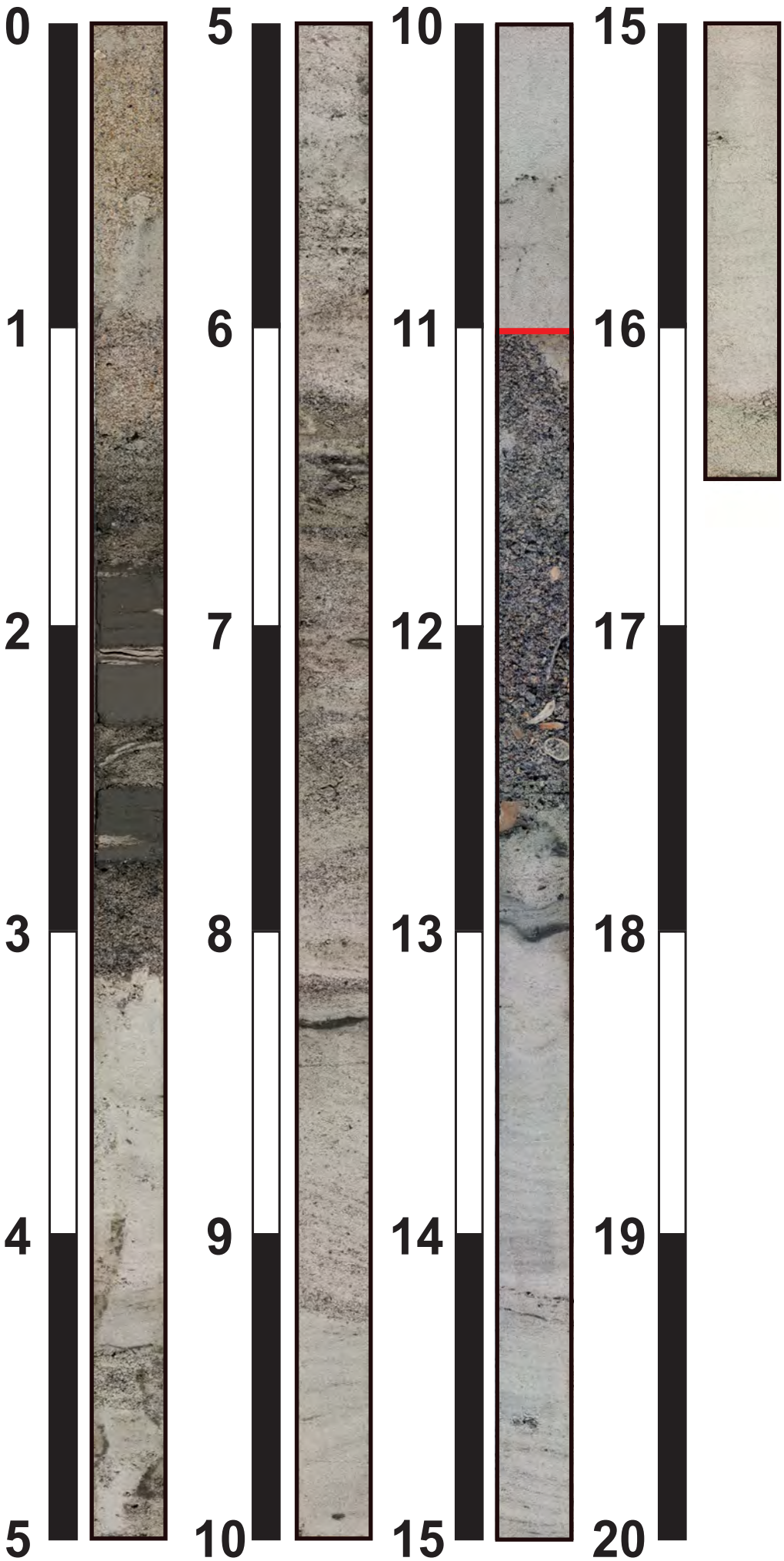
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-16**		
Sample No.:	**C**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 5Y 6/1**		

Tare Weight, (g):	49.86	
Dry Wt. Before Washing (g):	198.99	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	6.35	95.74	100	6.35
5/8"	16.000	2.65	93.96	100	2.65
#3.5	5.600	15.59	83.51	100	15.59
#4	4.750	3.00	81.50	100	3.00
#5	4.000	4.23	78.66	100	4.23
#7	2.800	10.69	71.49	100	10.69
#10	2.000	12.16	63.34	98	11.92
#14	1.400	15.22	53.13	90	13.70
#18	1.000	10.99	45.77	80	8.79
#25	0.710	8.43	40.11	50	4.22
#35	0.500	5.52	36.41	30	1.66
#45	0.355	4.65	33.29	20	0.93
#60	0.250	5.30	29.74	5	0.27
#80	0.180	11.44	22.07	1	0.11
#120	0.125	22.95	6.68	0	0.00
#170	0.090	7.61	1.58	0	0.00
#200	0.075	0.68	1.12	0	0.00
#230	0.063	0.16	1.01	0	0.00
Total Shell Content:		**56**		**%**	



Nassau Sound
Florida
2016 - 2017

C-17

Notes:
Scale in Feet
Photo Mosaic Image
= Jet Depth

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-17

DRILLING LOG

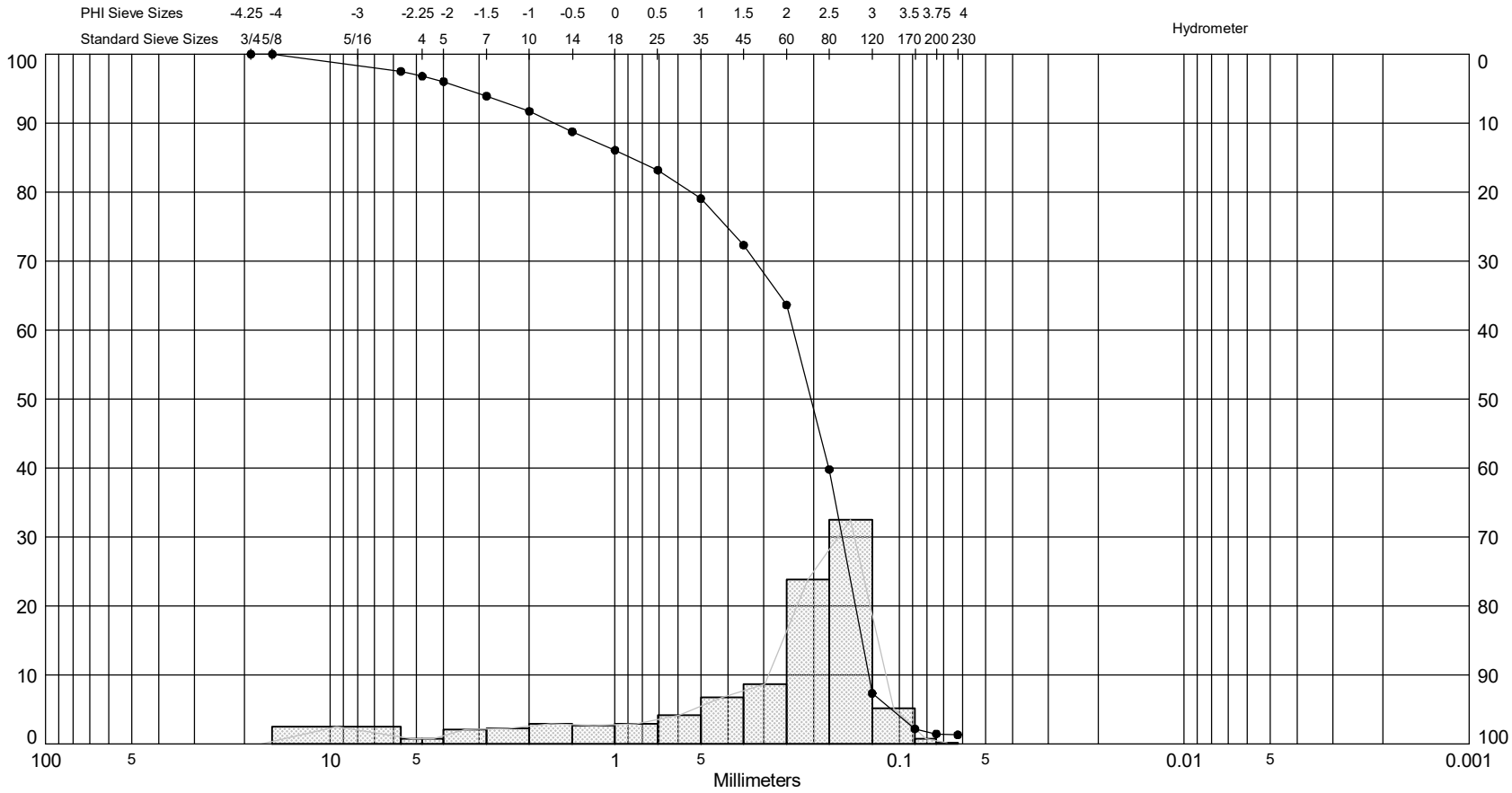
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-17
LOCATION COORDINATES	X = 522,359 Y = 2,250,268
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	18.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 4 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	12.8 Ft.
15. DATE BORING	STARTED 07-12-16 00:04 / COMPLETED 07-12-16
16. ELEVATION TOP OF BORING	-15.5 Ft.
17. TOTAL RECOVERY FOR BORING	16.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-15.5	0.0					
-17.3	1.8		Fine SAND, trace silt, few shell fragments <1.0cm increasing downcore., greenish gray (10Y-6/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.28, Phi Sorting: 1.31 Shell: 29%, Fines (#200) - 1.28 (SP)
-18.3	2.8		Soft CLAY with interbedded sand lenses., very dark greenish gray (5GY-3/1), (CH).			
-19.9	4.4		Fine SAND, 3 shell layer at top of unit, trace shell fragments, trace silt., light greenish gray (10Y-7/1), (SP).			
-21.6	6.1		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).			
-23.0	7.5		Fine SAND, little shell fragments <1.5cm, trace silt, greenish gray (10Y-6/1), (SW).		B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.46, Phi Sorting: 1.61 Shell: 46%, Fines (#200) - 1.14 (SP)
-24.7	9.2		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 16.5' Mean (mm): 0.30, Phi Sorting: 1.51 Shell: 30%, Carbonate: 18.6%, Fines (#200) - 1.45 (SP)
-26.5	11.0		Fine SAND, clean, light greenish gray (10Y-7/1), (SP).			
-28.1	12.6		Fine to medium SAND, some shell fragments <5.0cm, (N-7/1), (SW).			
-32.0	16.5		Fine SAND, trace silt in thin lenses, bedding present, light greenish gray (10Y-7/1), (SP).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 0.17, Phi Sorting: 0.41 Shell: 4%, Fines (#200) - 0.75 (SP)
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-17 #COMP	—●—	-15.5	SP	#200 - 1.45 #230 - 1.31		18.60	2.29	1.72	-1.63	5.03	1.51

Comments: Sample Interval = 0 - 16.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	522,359
Northing (Y, ft):	2,250,268
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

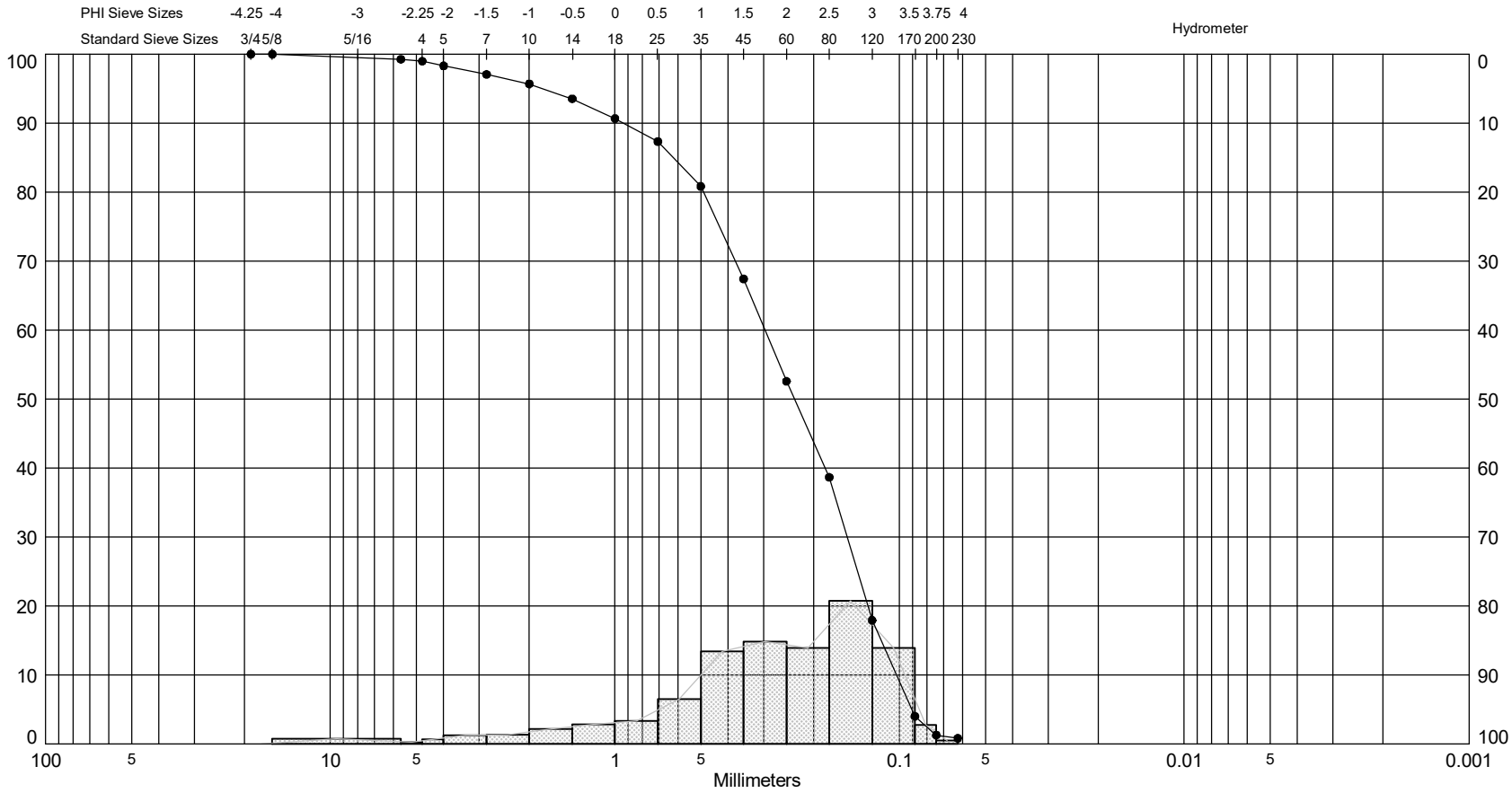
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-16.5'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-17**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.77	
Dry Wt. Before Washing (g):	192.78	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.56	97.51	100	3.56
#4	4.750	1.02	96.80	100	1.02
#5	4.000	1.10	96.03	100	1.10
#7	2.800	3.02	93.92	100	3.02
#10	2.000	3.16	91.71	100	3.16
#14	1.400	4.22	88.76	100	4.22
#18	1.000	3.85	86.06	100	3.85
#25	0.710	4.12	83.18	80	3.30
#35	0.500	5.92	79.04	70	4.14
#45	0.355	9.62	72.32	50	4.81
#60	0.250	12.43	63.62	30	3.73
#80	0.180	34.10	39.78	20	6.82
#120	0.125	46.42	7.32	0	0.00
#170	0.090	7.37	2.17	0	0.00
#200	0.075	1.04	1.44	0	0.00
#230	0.063	0.20	1.30	0	0.00
Total Shell Content:		**30**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-17 #A	—●—	-16.3	SP	#200 - 1.28 #230 - 0.81			2.09	1.84	-1.24	4.74	1.31

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	522,359
Northing (Y, ft):	2,250,268
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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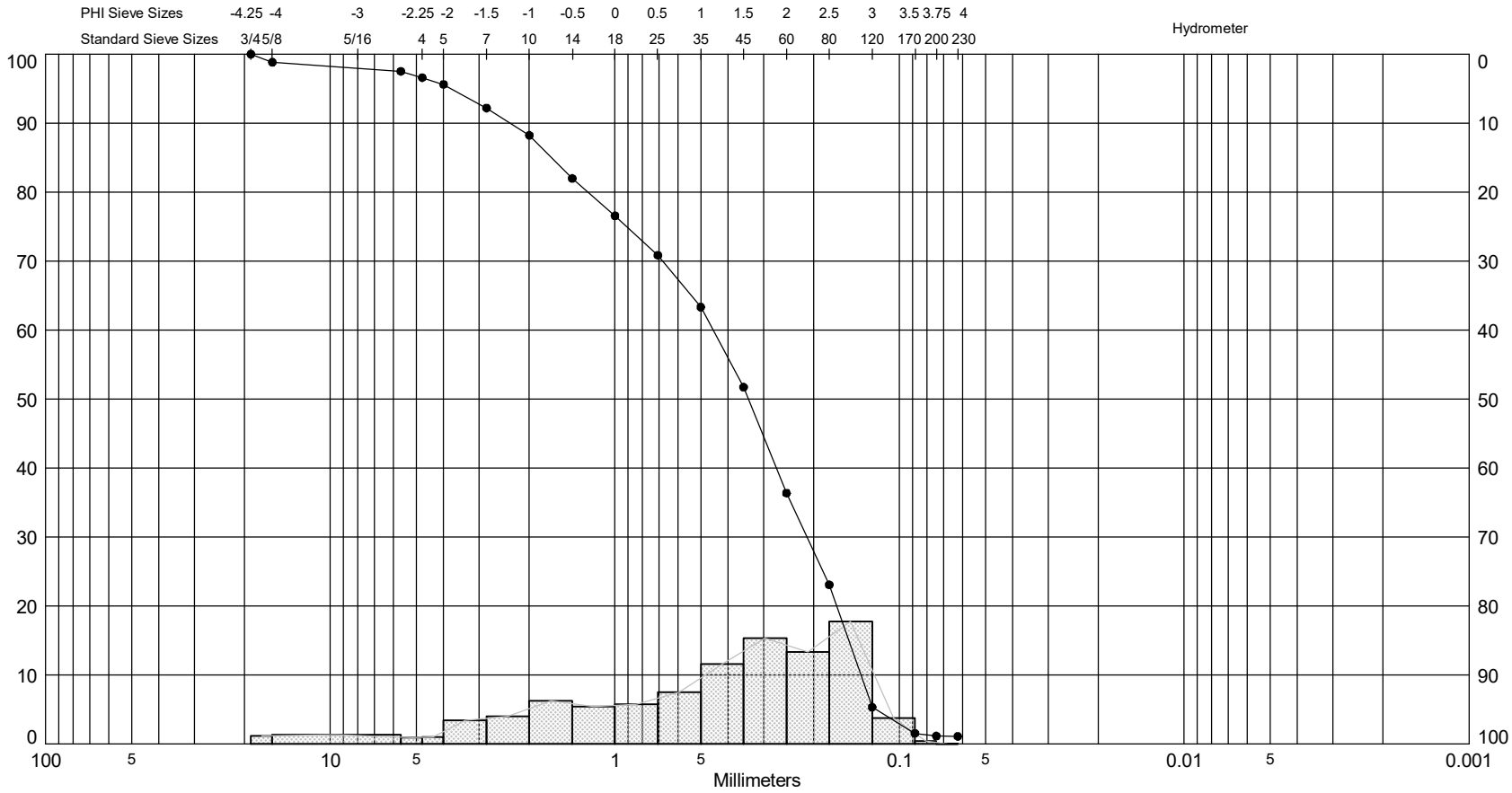
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-17**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	51.43	
Dry Wt. Before Washing (g):	199.16	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.08	99.27	100	1.08
#4	4.750	0.43	98.98	100	0.43
#5	4.000	1.00	98.30	100	1.00
#7	2.800	1.82	97.07	100	1.82
#10	2.000	2.03	95.69	100	2.03
#14	1.400	3.19	93.54	100	3.19
#18	1.000	4.24	90.67	100	4.24
#25	0.710	4.92	87.34	90	4.43
#35	0.500	9.61	80.83	70	6.73
#45	0.355	19.83	67.41	50	9.92
#60	0.250	21.92	52.57	30	6.58
#80	0.180	20.57	38.64	10	2.06
#120	0.125	30.63	17.91	0	0.00
#170	0.090	20.55	4.00	0	0.00
#200	0.075	4.03	1.27	0	0.00
#230	0.063	0.69	0.81	0	0.00
Total Shell Content:		**29**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-17 #B	—●—	-22.3	SP	#200 - 1.14 #230 - 1.10			1.56	1.12	-0.96	3.46	1.61

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	522,359
Northing (Y, ft):	2,250,268
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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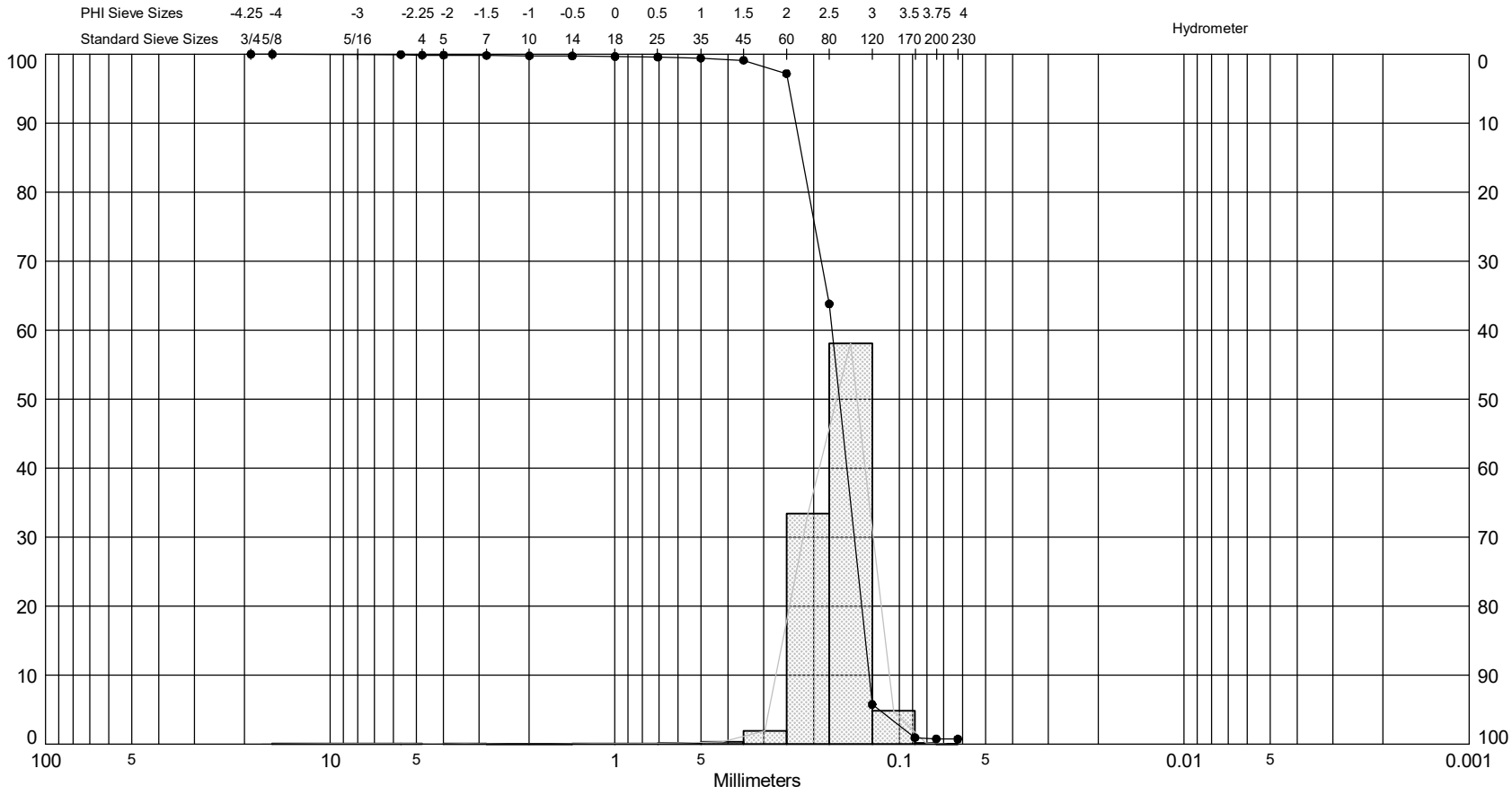
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-17**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 5/1**		

Tare Weight, (g):	51.83	
Dry Wt. Before Washing (g):	213.54	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	1.88	98.84	100	1.88
#3.5	5.600	2.14	97.51	100	2.14
#4	4.750	1.48	96.60	100	1.48
#5	4.000	1.59	95.62	100	1.59
#7	2.800	5.53	92.20	100	5.53
#10	2.000	6.42	88.23	100	6.42
#14	1.400	10.10	81.98	100	10.10
#18	1.000	8.76	76.56	100	8.76
#25	0.710	9.24	70.85	90	8.32
#35	0.500	12.16	63.33	70	8.51
#45	0.355	18.77	51.72	50	9.39
#60	0.250	24.82	36.37	30	7.45
#80	0.180	21.51	23.07	10	2.15
#120	0.125	28.71	5.32	0	0.00
#170	0.090	6.11	1.54	0	0.00
#200	0.075	0.64	1.14	0	0.00
#230	0.063	0.07	1.10	0	0.00
Total Shell Content:		**46**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-17 #C	—●—	-29.3	SP	#200 - 0.75 #230 - 0.72			2.62	2.56	-4.56	52.67	0.41

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	522,359
Northing (Y, ft):	2,250,268
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

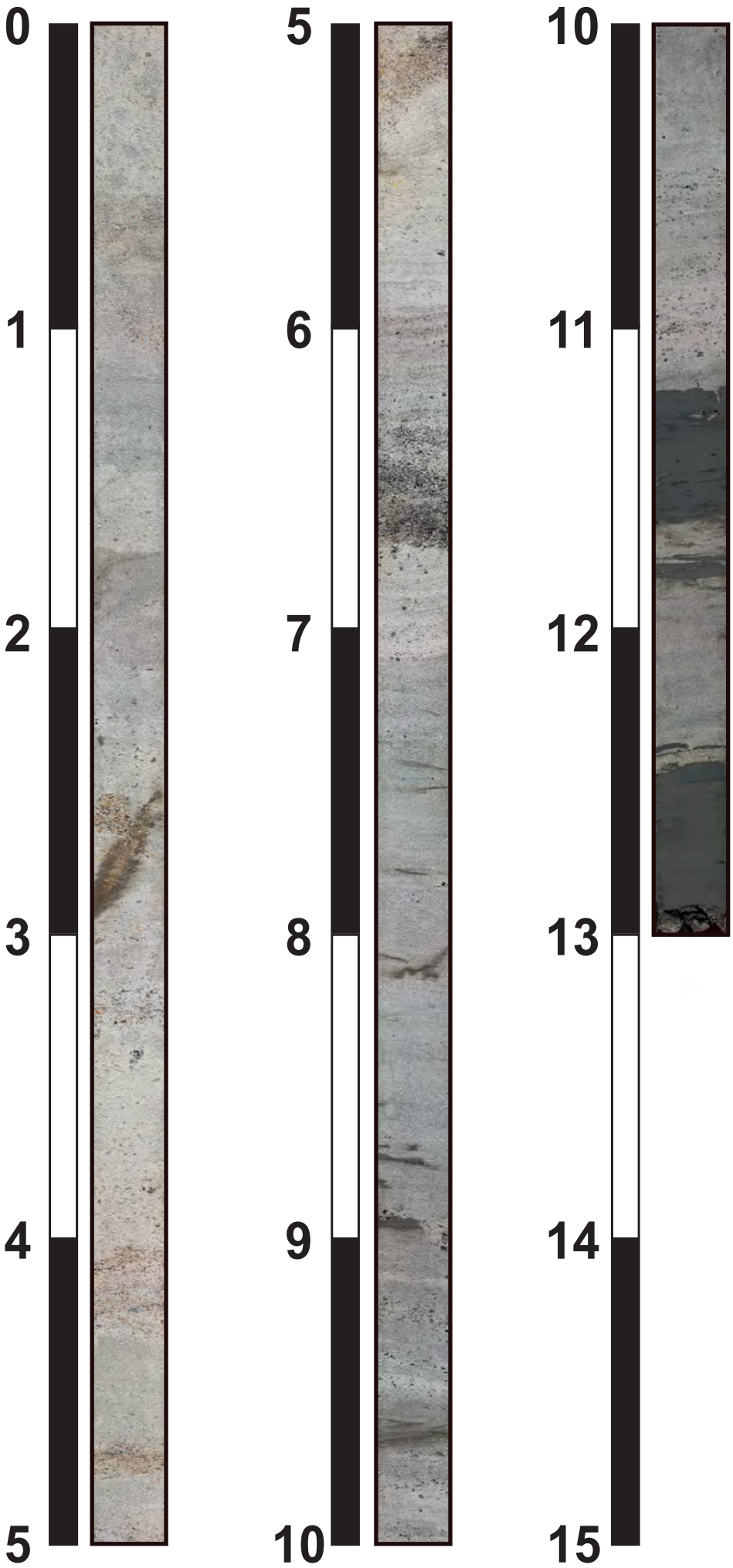
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-17**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.47	
Dry Wt. Before Washing (g):	206.71	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.08	99.95	0	0.00
#4	4.750	0.12	99.87	0	0.00
#5	4.000	0.00	99.87	0	0.00
#7	2.800	0.09	99.82	70	0.06
#10	2.000	0.07	99.77	50	0.04
#14	1.400	0.04	99.75	0	0.00
#18	1.000	0.11	99.68	50	0.06
#25	0.710	0.12	99.60	50	0.06
#35	0.500	0.25	99.44	60	0.15
#45	0.355	0.48	99.14	50	0.24
#60	0.250	3.02	97.21	35	1.06
#80	0.180	52.52	63.81	10	5.25
#120	0.125	91.30	5.75	0	0.00
#170	0.090	7.54	0.95	0	0.00
#200	0.075	0.30	0.76	0	0.00
#230	0.063	0.05	0.73	0	0.00
Total Shell Content:		**4**		**%**	



Nassau Sound
Florida
2016 - 2017

C-18

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-18

DRILLING LOG

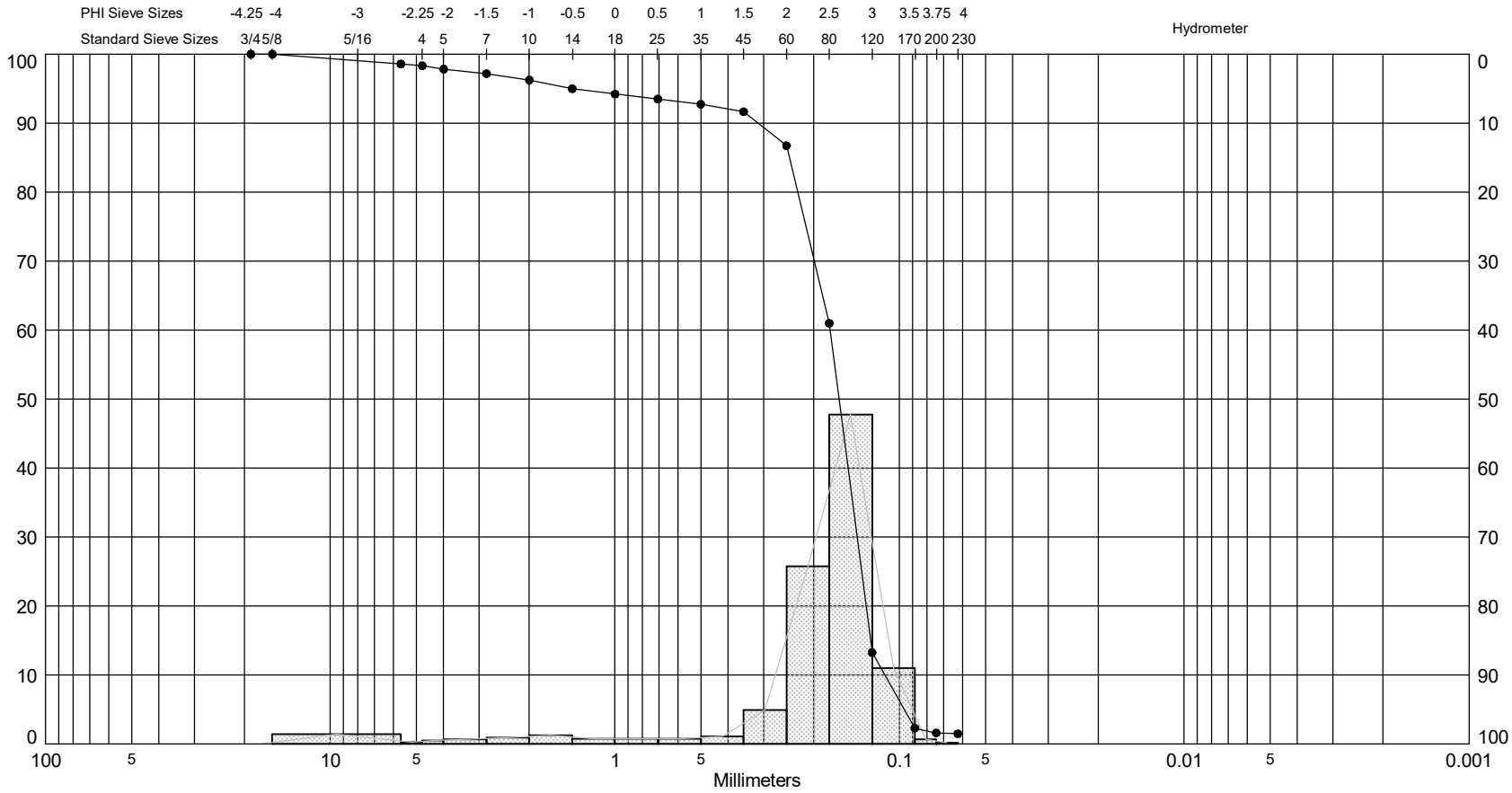
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-18
LOCATION COORDINATES	X = 526,514 Y = 2,247,046
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	12.1 Ft.
15. DATE BORING	STARTED: 03-18-17 11:13 / COMPLETED: 03-18-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-12.9 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	13 Ft.
8. TOTAL DEPTH OF BORING	15.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-12.9	0.0					
			Fine quartz SAND, few fine to medium sand-size shell, trace silt in burrows, poorly graded, loose, subangular, 2.8' = silt-lined Callianassa major burrow, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.73 Shell: 3%, Fines (#200) - 0.97 (SP)
-16.1	3.2					
			Fine to medium quartz SAND, few medium to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).			
-17.2	4.3					
			Fine quartz SAND, few fine to coarse sand-size shell (primarily in layers ~ 1 thick), trace silt in occasional burrow, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 11.0' Mean (mm): 0.20, Phi Sorting: 1.13 Shell: 8%, Carbonate: 8.2%, Fines (#200) - 1.60 (SP)
-19.2	6.3					
-19.6	6.7		Fine to medium quartz SAND, some fine to coarse sand-size shell, trace silt, well graded, loose, subangular, gray (5Y-5/1), (SW).			
			Fine quartz SAND, trace silt in burrows and flaser beds, trace fine to coarse sand-size shell, poorly graded, loose, subangular, color grades to gray (5Y 6/1) from, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.17, Phi Sorting: 1.22 Shell: 8%, Fines (#200) - 2.84 (SP)
-24.1	11.2					
-24.6	11.7		SILT, few fine quartz sand in burrows, soft, dark gray (5Y-4/1), (ML).			
-25.4	12.5		Fine quartz SAND, few silt (primarily in layers at 11.8', and 12.4'), poorly graded, loose, subangular, gray (5Y-6/1), (SP-SM).			
-25.9	13.0		SILT, trace fine quartz sand in occasional burrow, trace organic material, soft, dark gray (5Y-4/1), (ML).			

End of Boring

FLORIDA DEP ROSS_2016-07-18 OLSEN_NASSAU SOUND.GPJ_FL_DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-18 #COMP	—●—	-12.9	SP	#200 - 1.60 #230 - 1.46		8.20	2.62	2.32	-3.12	13.47	1.13

Comments: Sample Interval = 0 - 11.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,514
Northing (Y, ft):	2,247,046
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

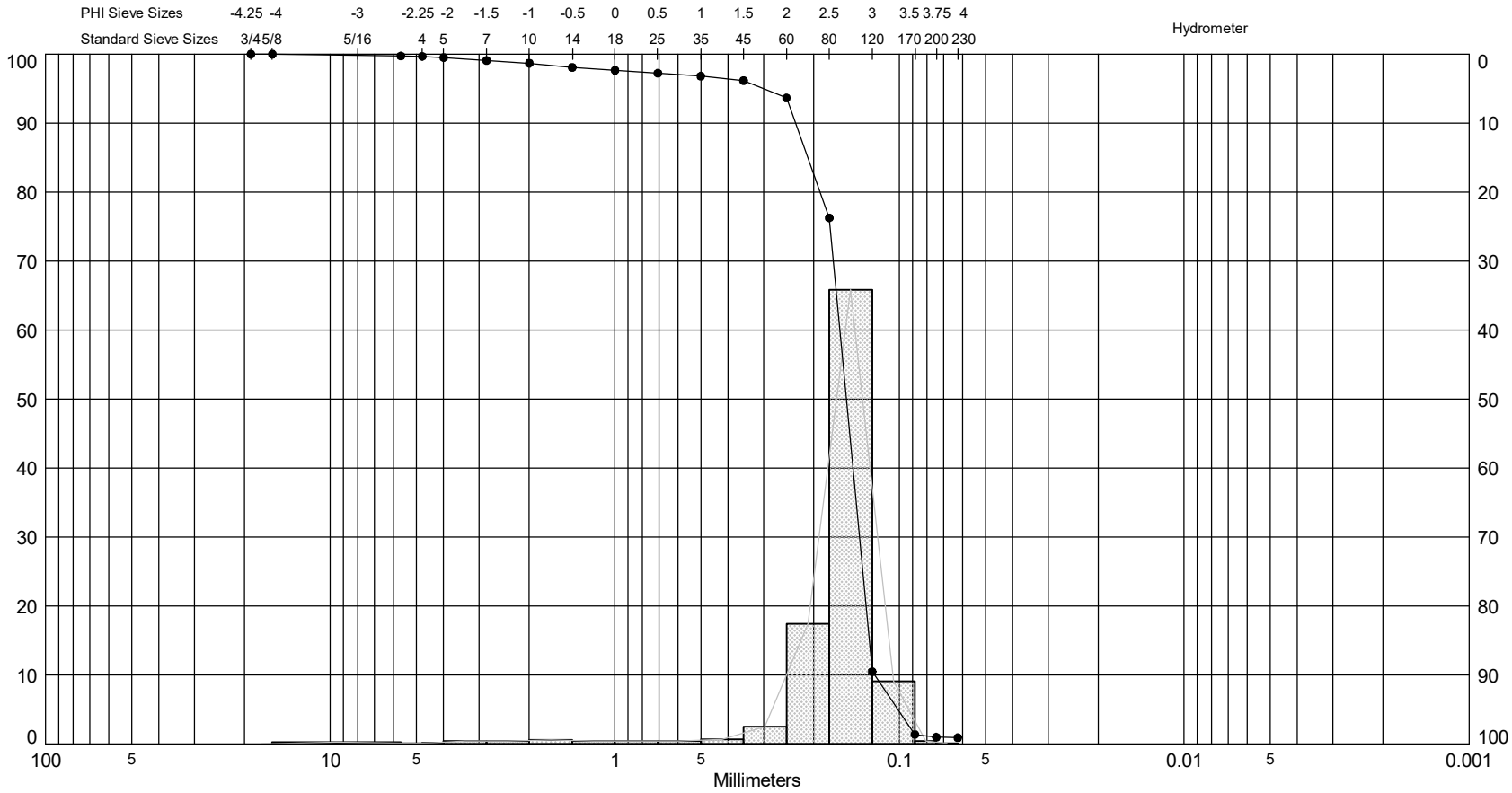
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-11'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-18**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.53	
Dry Wt. Before Washing (g):	184.32	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.88	98.58	100	1.88
#4	4.750	0.32	98.34	100	0.32
#5	4.000	0.67	97.84	100	0.67
#7	2.800	0.86	97.19	100	0.86
#10	2.000	1.23	96.26	100	1.23
#14	1.400	1.68	95.00	100	1.68
#18	1.000	1.04	94.22	98	1.02
#25	0.710	0.95	93.50	90	0.86
#35	0.500	1.01	92.74	50	0.51
#45	0.355	1.44	91.66	30	0.43
#60	0.250	6.53	86.74	10	0.65
#80	0.180	34.19	60.99	1	0.34
#120	0.125	63.38	13.26	0	0.00
#170	0.090	14.56	2.30	0	0.00
#200	0.075	0.92	1.60	0	0.00
#230	0.063	0.18	1.47	0	0.00
Total Shell Content:		**8**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-18 #A	—●—	-13.7	SP	#200 - 0.97 #230 - 0.89			2.7	2.56	-4.4	27.2	0.73

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,514
Northing (Y, ft):	2,247,046
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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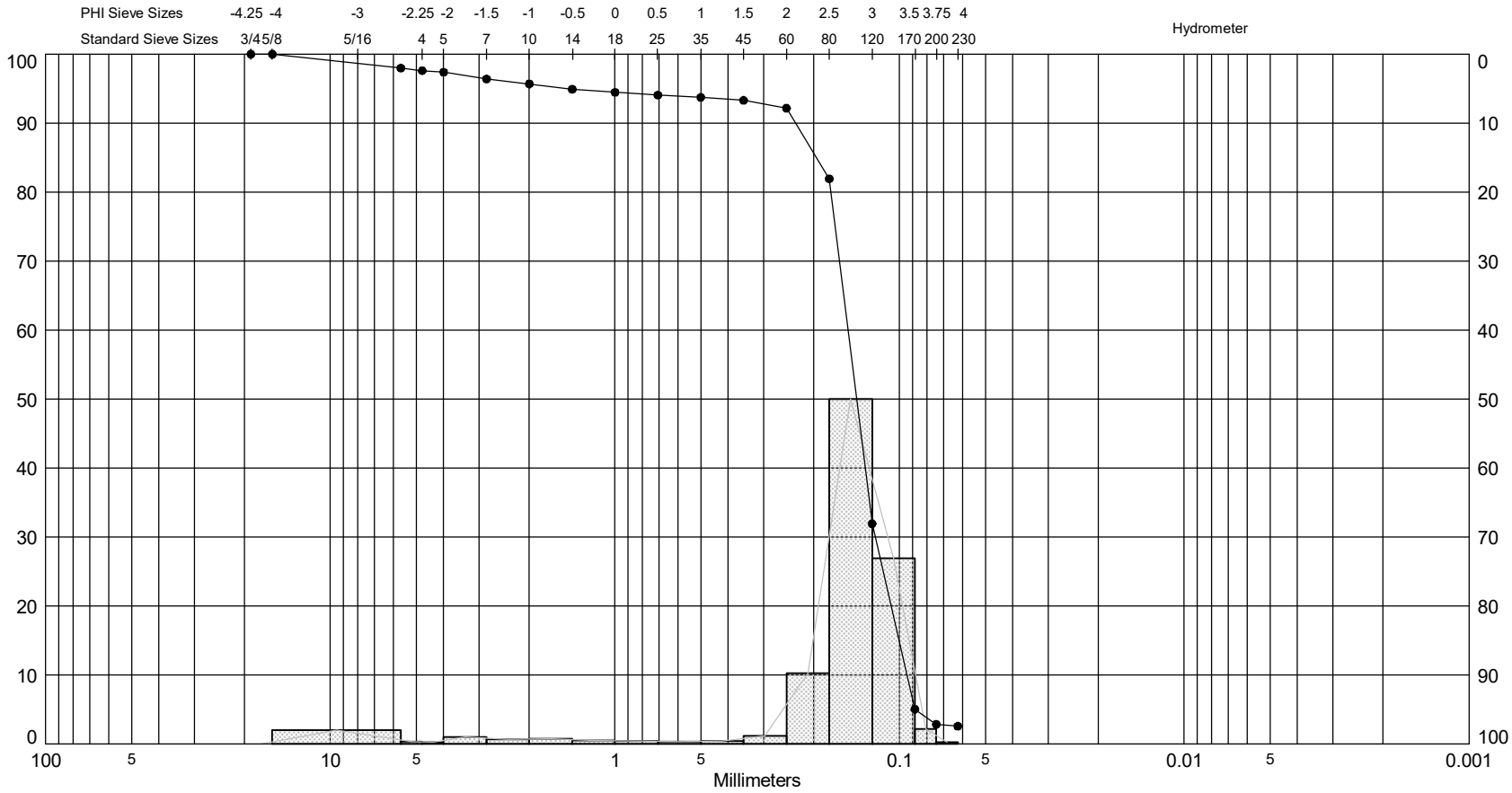
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-18**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.00	
Dry Wt. Before Washing (g):	174.20	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.34	99.73	100	0.34
#4	4.750	0.06	99.68	100	0.06
#5	4.000	0.20	99.52	100	0.20
#7	2.800	0.53	99.09	100	0.53
#10	2.000	0.49	98.70	100	0.49
#14	1.400	0.76	98.08	100	0.76
#18	1.000	0.53	97.66	98	0.52
#25	0.710	0.52	97.24	95	0.49
#35	0.500	0.53	96.81	50	0.27
#45	0.355	0.80	96.17	30	0.24
#60	0.250	3.13	93.65	5	0.16
#80	0.180	21.58	76.27	1	0.22
#120	0.125	81.72	10.48	0	0.00
#170	0.090	11.30	1.38	0	0.00
#200	0.075	0.50	0.97	0	0.00
#230	0.063	0.10	0.89	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-18 #B	—●—	-21.7	SP	#200 - 2.84 #230 - 2.56			2.82	2.55	-3.43	14.86	1.22

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	526,514
Northing (Y, ft):	2,247,046
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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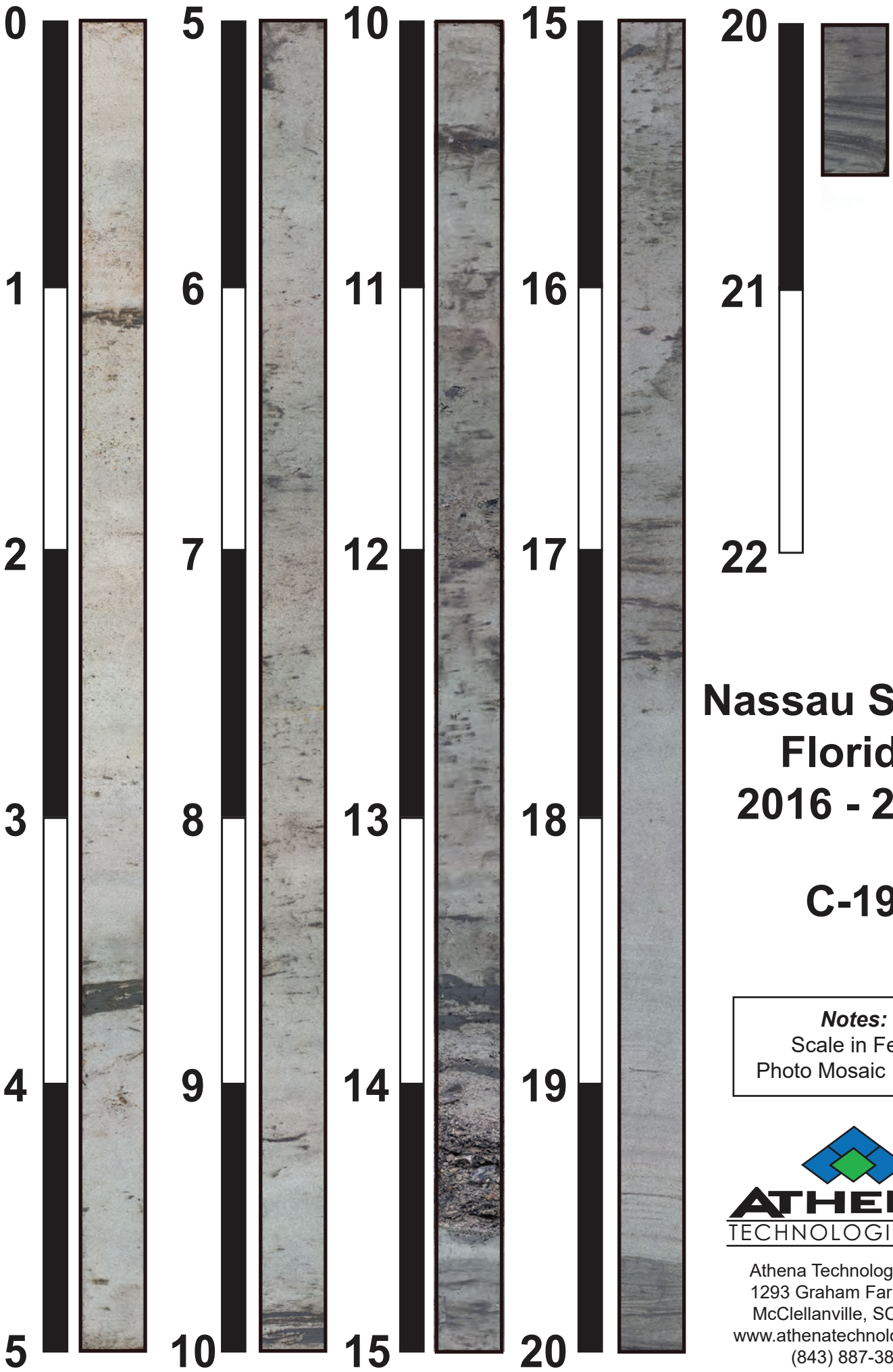
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-18**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.60	
Dry Wt. Before Washing (g):	171.62	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.46	97.98	100	2.46
#4	4.750	0.44	97.62	100	0.44
#5	4.000	0.29	97.39	100	0.29
#7	2.800	1.19	96.41	100	1.19
#10	2.000	0.86	95.71	100	0.86
#14	1.400	0.95	94.93	98	0.93
#18	1.000	0.56	94.47	98	0.55
#25	0.710	0.47	94.08	80	0.38
#35	0.500	0.41	93.75	50	0.21
#45	0.355	0.53	93.31	50	0.27
#60	0.250	1.38	92.18	30	0.41
#80	0.180	12.49	81.95	5	0.62
#120	0.125	61.02	31.94	1	0.61
#170	0.090	32.81	5.05	0	0.00
#200	0.075	2.67	2.86	0	0.00
#230	0.063	0.34	2.58	0	0.00
Total Shell Content:		**8**		**%**	



Nassau Sound
Florida
2016 - 2017

C-19

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-19

DRILLING LOG

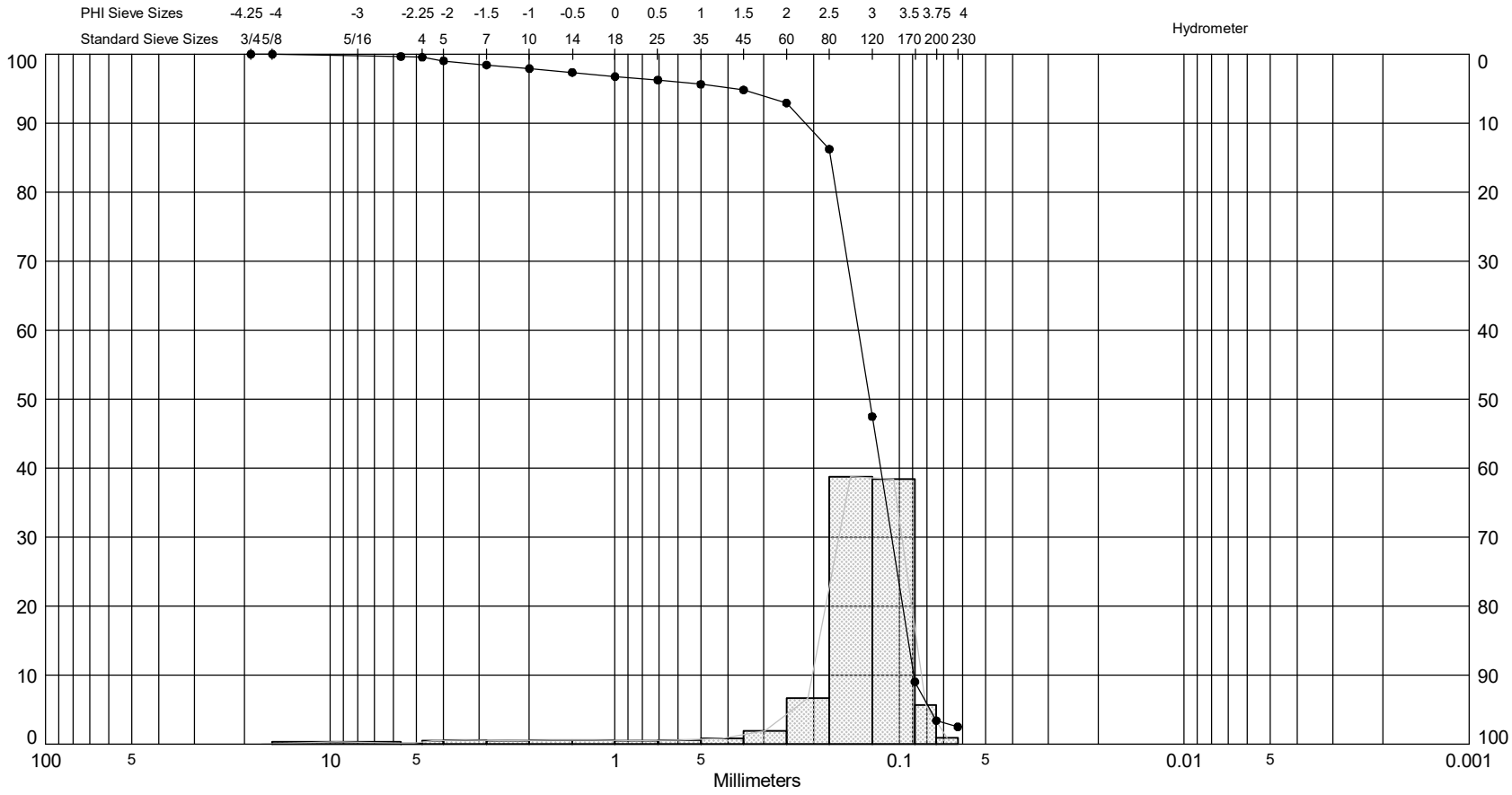
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-19
LOCATION COORDINATES	X = 527,444 Y = 2,248,805
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	15.3 Ft.
15. DATE BORING	STARTED: 02-21-17 09:40 / COMPLETED: 02-21-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-18.4 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	20.5 Ft.
8. TOTAL DEPTH OF BORING	21.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-18.4	0.0					
			Fine to medium quartz SAND, few medium sand-size shell fragments, trace silt in burrows, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 1.8' - 2.3' Mean (mm): 0.17, Phi Sorting: 0.60 Shell: 5%, Fines (#200) - 0.97 (SP)
-21.3	2.9					
			Fine quartz SAND, trace silt in burrows and laminations, trace fine to medium sand-size shell fragments, poorly graded, subangular, loose; notable SILT (color = gray [5Y 4/1]; USCS = ML) layers at following intervals: 3.6-3.7', 9.85-9.95', and 13.6-13.8', gray (5Y-6/1), (SP).		B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.14, Phi Sorting: 0.40 Shell: 0%, Fines (#200) - 1.61 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 19.0' Mean (mm): 0.15, Phi Sorting: 0.94 Shell: 3%, Carbonate: 3.8%, Fines (#200) - 3.40 (SP)
-32.2	13.8					
-33.0	14.6		Fine to medium quartz SAND, some coarse sand to fine gravel-size shell fragments, well graded, subangular, loose, light gray (5Y-7/1), (SW).		C	Sample #C, Depth = 15.8' - 16.3' Mean (mm): 0.11, Phi Sorting: 0.43 Shell: 1%, Fines (#200) - 4.16 (SP)
			Fine quartz SAND, trace to few silt in burrows, trace fine sand-size shell fragments, poorly graded, subangular, loose, gray (5Y-6/1), (SP).			
-35.8	17.4					
			Fine quartz SAND, trace fine sand-size shell fragments, trace silt, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).			
-38.1	19.7					
-38.9	20.5		Fine quartz SAND, few silt (in laminations), trace fine sand-size shell fragments, poorly graded, subangular, loose, gray (5Y-5/1), (SP-SM).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-19 #COMP	—●—	-18.4	SP	#200 - 3.40 #230 - 2.51		3.80	2.97	2.78	-3.6	18.32	0.94

Comments: Sample Interval = 0 - 19.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	527,444
Northing (Y, ft):	2,248,805
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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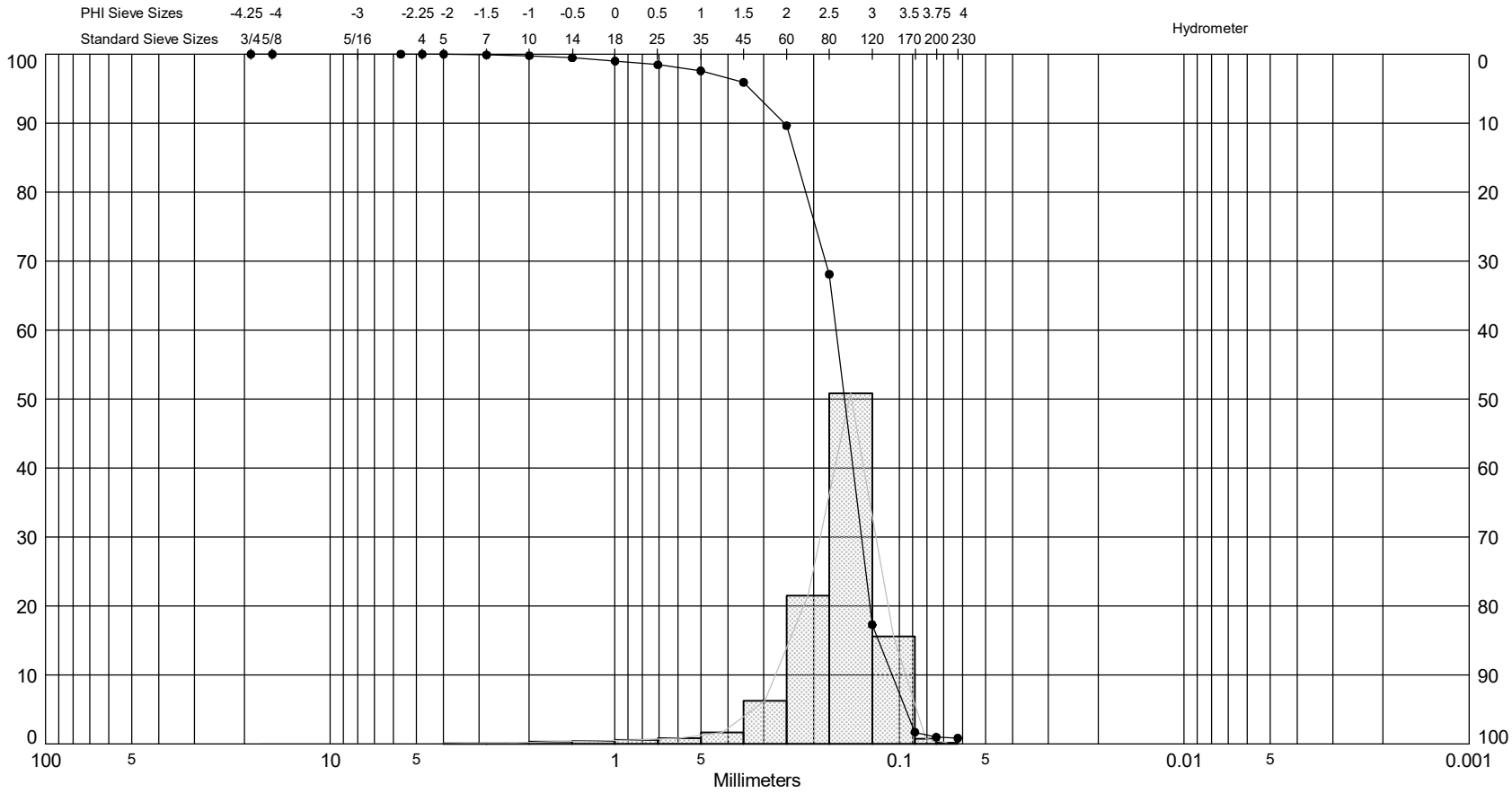
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-19'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-19**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.08	
Dry Wt. Before Washing (g):	200.03	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.51	99.66	100	0.51
#4	4.750	0.17	99.55	100	0.17
#5	4.000	0.76	99.04	50	0.38
#7	2.800	0.90	98.44	50	0.45
#10	2.000	0.79	97.91	50	0.40
#14	1.400	0.83	97.36	50	0.42
#18	1.000	0.90	96.76	70	0.63
#25	0.710	0.76	96.25	50	0.38
#35	0.500	0.93	95.63	30	0.28
#45	0.355	1.21	94.82	20	0.24
#60	0.250	2.83	92.94	10	0.28
#80	0.180	10.04	86.24	1	0.10
#120	0.125	58.13	47.48	0	0.00
#170	0.090	57.63	9.04	0	0.00
#200	0.075	8.44	3.41	0	0.00
#230	0.063	1.34	2.52	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-19 #A	—●—	-20.2	SP	#200 - 0.97 #230 - 0.84			2.68	2.57	-2.36	12.95	0.6

Comments: Sample Depth = 2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-28-17
Analyzed By:	CM
Easting (X, ft):	527,444
Northing (Y, ft):	2,248,805
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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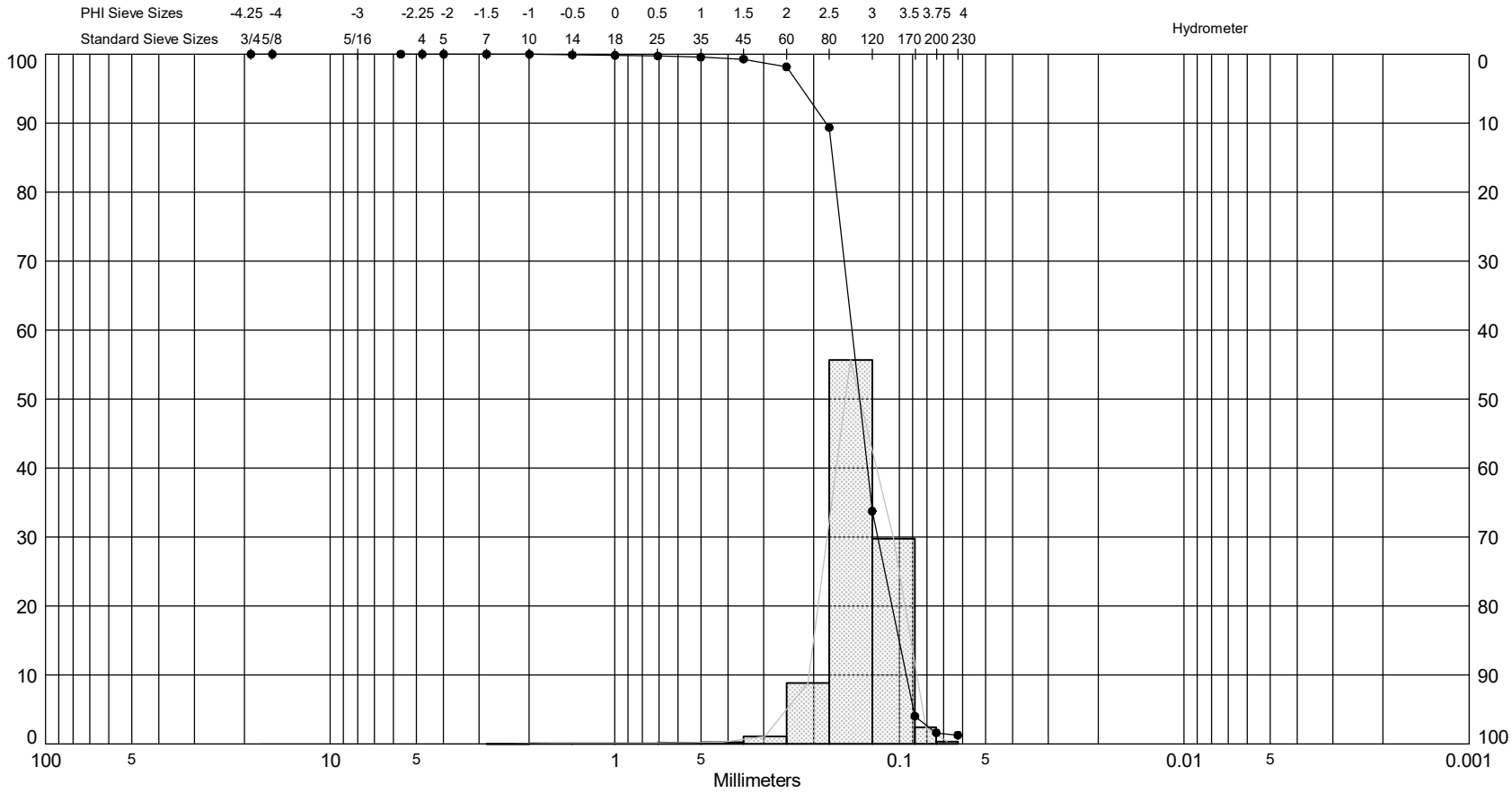
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**2'**
Project No.:	**EQ175023**	**Date:**	**3/28/2017**
Boring No.:	**C-19**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.87	
Dry Wt. Before Washing (g):	195.35	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.16	99.89	100	0.16
#10	2.000	0.15	99.79	100	0.15
#14	1.400	0.48	99.46	100	0.48
#18	1.000	0.66	99.00	100	0.66
#25	0.710	0.80	98.45	80	0.64
#35	0.500	1.26	97.59	70	0.88
#45	0.355	2.43	95.92	50	1.22
#60	0.250	9.15	89.63	30	2.75
#80	0.180	31.34	68.08	2	0.63
#120	0.125	73.90	17.29	0	0.00
#170	0.090	22.68	1.70	0	0.00
#200	0.075	1.06	0.97	0	0.00
#230	0.063	0.19	0.84	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-19 #B	—●—	-26.2	SP	#200 - 1.61 #230 - 1.28			2.85	2.85	-1.88	15.92	0.4

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	527,444
Northing (Y, ft):	2,248,805
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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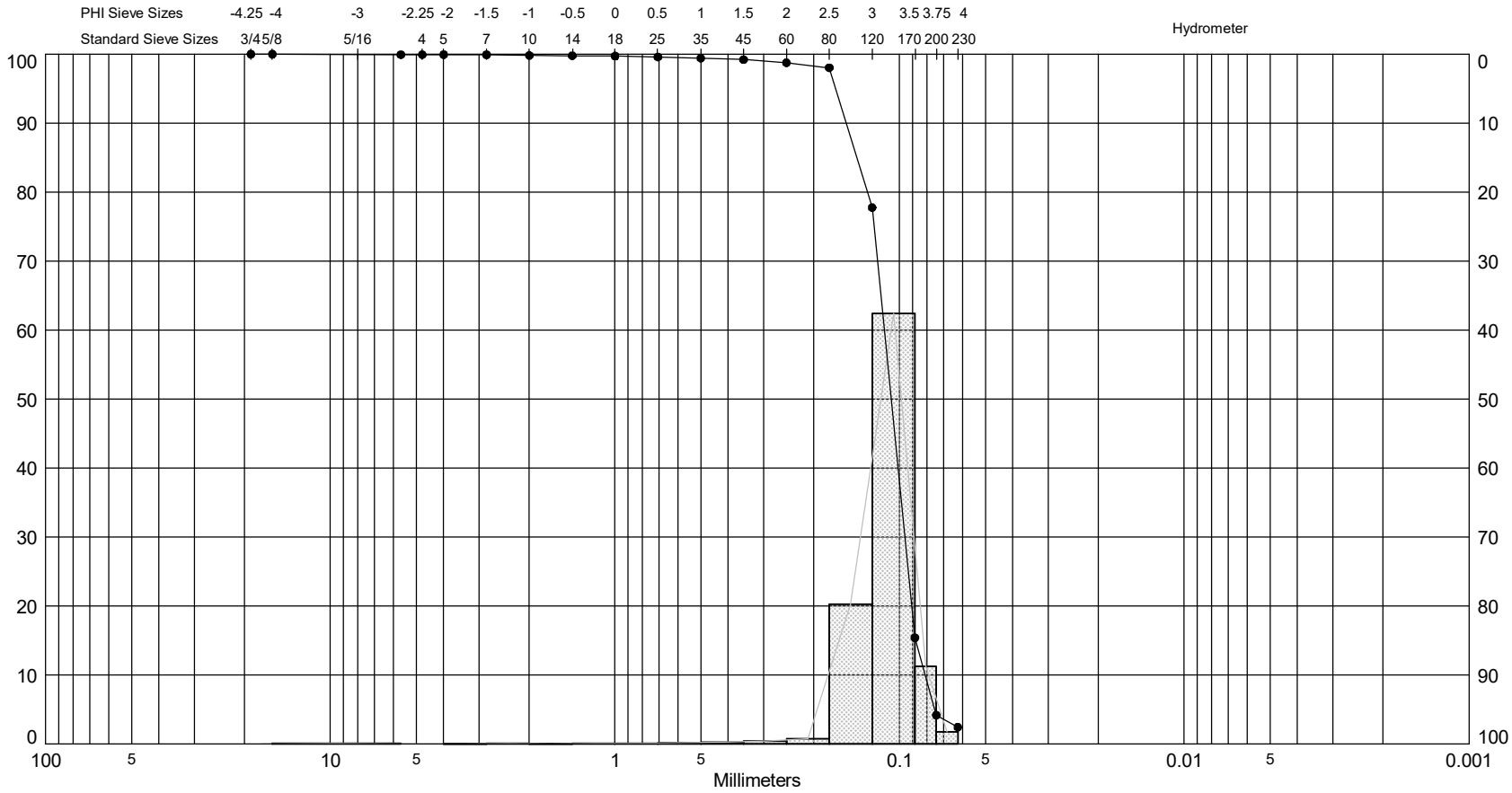
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-19**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 2.5Y 7/1**		

Tare Weight, (g):	49.89	
Dry Wt. Before Washing (g):	181.51	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.03	99.98	0	0.00
#14	1.400	0.10	99.90	70	0.07
#18	1.000	0.09	99.83	50	0.05
#25	0.710	0.13	99.73	30	0.04
#35	0.500	0.22	99.57	25	0.06
#45	0.355	0.36	99.29	15	0.05
#60	0.250	1.48	98.17	10	0.15
#80	0.180	11.58	89.37	2	0.23
#120	0.125	73.22	33.74	0	0.00
#170	0.090	39.12	4.02	0	0.00
#200	0.075	3.17	1.61	0	0.00
#230	0.063	0.43	1.29	0	0.00
Total Shell Content:		**0**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-19 #C	—●—	-34.2	SP	#200 - 4.16 #230 - 2.43			3.22	3.16	-5.27	58.82	0.43

Comments: Sample Depth = 16'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	527,444
Northing (Y, ft):	2,248,805
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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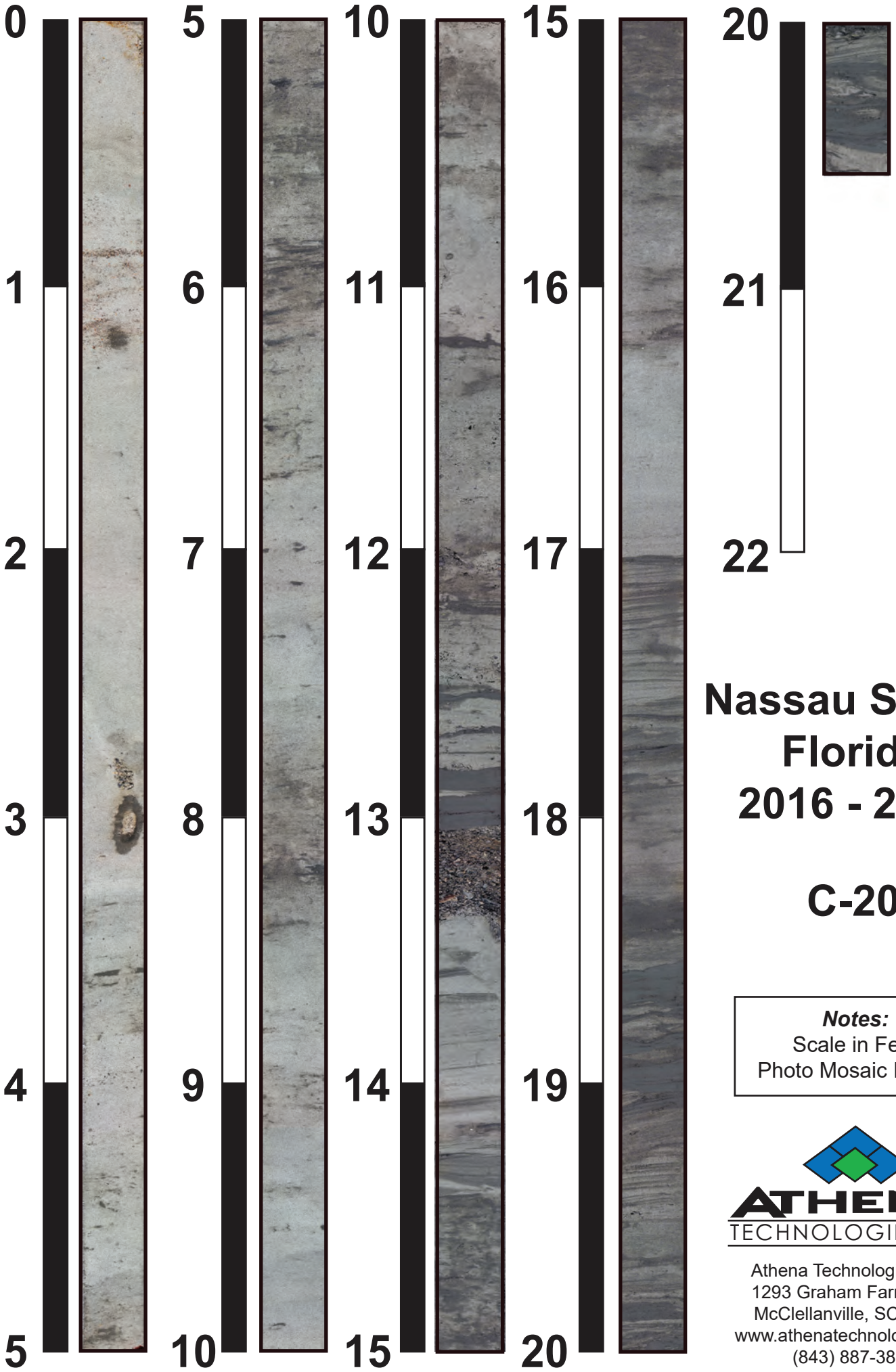
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**16'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-19**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 2.5Y 7/1**		

Tare Weight, (g):	49.60	
Dry Wt. Before Washing (g):	184.12	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.08	99.94	100	0.08
#4	4.750	0.00	99.94	0	0.00
#5	4.000	0.00	99.94	0	0.00
#7	2.800	0.03	99.92	50	0.02
#10	2.000	0.13	99.82	0	0.00
#14	1.400	0.06	99.78	20	0.01
#18	1.000	0.08	99.72	50	0.04
#25	0.710	0.16	99.60	75	0.12
#35	0.500	0.23	99.43	70	0.16
#45	0.355	0.29	99.21	50	0.15
#60	0.250	0.59	98.77	30	0.18
#80	0.180	0.98	98.04	25	0.25
#120	0.125	27.27	77.77	1	0.27
#170	0.090	83.91	15.40	0	0.00
#200	0.075	15.10	4.17	0	0.00
#230	0.063	2.33	2.44	0	0.00
Total Shell Content:		**1**		**%**	



Nassau Sound
Florida
2016 - 2017

C-20

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-20

DRILLING LOG

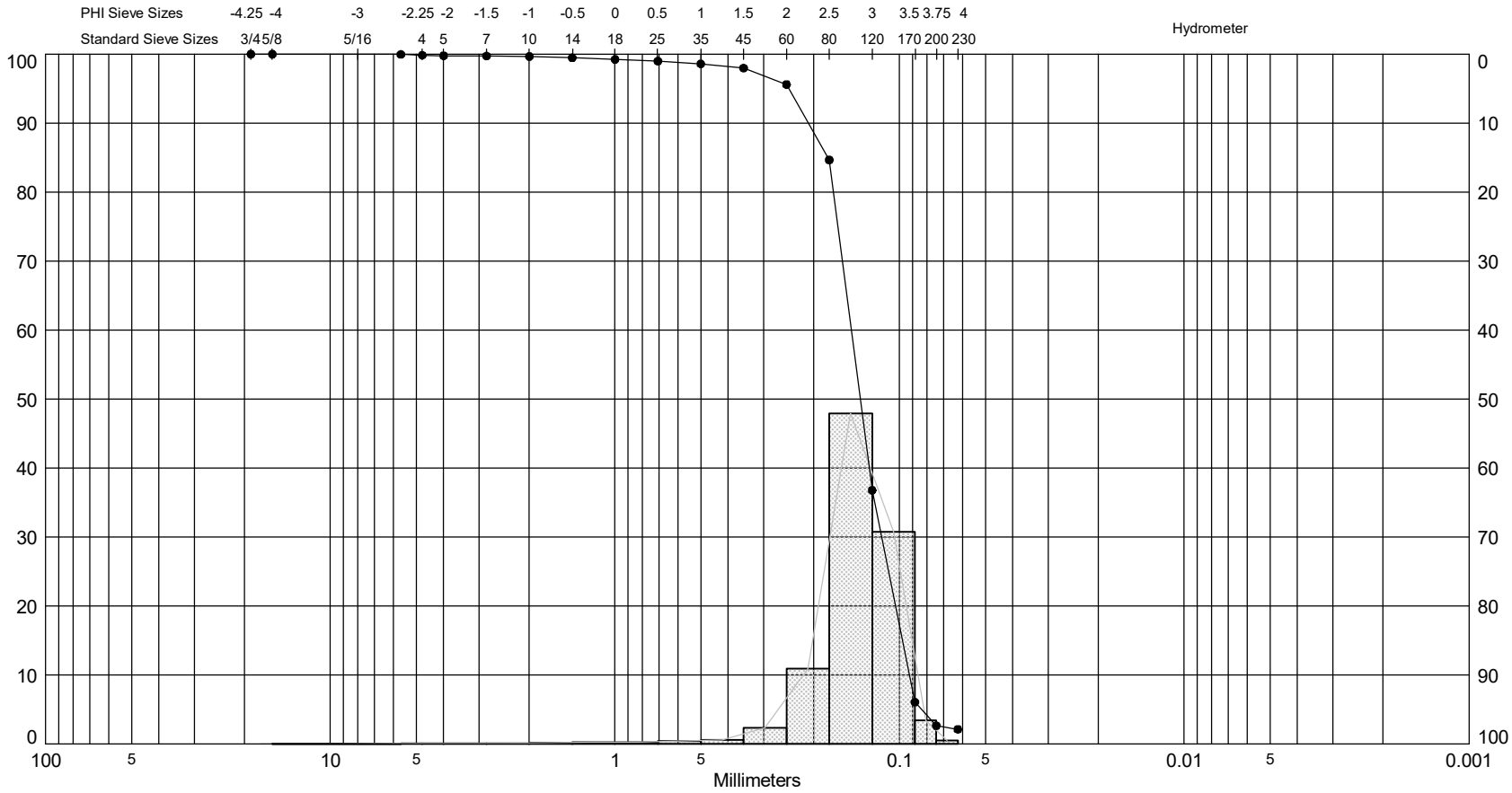
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-20
LOCATION COORDINATES	X = 527,472 Y = 2,248,218
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	21.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 4 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	15.9 Ft.
15. DATE BORING	STARTED 02-21-17 13:42 / COMPLETED 02-21-17
16. ELEVATION TOP OF BORING	-15.7 Ft.
17. TOTAL RECOVERY FOR BORING	20.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-15.7	0.0					
			Fine quartz SAND, trace to few silt in burrows, trace fine sand-size shell fragments, poorly graded, subangular, loose, 3.0' = silt-lined callianassa major burrow, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 1.8' - 2.3' Mean (mm): 0.15, Phi Sorting: 0.40 Shell: 1%, Fines (#200) - 1.05 (SP)
-20.4	4.7					
			Fine quartz SAND, trace to few silt in burrows and laminations, negligible shell material, poorly graded, subangular, loose, shell percentage increases to approximately 5% at 11.1-12.5', light gray (5Y-7/2), (SP).		COMP	Sample #COMP, Depth = 0.0' - 12.5' Mean (mm): 0.14, Phi Sorting: 0.58 Shell: 3%, Carbonate: 3.5%, Fines (#200) - 2.64 (SP)
					B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.13, Phi Sorting: 0.37 Shell: 0%, Fines (#200) - 1.58 (SP)
-28.5	12.8					
-28.7	13.0		SILT, little fine quart sand in laminations, burrows, trace organic material, soft, dark gray (5Y-4/1), (ML).			
-29.1	13.4		Medium quartz SAND, some coarse sand to fine gravel-size shell fragments, few coarse quartz sand, well graded, subangular, loose, gray (5Y-5/1), (SW).			
			Silty fine quartz SAND, few to little silt in laminations and burrows, trace fine sand-size shell in layers (<0.5 thick) , trace organic material in silt laminations, poorly graded, subangular, loose, gray (5Y-6/1), (SP-SM).		C	Sample #C, Depth = 16.8' - 17.3' Mean (mm): 0.10, Phi Sorting: 0.64 Shell: 2%, Fines (#200) - 16.57 (SM)
-36.2	20.5					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-20 #COMP	—●—	-15.7	SP	#200 - 2.64 #230 - 2.12		3.50	2.86	2.81	-3.51	26.85	0.58

Comments: Sample Interval = 0 - 12.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	527,472
Northing (Y, ft):	2,248,218
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

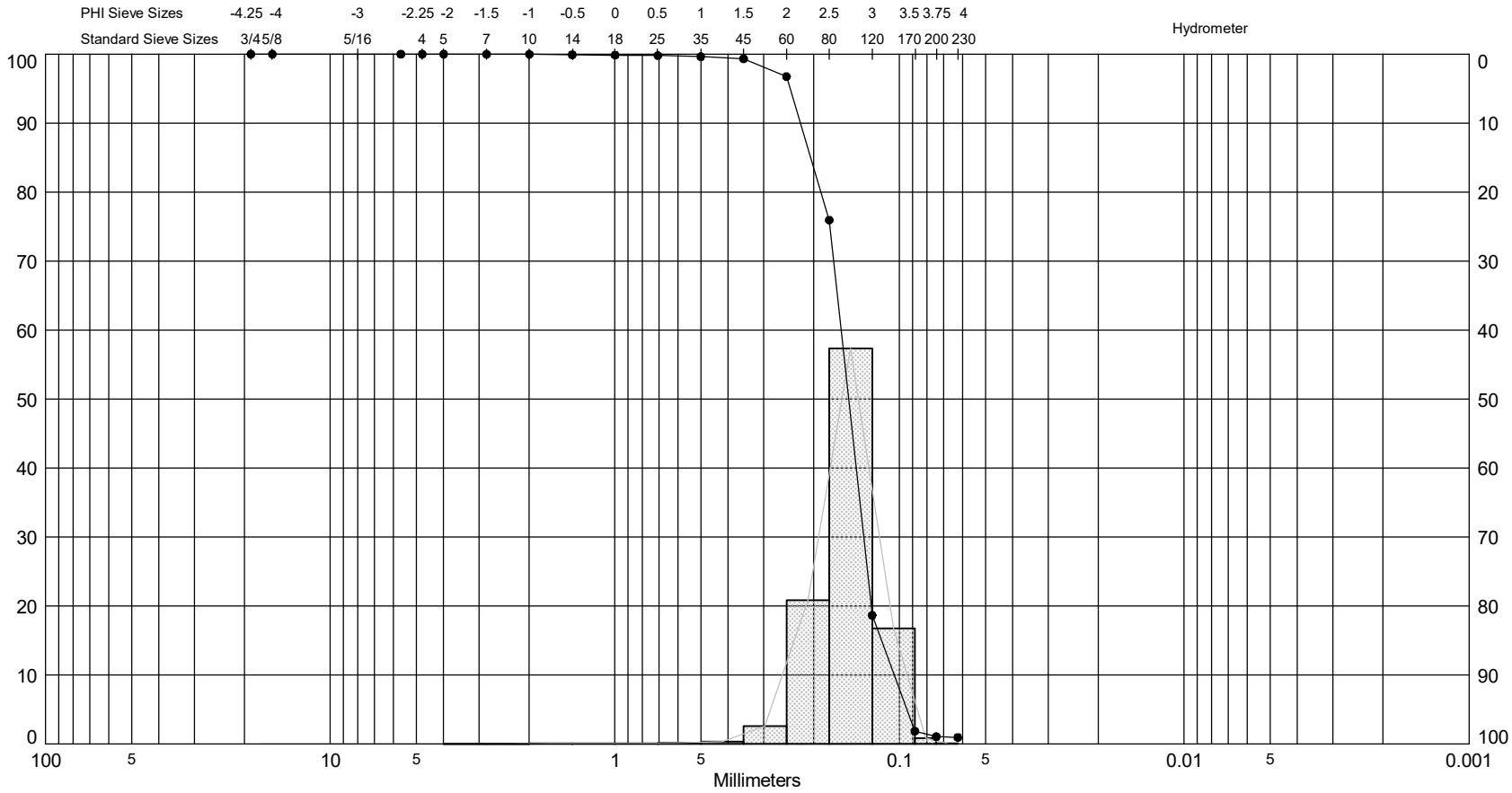
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12.5'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-20**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.32	
Dry Wt. Before Washing (g):	203.18	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.06	99.96	100	0.06
#4	4.750	0.17	99.85	0	0.00
#5	4.000	0.11	99.78	100	0.11
#7	2.800	0.07	99.73	100	0.07
#10	2.000	0.09	99.67	90	0.08
#14	1.400	0.30	99.48	80	0.24
#18	1.000	0.35	99.25	70	0.25
#25	0.710	0.38	99.00	65	0.25
#35	0.500	0.60	98.61	50	0.30
#45	0.355	0.95	97.99	30	0.29
#60	0.250	3.63	95.61	20	0.73
#80	0.180	16.72	84.67	10	1.67
#120	0.125	73.20	36.79	0	0.00
#170	0.090	46.98	6.05	0	0.00
#200	0.075	5.21	2.64	0	0.00
#230	0.063	0.80	2.12	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-20 #A	—●—	-17.5	SP	#200 - 1.05 #230 - 0.95			2.73	2.7	-1.5	12.97	0.4

Comments: Sample Depth = 2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	527,472
Northing (Y, ft):	2,248,218
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
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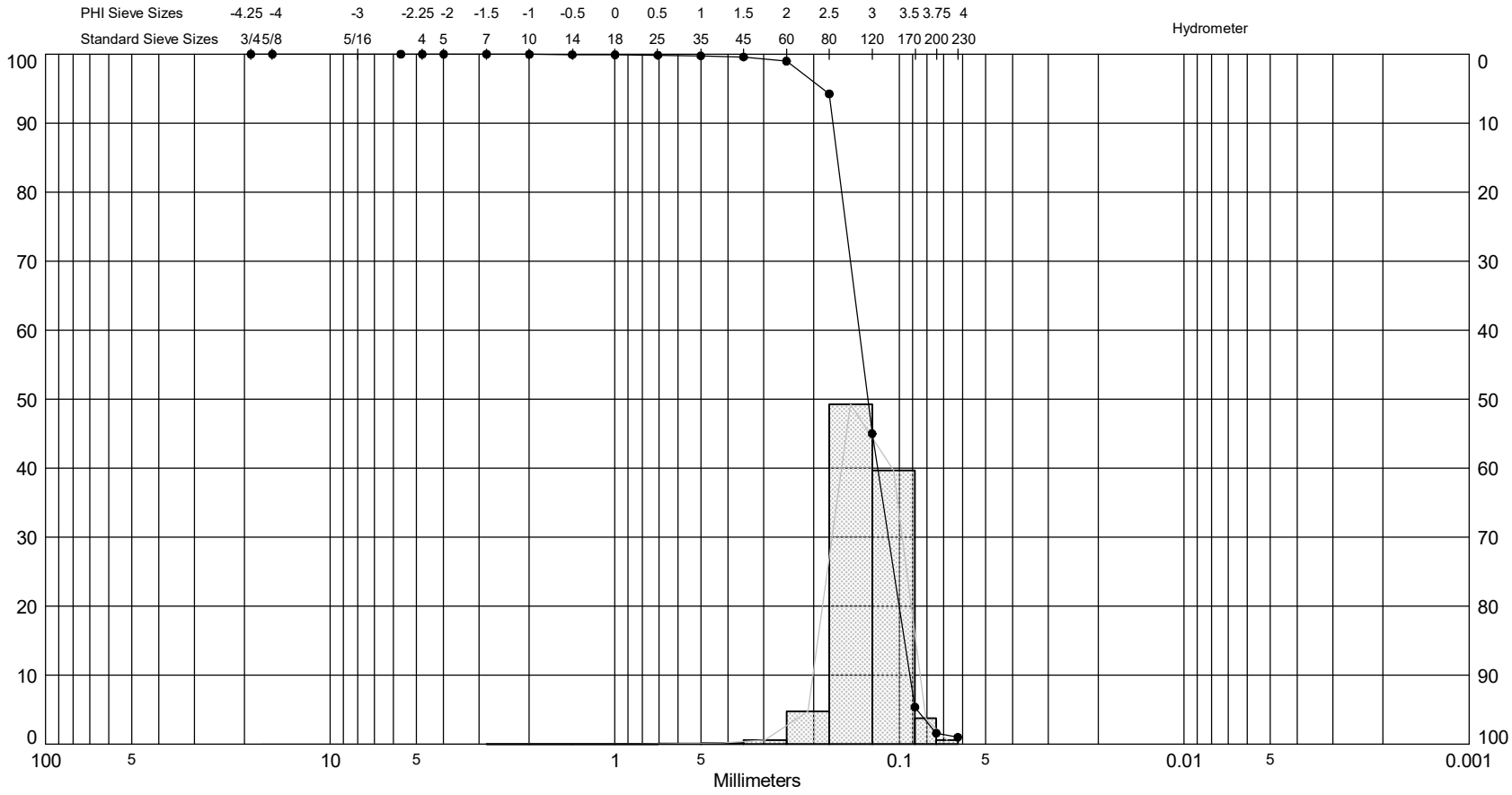
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**2'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-20**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.83	
Dry Wt. Before Washing (g):	184.25	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.02	99.99	100	0.02
#10	2.000	0.02	99.97	100	0.02
#14	1.400	0.08	99.91	100	0.08
#18	1.000	0.07	99.86	100	0.07
#25	0.710	0.10	99.78	90	0.09
#35	0.500	0.21	99.63	70	0.15
#45	0.355	0.41	99.32	50	0.21
#60	0.250	3.45	96.76	30	1.04
#80	0.180	27.97	75.95	1	0.28
#120	0.125	77.04	18.64	0	0.00
#170	0.090	22.57	1.84	0	0.00
#200	0.075	1.07	1.05	0	0.00
#230	0.063	0.13	0.95	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-20 #B	—●—	-24.5	SP	#200 - 1.58 #230 - 0.98			2.95	2.95	-1.52	14.68	0.37

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	527,472
Northing (Y, ft):	2,248,218
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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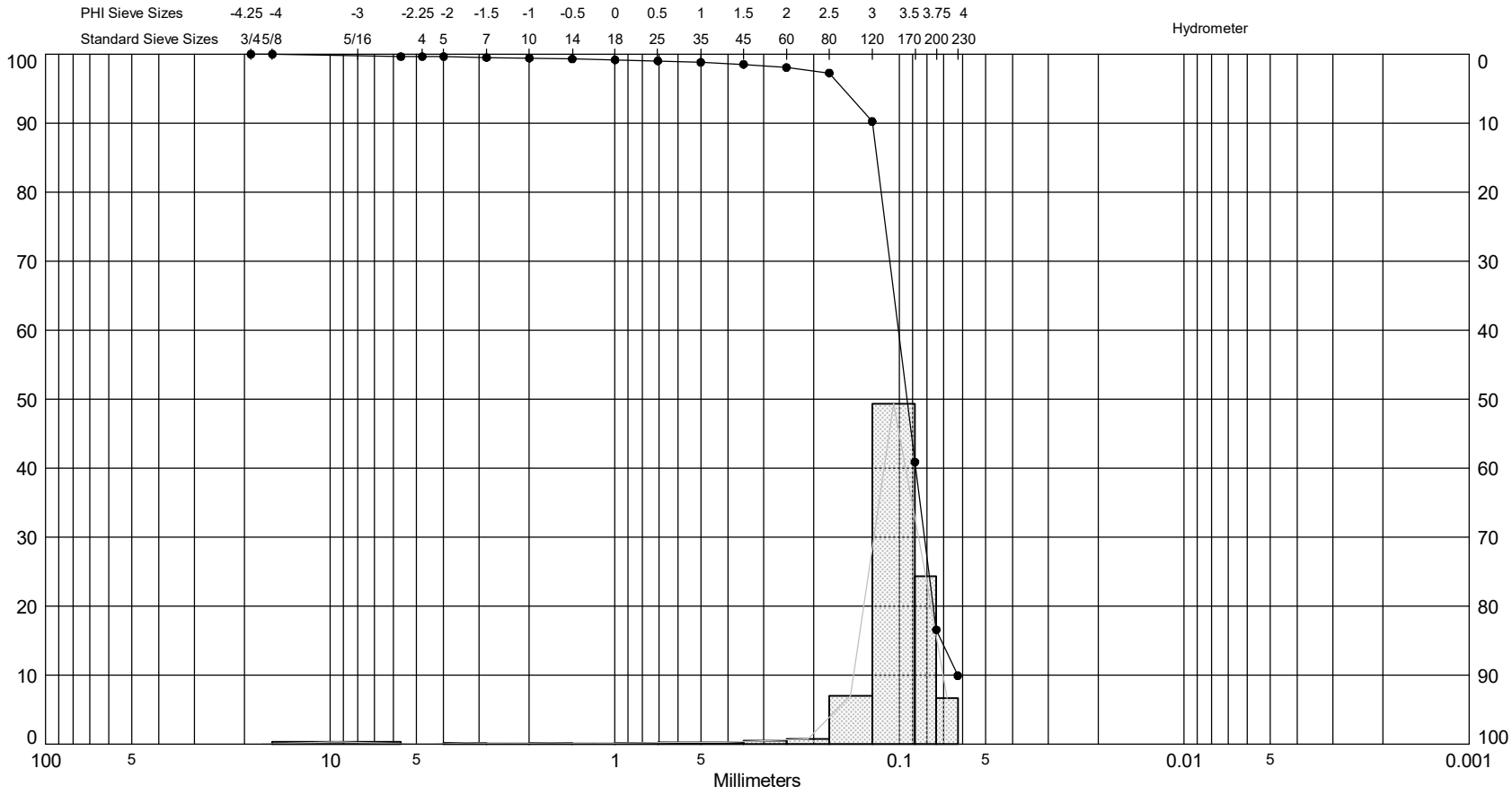
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-20**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 6/1**		

Tare Weight, (g):	49.94	
Dry Wt. Before Washing (g):	206.19	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.04	99.97	100	0.04
#14	1.400	0.05	99.94	100	0.05
#18	1.000	0.04	99.92	60	0.02
#25	0.710	0.06	99.88	50	0.03
#35	0.500	0.16	99.78	40	0.06
#45	0.355	0.27	99.60	30	0.08
#60	0.250	0.94	99.00	15	0.14
#80	0.180	7.42	94.25	2	0.15
#120	0.125	76.93	45.02	0	0.00
#170	0.090	61.93	5.38	0	0.00
#200	0.075	5.92	1.59	0	0.00
#230	0.063	0.93	1.00	0	0.00
Total Shell Content:		**0**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-20 #C	—●—	-32.5	SM	#200 - 16.57 #230 - 9.91			3.41	3.28	-6.27	56.37	0.64

Comments: Sample Depth = 17'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	527,472
Northing (Y, ft):	2,248,218
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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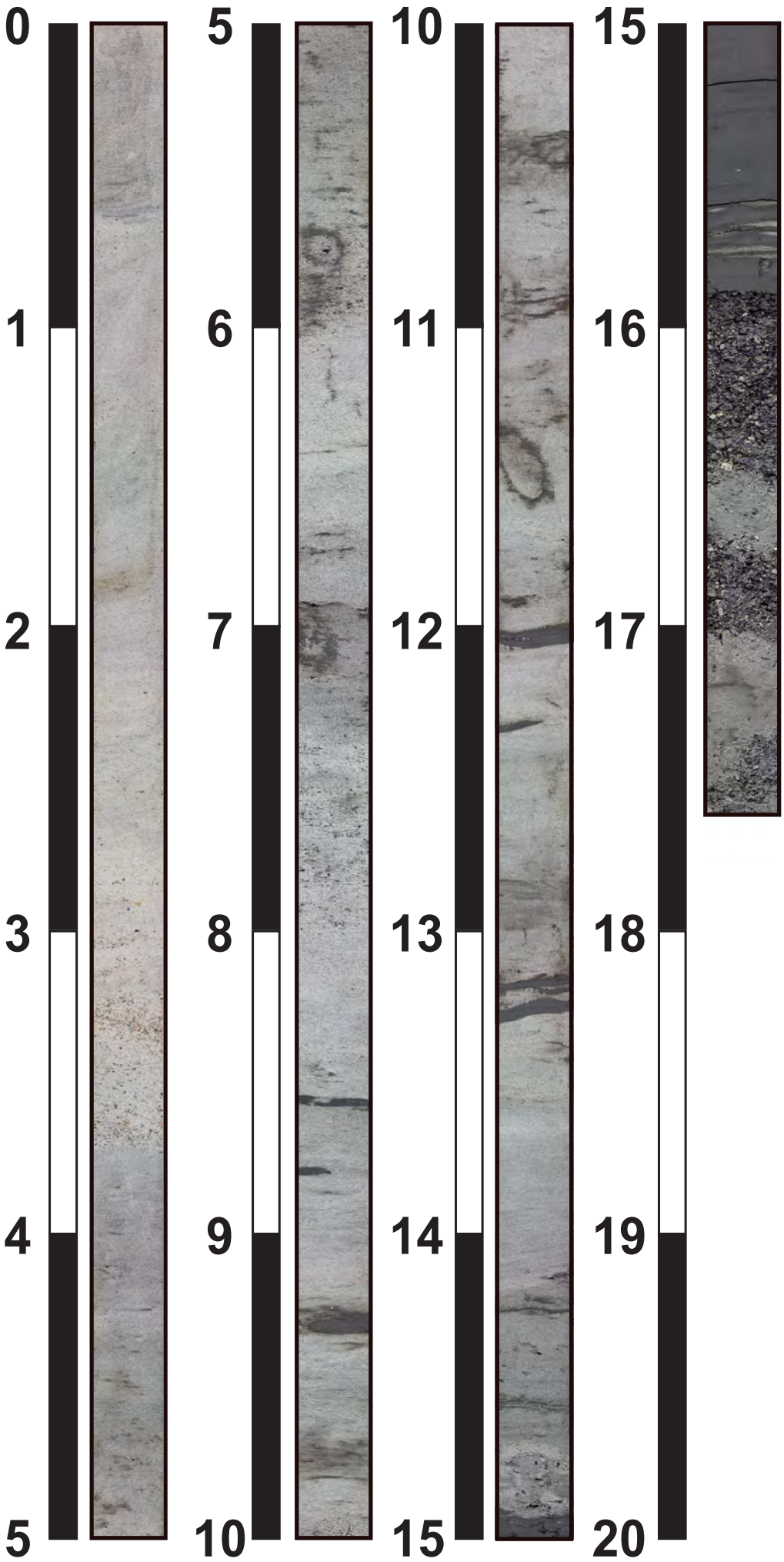
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**17'**
Project No.:	**EQ155023**	**Date:**	**3/29/2017**
Boring No.:	**C-20**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.97	
Dry Wt. Before Washing (g):	179.20	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.45	99.65	50	0.23
#4	4.750	0.00	99.65	0	0.00
#5	4.000	0.00	99.65	0	0.00
#7	2.800	0.17	99.52	0	0.00
#10	2.000	0.09	99.45	0	0.00
#14	1.400	0.19	99.30	20	0.04
#18	1.000	0.15	99.19	30	0.05
#25	0.710	0.19	99.04	30	0.06
#35	0.500	0.27	98.83	40	0.11
#45	0.355	0.37	98.55	50	0.19
#60	0.250	0.59	98.09	30	0.18
#80	0.180	1.02	97.30	25	0.26
#120	0.125	9.10	90.26	10	0.91
#170	0.090	63.79	40.90	0	0.00
#200	0.075	31.41	16.59	0	0.00
#230	0.063	8.61	9.93	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-21

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
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McClellanville, SC 29458
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Boring Designation C-21

DRILLING LOG

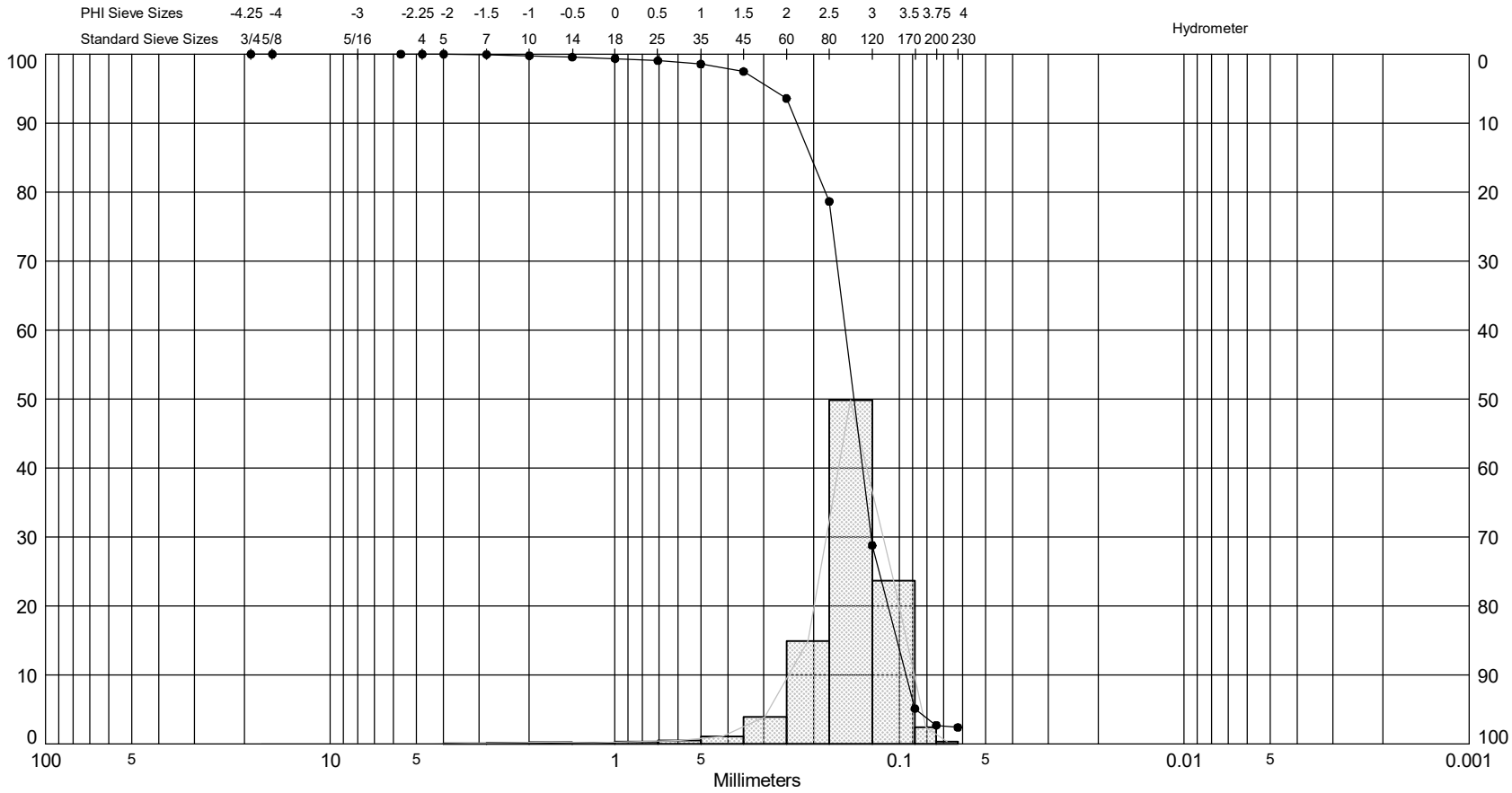
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-21
LOCATION COORDINATES	X = 527,481 Y = 2,247,578
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	10.9 Ft.
15. DATE BORING	STARTED: 03-18-17 08:41 / COMPLETED: 03-18-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-14.4 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	17.6 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-14.4	0.0				
		Fine quartz SAND, trace medium to coarse sand-size shell, trace silt in occasional burrow, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.15, Phi Sorting: 0.42 Shell: 1%, Fines (#200) - 0.92 (SP)
-17.6	3.2				
-18.1	3.7	Fine to medium quartz SAND, few fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
		Fine quartz SAND, trace silt in burrows and laminations, trace medium sand-size shell, poorly graded, loose, subangular, 5.7' and 7.1' = silt-lined Callianassa major burrow, gray (5Y-6/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 14.5' Mean (mm): 0.15, Phi Sorting: 0.56 Shell: 2%, Carbonate: 3.1%, Fines (#200) - 2.70 (SP)
-21.8	7.4				
-22.4	8.0	Fine to medium quartz SAND, few medium sand-size shell, trace silt, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.18, Phi Sorting: 0.53 Shell: 5%, Fines (#200) - 0.71 (SP)
		Fine quartz SAND, few silt in burrows and layers (notable layers at 9.3', 12.0', and 13.1-13.2'), trace fine sand-size shell, poorly graded, loose, subangular, 11.4' = silt-lined Callianassa major burrow, gray (5Y-6/1), (SP-SM).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 0.12, Phi Sorting: 0.36 Shell: 1%, Fines (#200) - 3.60 (SP)
-29.3	14.9				
-30.3	15.9	SILT, few fine quartz sand in laminations, soft, dark gray (5Y-4/1), (ML).			
-32.0	17.6	Interbedded, fine gravel-size SHELL (GP; gray [5Y 5/1]) and fine to medium quartz SAND (SP; gray [5Y 6/1]), trace silt, loose/very loose, subangular, gray (5Y-5/1), (GP).			
		End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-21 #COMP	—●—	-14.4	SP	#200 - 2.70 #230 - 2.38		3.10	2.79	2.72	-2.41	15.04	0.56

Comments: Sample Interval = 0 - 14.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,481
Northing (Y, ft):	2,247,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

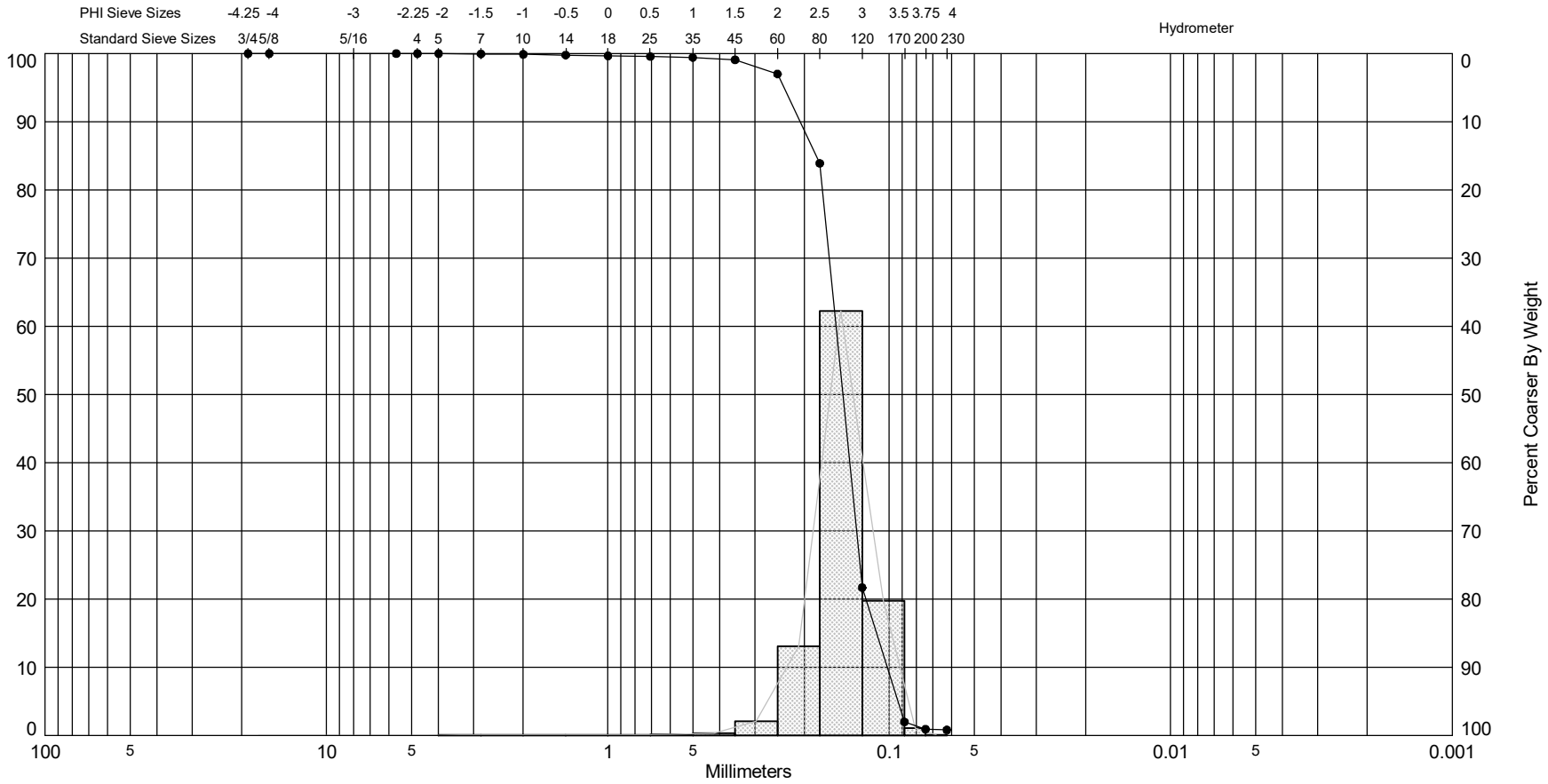
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-21**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.87	
Dry Wt. Before Washing (g):	193.22	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.07	99.95	100	0.07
#10	2.000	0.24	99.78	100	0.24
#14	1.400	0.31	99.57	100	0.31
#18	1.000	0.29	99.37	98	0.28
#25	0.710	0.45	99.05	90	0.41
#35	0.500	0.72	98.55	50	0.36
#45	0.355	1.54	97.47	30	0.46
#60	0.250	5.59	93.58	5	0.28
#80	0.180	21.41	78.64	1	0.21
#120	0.125	71.46	28.79	0	0.00
#170	0.090	33.93	5.12	0	0.00
#200	0.075	3.47	2.70	0	0.00
#230	0.063	0.46	2.38	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-21 #A	—●—	-15.2	SP	#200 - 0.92 #230 - 0.80			2.77	2.75	-2.79	24.2	0.42

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,481
Northing (Y, ft):	2,247,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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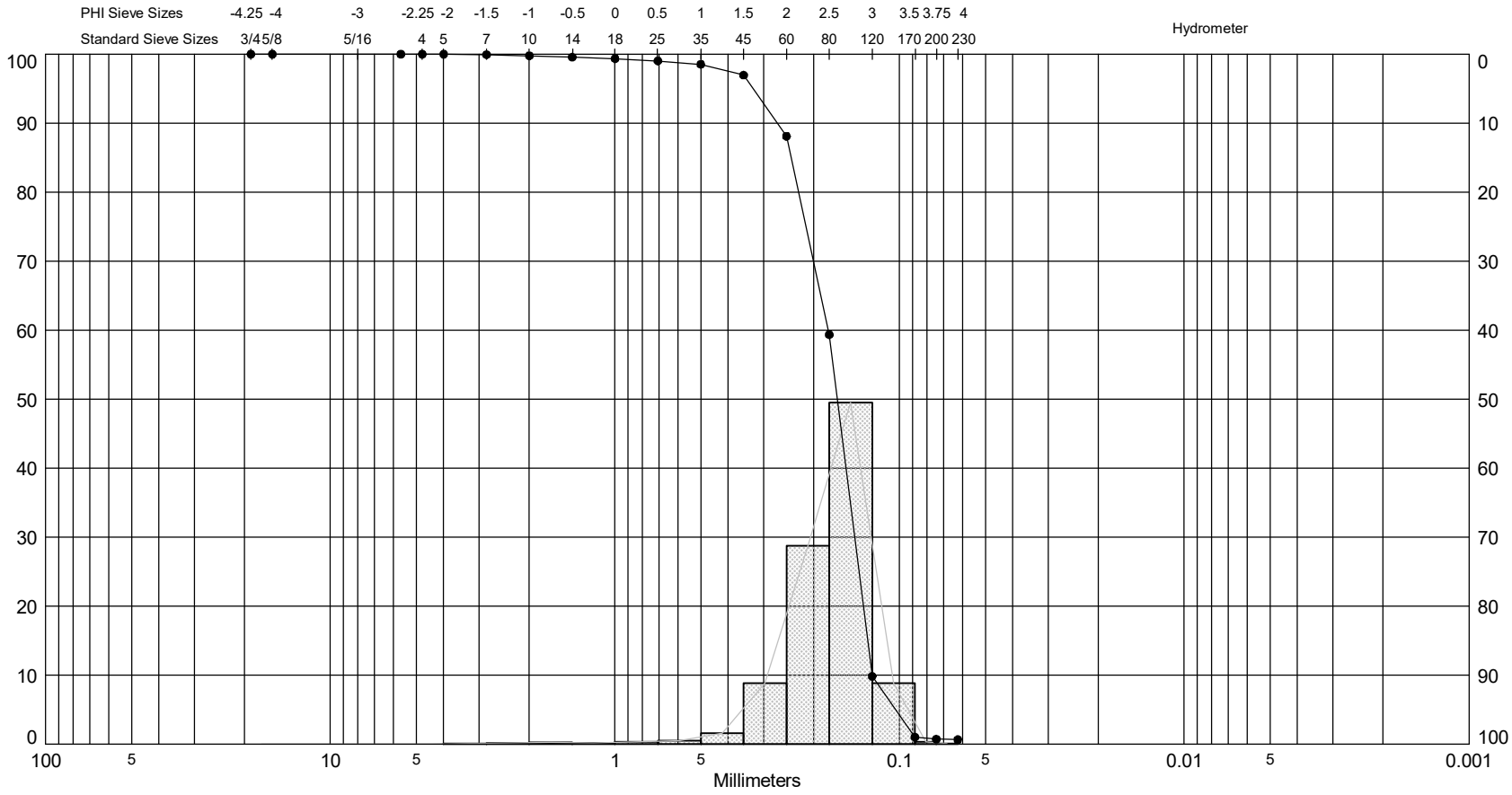
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-21**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	48.98	
Dry Wt. Before Washing (g):	182.34	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.07	99.95	100	0.07
#10	2.000	0.08	99.89	100	0.08
#14	1.400	0.15	99.78	100	0.15
#18	1.000	0.15	99.66	100	0.15
#25	0.710	0.15	99.55	100	0.15
#35	0.500	0.17	99.42	90	0.15
#45	0.355	0.47	99.07	50	0.24
#60	0.250	2.75	97.01	10	0.28
#80	0.180	17.50	83.89	1	0.18
#120	0.125	82.96	21.68	0	0.00
#170	0.090	26.29	1.96	0	0.00
#200	0.075	1.42	0.90	0	0.00
#230	0.063	0.16	0.78	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-21 #B	—●—	-22.2	SP	#200 - 0.71 #230 - 0.64			2.59	2.5	-2.22	13.98	0.53

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,481
Northing (Y, ft):	2,247,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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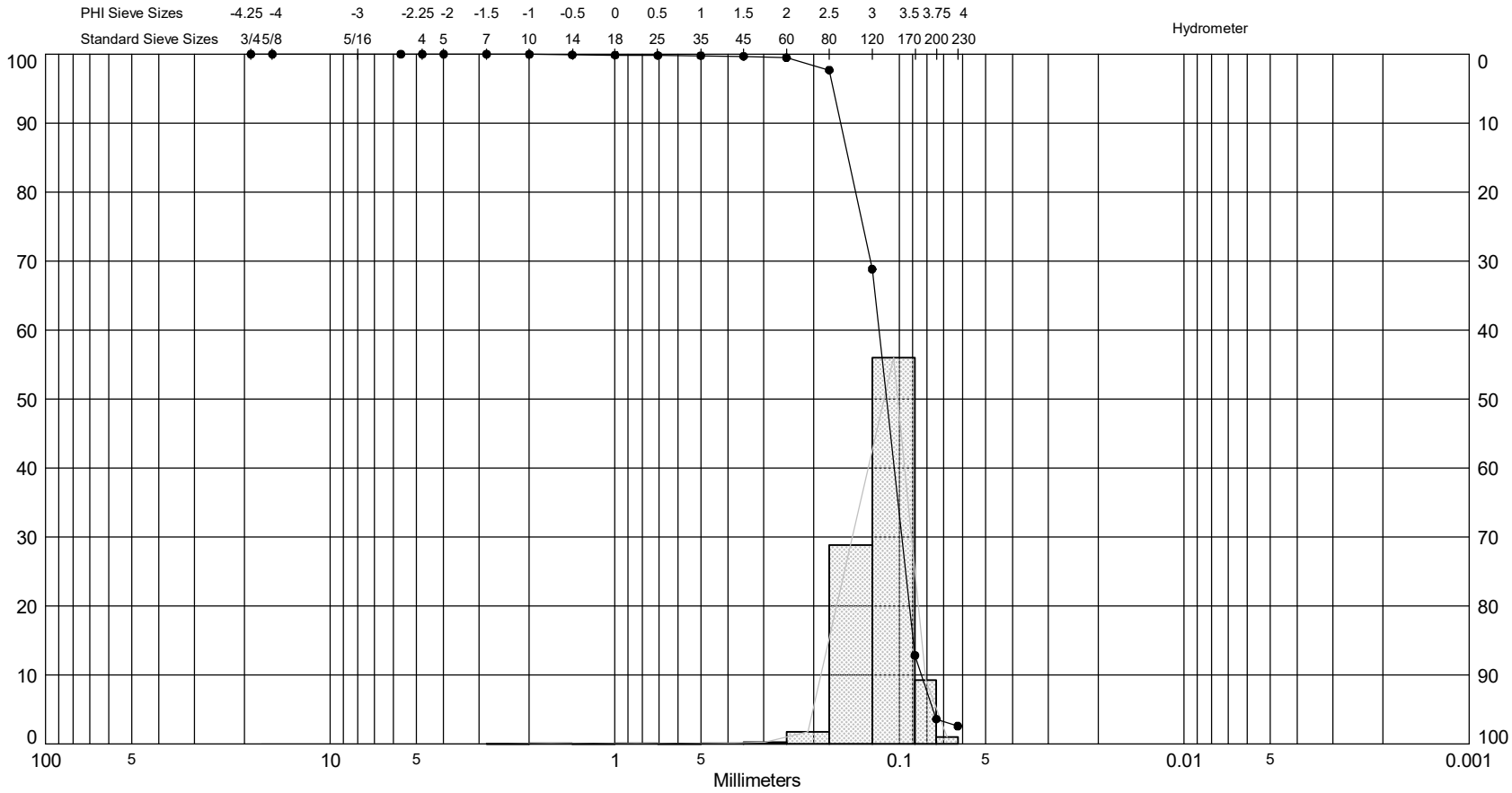
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-21**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.53	
Dry Wt. Before Washing (g):	150.41	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.07	99.93	100	0.07
#10	2.000	0.15	99.78	100	0.15
#14	1.400	0.22	99.56	100	0.22
#18	1.000	0.20	99.37	100	0.20
#25	0.710	0.33	99.04	100	0.33
#35	0.500	0.49	98.55	98	0.48
#45	0.355	1.59	96.98	70	1.11
#60	0.250	8.93	88.12	20	1.79
#80	0.180	29.00	59.38	1	0.29
#120	0.125	49.98	9.83	0	0.00
#170	0.090	8.89	1.02	0	0.00
#200	0.075	0.30	0.72	0	0.00
#230	0.063	0.07	0.65	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-21 #C	—●—	-28.2	SP	#200 - 3.60 #230 - 2.59			3.17	3.11	-2.51	24.68	0.36

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,481
Northing (Y, ft):	2,247,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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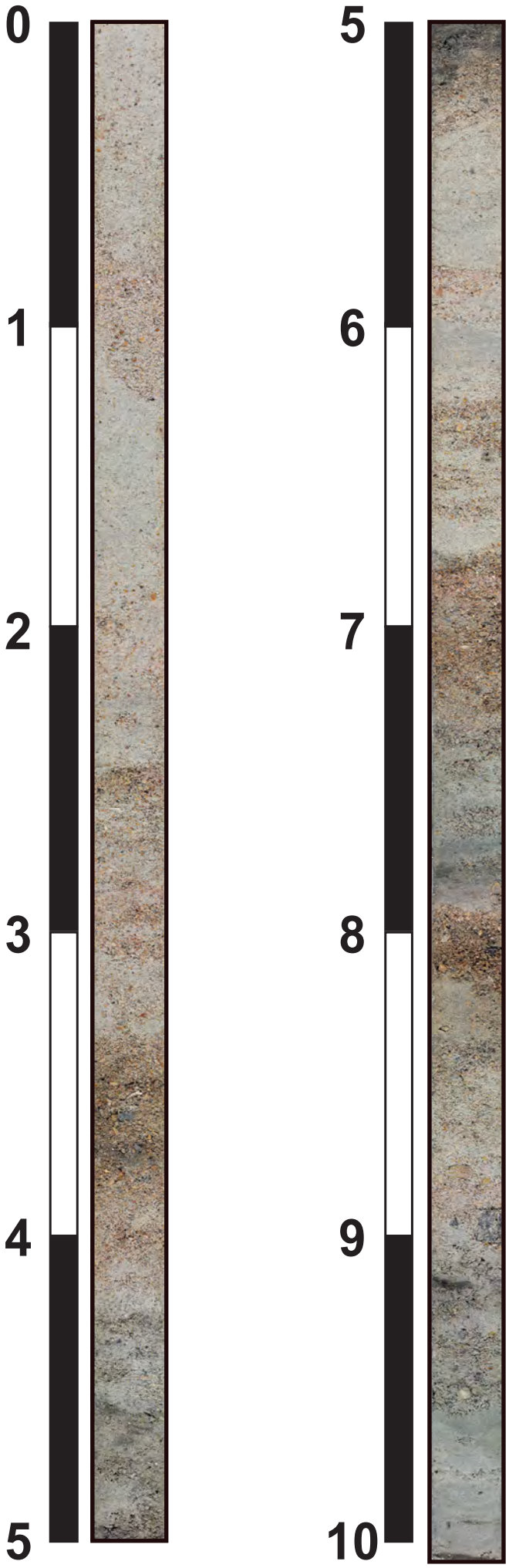
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-21**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.71	
Dry Wt. Before Washing (g):	172.15	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.04	99.97	100	0.04
#14	1.400	0.08	99.90	100	0.08
#18	1.000	0.04	99.87	100	0.04
#25	0.710	0.07	99.81	98	0.07
#35	0.500	0.03	99.79	95	0.03
#45	0.355	0.11	99.70	70	0.08
#60	0.250	0.27	99.48	50	0.14
#80	0.180	2.18	97.70	30	0.65
#120	0.125	35.35	68.83	1	0.35
#170	0.090	68.55	12.84	0	0.00
#200	0.075	11.31	3.60	0	0.00
#230	0.063	1.24	2.59	0	0.00
Total Shell Content:		**1**		**%**	



Nassau Sound
Florida
2016 - 2017

C-22

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-22

DRILLING LOG

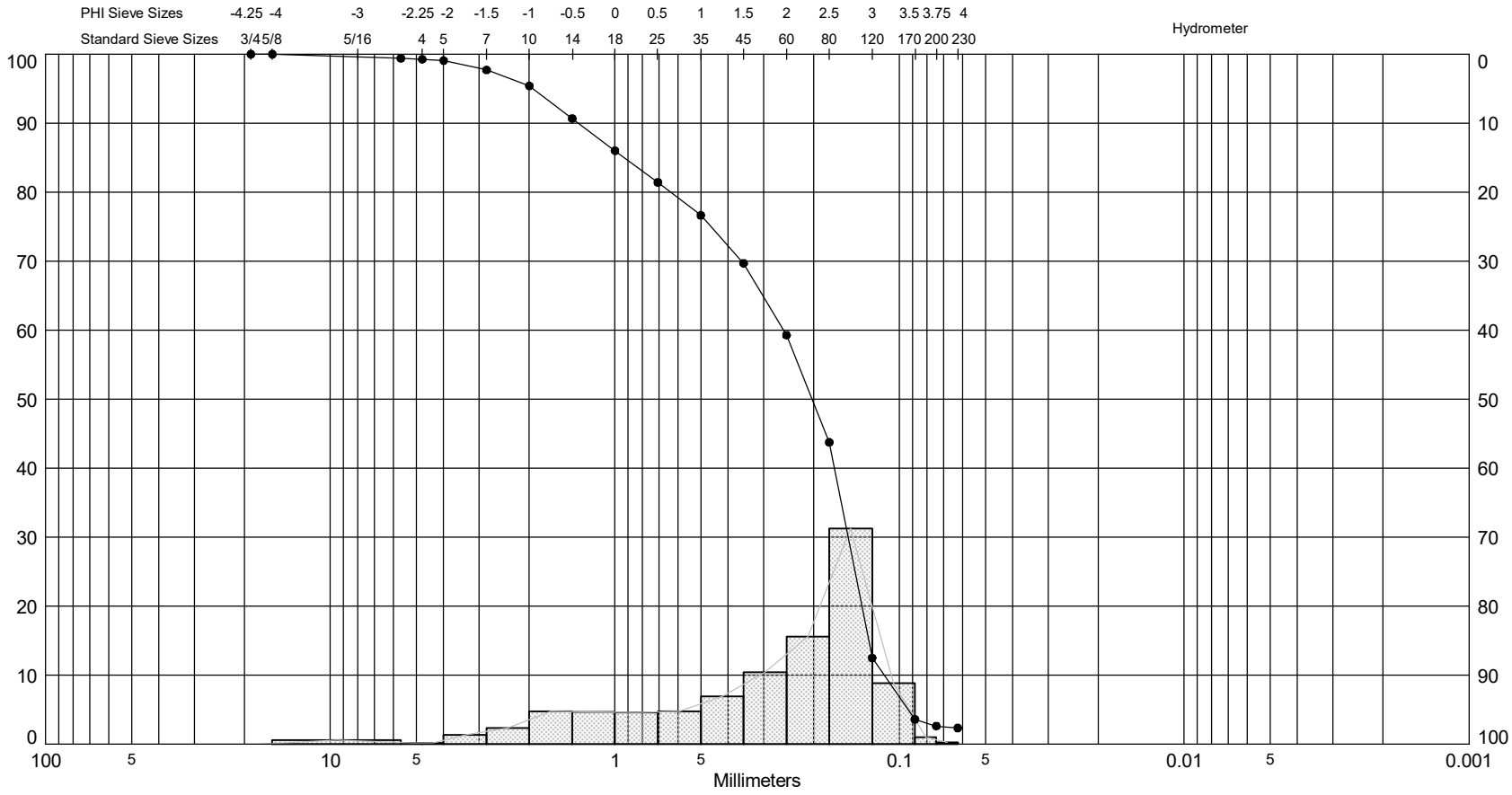
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-22
LOCATION COORDINATES	X = 523,087 Y = 2,247,264
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	11.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	9.7 Ft.
15. DATE BORING	STARTED: 03-18-17 12:45 / COMPLETED: 03-18-17
16. ELEVATION TOP OF BORING	-9.5 Ft.
17. TOTAL RECOVERY FOR BORING	10.1 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-9.5	0.0					
			Fine to medium quartz SAND, little medium sand to fine gravel-size shell, trace silt (in lamination at 3.8') loose, poorly graded, subangular, 3.3-3.8' = shell percentage ~ 40%, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.33, Phi Sorting: 1.22 Shell: 28%, Fines (#200) - 3.04 (SP)
-14.0	4.5				COMP	Sample #COMP, Depth = 0.0' - 10.1' Mean (mm): 0.29, Phi Sorting: 1.37 Shell: 25%, Carbonate: 23.8%, Fines (#200) - 2.62 (SP)
-14.7	5.2		Fine to medium quartz SAND, few silt, few medium to coarse sand-size shell, well graded, loose, subangular, light olive gray (5Y-6/2), (SW-SM).			
-16.3	6.8		Fine to medium quartz SAND, little medium sand to fine gravel-size shell, trace silt, loose, poorly graded, subangular, light gray (5Y-7/1), (SP).			
-16.8	7.3		Fine to medium quartz SAND, some medium sand to fine gravel-size shell, trace silt, well graded, loose, subangular, light brownish gray (2.5Y-6/2), (SW).			
-17.4	7.9					
-17.7	8.2		Fine to medium quartz SAND, little fine to medium sand-size shell, few silt, well graded, loose, subangular, gray (5Y-6/1), (SW-SM).		B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.29, Phi Sorting: 1.37 Shell: 25%, Fines (#200) - 2.62 (SP)
-19.1	9.6		Medium sand to fine gravel-size SHELL, some medium quartz sand, poorly graded, very loose, subangular, light brownish gray (2.5Y-6/2), (SP).			
-19.6	10.1		Fine to medium quartz SAND, little medium sand to fine gravel-size shell, trace silt in burrows, trace organic material, well graded, loose, subangular, light gray (5Y-7/2), (SW).			
			Fine quartz SAND, trace silt in burrows, trace fine to coarse sand-size shell, poorly graded, loose, subangular, gray (5Y-6/1), (SP).			
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-22 #COMP	—●—	-9.5	SP	#200 - 2.62 #230 - 2.34		23.80	2.3	1.78	-1.16	3.69	1.37

Comments: Sample Interval = 0 - 10.1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,087
Northing (Y, ft):	2,247,264
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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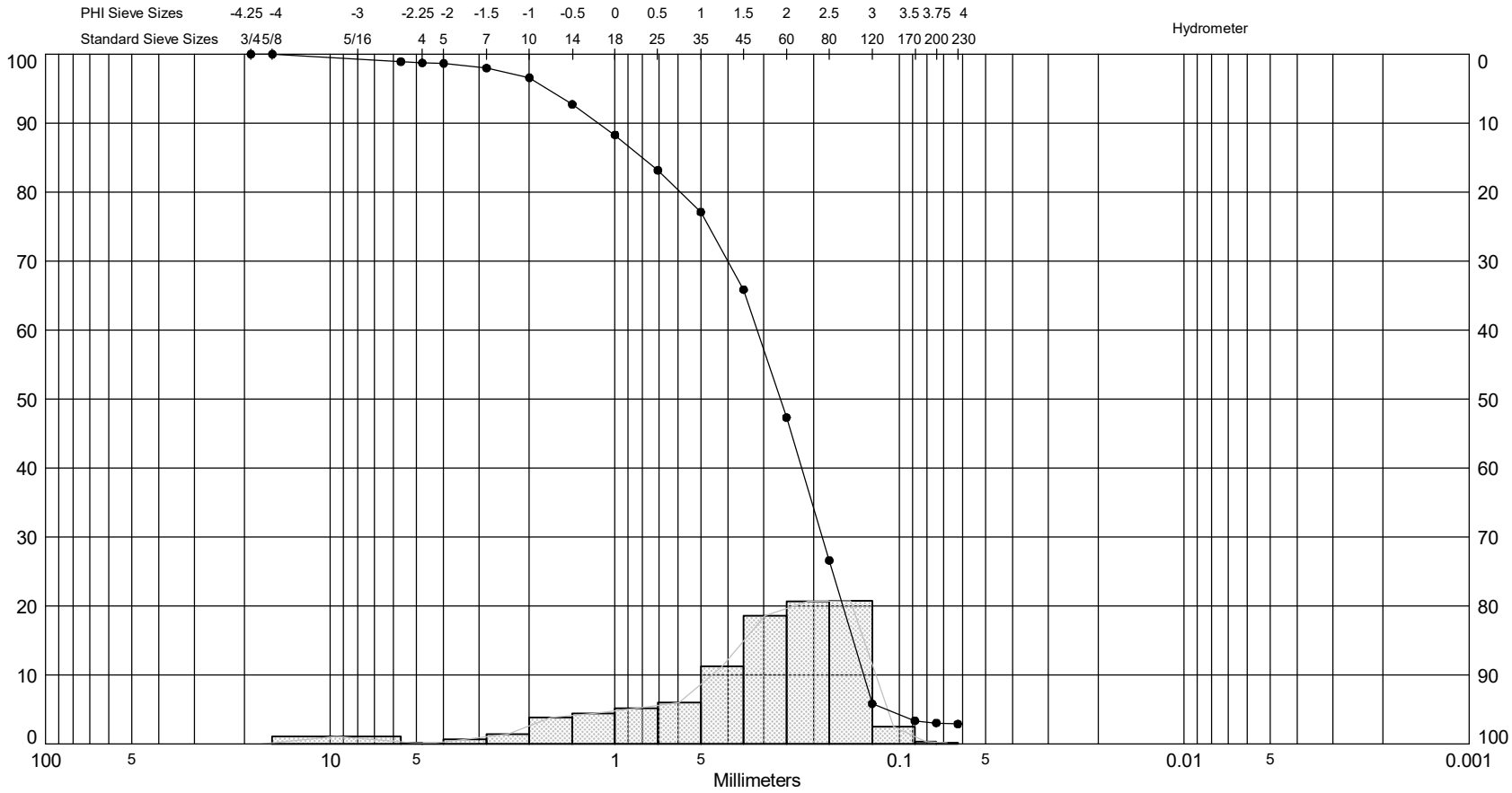
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-10.1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-22**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.45	
Dry Wt. Before Washing (g):	207.43	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.94	99.40	100	0.94
#4	4.750	0.20	99.28	100	0.20
#5	4.000	0.32	99.08	100	0.32
#7	2.800	2.15	97.71	100	2.15
#10	2.000	3.65	95.40	100	3.65
#14	1.400	7.46	90.68	100	7.46
#18	1.000	7.36	86.02	90	6.62
#25	0.710	7.27	81.42	70	5.09
#35	0.500	7.55	76.64	60	4.53
#45	0.355	10.97	69.70	40	4.39
#60	0.250	16.44	59.29	20	3.29
#80	0.180	24.56	43.75	1	0.25
#120	0.125	49.42	12.46	0	0.00
#170	0.090	14.01	3.60	0	0.00
#200	0.075	1.54	2.62	0	0.00
#230	0.063	0.45	2.34	0	0.00
Total Shell Content:		**25**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-22 #A	—●—	-10.3	SP	#200 - 3.04 #230 - 2.88			1.93	1.59	-1.32	4.99	1.22

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,087
Northing (Y, ft):	2,247,264
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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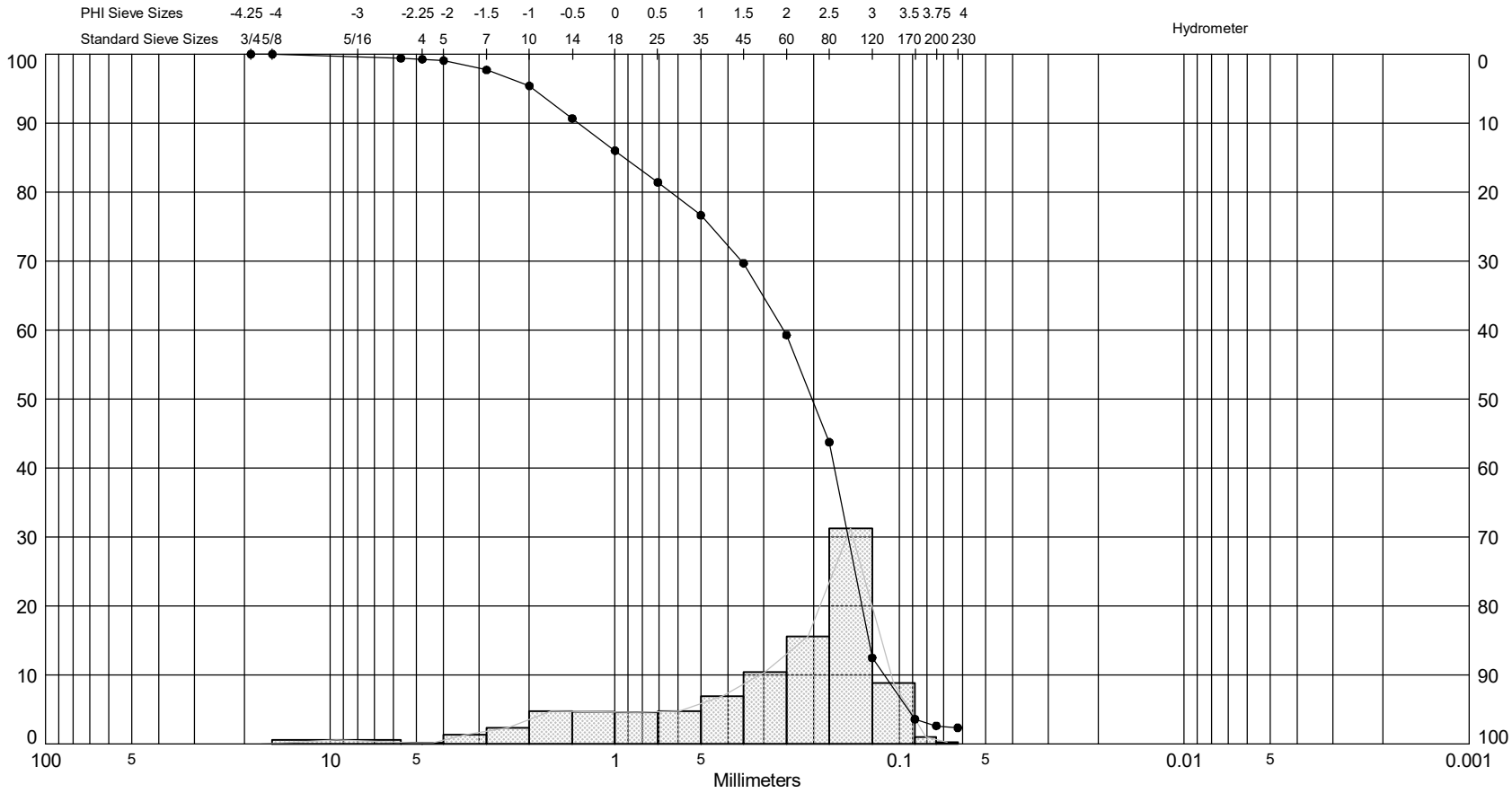
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-22**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.51	
Dry Wt. Before Washing (g):	195.41	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.57	98.92	100	1.57
#4	4.750	0.27	98.74	100	0.27
#5	4.000	0.09	98.68	100	0.09
#7	2.800	1.01	97.98	100	1.01
#10	2.000	2.03	96.59	100	2.03
#14	1.400	5.65	92.72	100	5.65
#18	1.000	6.46	88.29	100	6.46
#25	0.710	7.49	83.16	80	5.99
#35	0.500	8.81	77.12	70	6.17
#45	0.355	16.41	65.87	40	6.56
#60	0.250	27.08	47.31	20	5.42
#80	0.180	30.20	26.61	1	0.30
#120	0.125	30.33	5.83	0	0.00
#170	0.090	3.59	3.37	0	0.00
#200	0.075	0.47	3.04	0	0.00
#230	0.063	0.24	2.88	0	0.00
Total Shell Content:		**28**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-22 #B	—●—	-18.3	SP	#200 - 2.62 #230 - 2.34			2.3	1.78	-1.16	3.69	1.37

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,087
Northing (Y, ft):	2,247,264
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

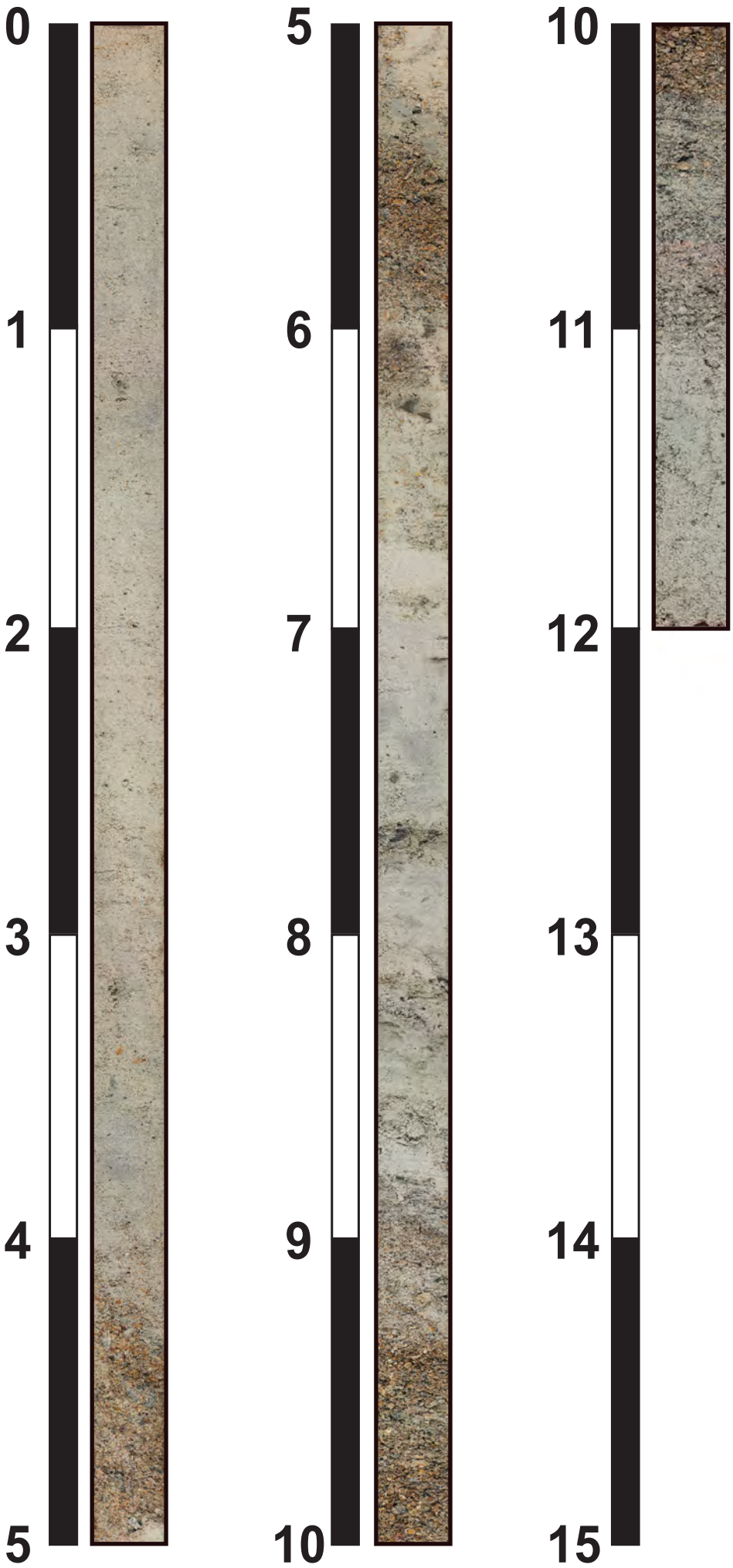
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-22**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.83	
Dry Wt. Before Washing (g):	176.98	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.33	99.74	100	0.33
#4	4.750	0.21	99.58	100	0.21
#5	4.000	0.48	99.20	100	0.48
#7	2.800	1.43	98.07	100	1.43
#10	2.000	2.93	95.77	100	2.93
#14	1.400	6.68	90.52	100	6.68
#18	1.000	5.78	85.97	100	5.78
#25	0.710	4.11	82.74	70	2.88
#35	0.500	3.23	80.20	60	1.94
#45	0.355	3.97	77.07	50	1.99
#60	0.250	6.25	72.16	30	1.88
#80	0.180	15.55	59.93	10	1.56
#120	0.125	54.74	16.88	0	0.00
#170	0.090	16.04	4.26	0	0.00
#200	0.075	1.54	3.05	0	0.00
#230	0.063	0.42	2.72	0	0.00
Total Shell Content:		**22**		**%**	



Nassau Sound
Florida
2016 - 2017

C-23

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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www.athenatechnologies.com
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Boring Designation C-23

DRILLING LOG

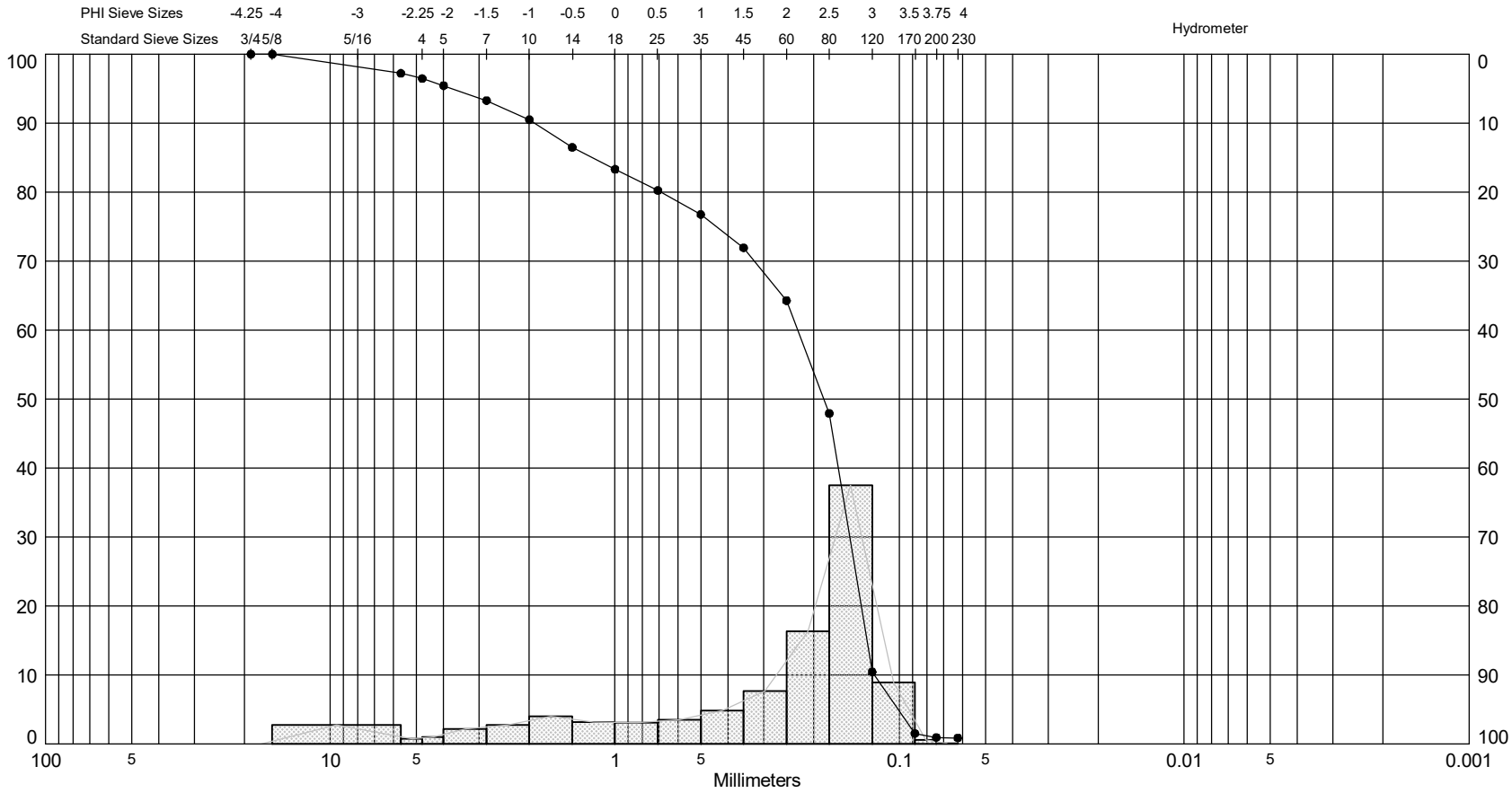
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-23
LOCATION COORDINATES	X = 522,840 Y = 2,248,532
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	15.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	7.5 Ft.
15. DATE BORING	STARTED 07-25-16 07:28 / COMPLETED 07-25-16
16. ELEVATION TOP OF BORING	-11.0 Ft.
17. TOTAL RECOVERY FOR BORING	12 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-11.0	0.0					
			Fine SAND, trace shell fragments, white (5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.72 Shell: 5%, Fines (#200) - 2.64 (SP)
-15.2	4.2					
-16.0	5.0		Fine to medium SAND, little shell fragments <3.0cm, light gray (2.5Y-7/1), (SW).		COMP	Sample #COMP, Depth = 0.0' - 12.0' Mean (mm): 0.31, Phi Sorting: 1.63 Shell: 25%, Carbonate: 21.3%, Fines (#200) - 0.94 (SP)
-16.5	5.5		Fine SAND, trace shell fragments, white (5Y-8/1), (SP).			
-17.0	6.0		Fine to medium SAND, little shell fragments <3.0cm, light gray (2.5Y-7/1), (SW).			
			Fine SAND, trace shell fragments, trace silt in thin lenses, light gray (5Y-7/1), (SP).			
-19.8	8.8					
			Fine to medium SAND, little shell fragments <2.0cm, light gray (2.5Y-7/1), (SW).		B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 1.29, Phi Sorting: 2.00 Shell: 72%, Fines (#200) - 0.95 (SP)
-21.3	10.3					
			Fine SAND, trace shell fragments increasing downcore, light greenish gray (10Y-8/1), (SP).			
-23.0	12.0					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-23 #COMP	—●—	-11.0	SP	#200 - 0.94 #230 - 0.87		21.30	2.44	1.71	-1.47	4.27	1.63

Comments: Sample Interval = 0 - 12.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,840
Northing (Y, ft):	2,248,532
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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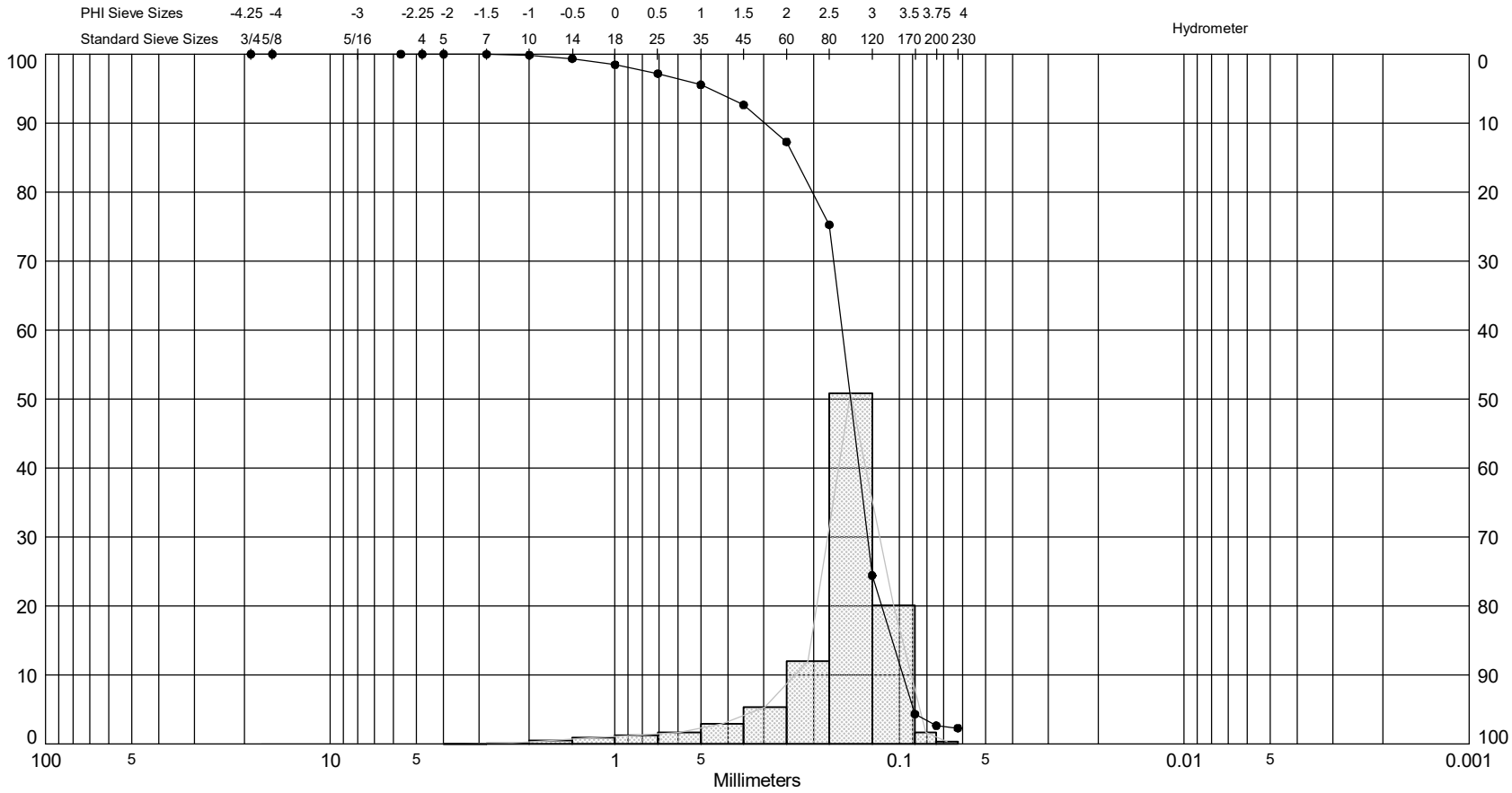
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-23**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.56	
Dry Wt. Before Washing (g):	199.15	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	4.16	97.22	100	4.16
#4	4.750	1.14	96.46	100	1.14
#5	4.000	1.51	95.45	100	1.51
#7	2.800	3.25	93.27	100	3.25
#10	2.000	4.15	90.50	100	4.15
#14	1.400	6.01	86.48	100	6.01
#18	1.000	4.77	83.29	90	4.29
#25	0.710	4.57	80.24	80	3.66
#35	0.500	5.19	76.77	60	3.11
#45	0.355	7.24	71.93	40	2.90
#60	0.250	11.45	64.28	20	2.29
#80	0.180	24.48	47.91	1	0.24
#120	0.125	56.05	10.44	0	0.00
#170	0.090	13.36	1.51	0	0.00
#200	0.075	0.87	0.93	0	0.00
#230	0.063	0.10	0.86	0	0.00
Total Shell Content:		**25**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-23 #A	—●—	-11.8	SP	#200 - 2.64 #230 - 2.29			2.75	2.59	-2.13	8.93	0.72

Comments: Sample Depth = 1'

Depths and elevations based on measured values

ATHENA TECHNOLOGIES, INC.

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Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,840
Northing (Y, ft):	2,248,532
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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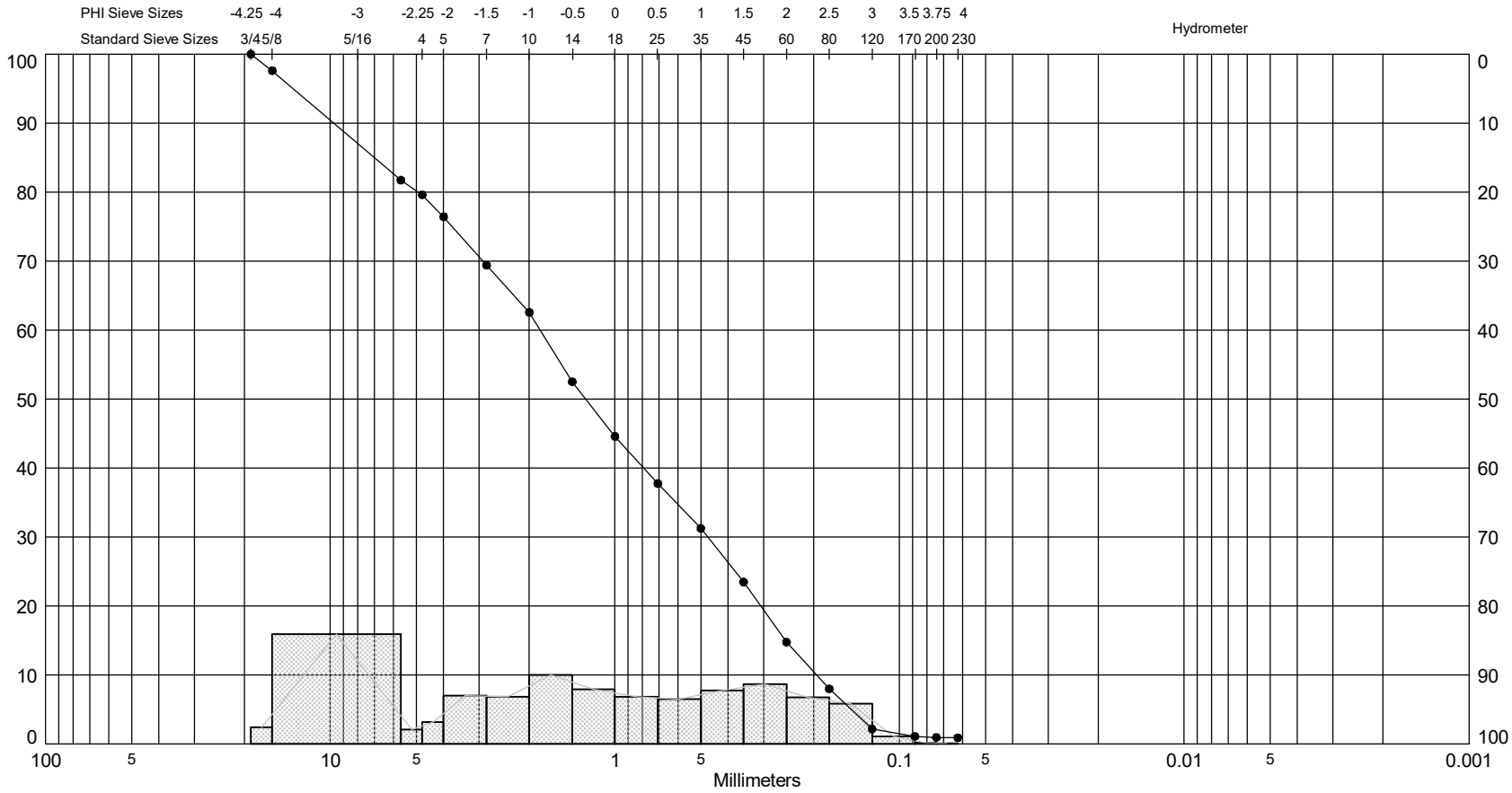
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-23**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.61	
Dry Wt. Before Washing (g):	176.76	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.03	99.98	100	0.03
#10	2.000	0.15	99.86	100	0.15
#14	1.400	0.63	99.36	100	0.63
#18	1.000	1.15	98.46	90	1.04
#25	0.710	1.62	97.18	80	1.30
#35	0.500	2.07	95.56	60	1.24
#45	0.355	3.71	92.64	30	1.11
#60	0.250	6.80	87.29	10	0.68
#80	0.180	15.28	75.27	1	0.15
#120	0.125	64.67	24.41	0	0.00
#170	0.090	25.55	4.32	0	0.00
#200	0.075	2.14	2.63	0	0.00
#230	0.063	0.44	2.29	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-23 #B	—●—	-20.8	SP	#200 - 0.95 #230 - 0.88				-0.37	-0.09	1.92	2

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,840
Northing (Y, ft):	2,248,532
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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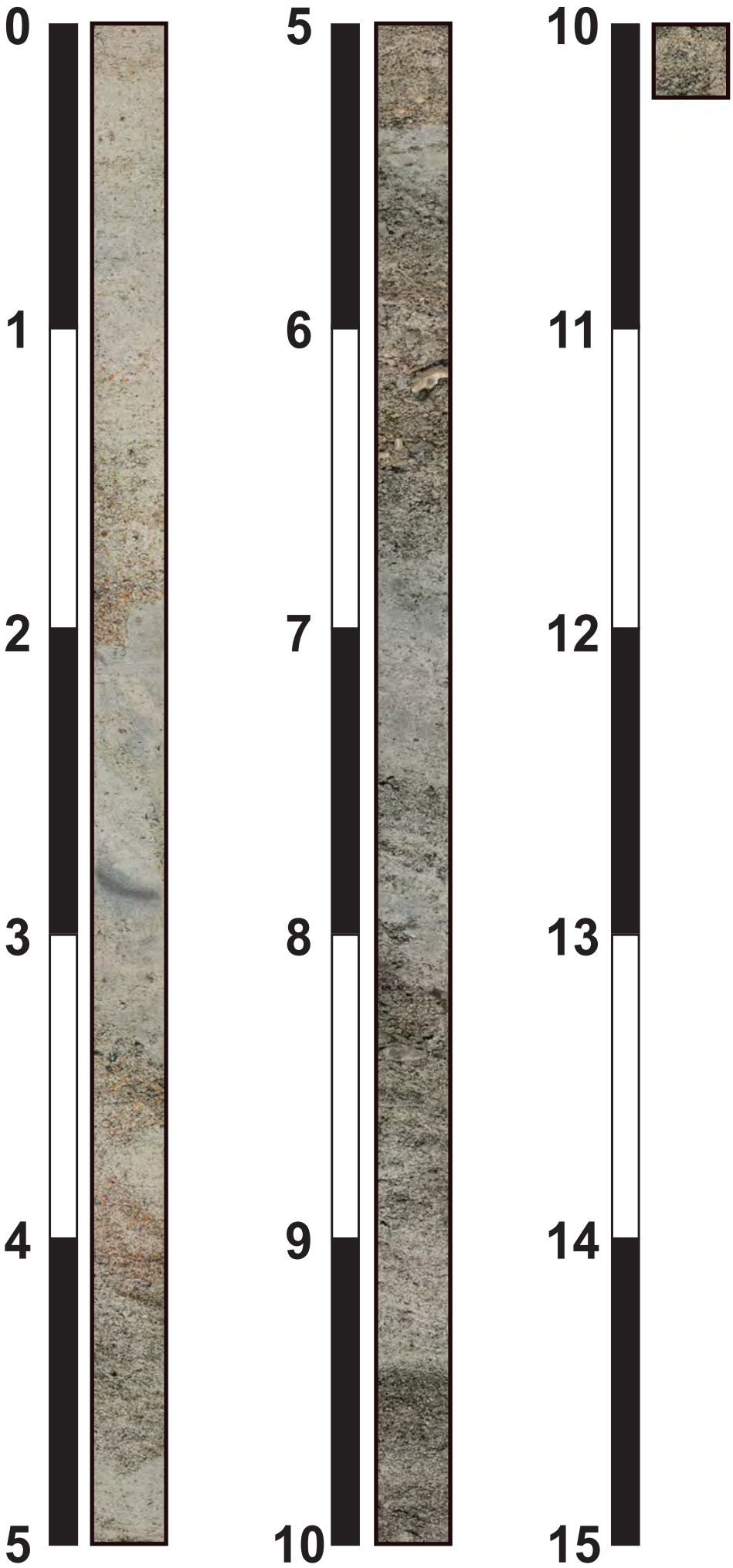
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-23**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, few fine-grained quartz sand (SP) 5Y 6/2**		

Tare Weight, (g):	49.79	
Dry Wt. Before Washing (g):	172.10	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	2.91	97.62	100	2.91
#3.5	5.600	19.43	81.73	100	19.43
#4	4.750	2.58	79.63	100	2.58
#5	4.000	3.89	76.45	100	3.89
#7	2.800	8.61	69.41	100	8.61
#10	2.000	8.36	62.57	100	8.36
#14	1.400	12.28	52.53	100	12.28
#18	1.000	9.71	44.59	100	9.71
#25	0.710	8.36	37.76	80	6.69
#35	0.500	7.92	31.28	70	5.54
#45	0.355	9.53	23.49	50	4.77
#60	0.250	10.64	14.79	30	3.19
#80	0.180	8.31	8.00	5	0.42
#120	0.125	7.11	2.18	0	0.00
#170	0.090	1.31	1.11	0	0.00
#200	0.075	0.18	0.96	0	0.00
#230	0.063	0.09	0.89	0	0.00
Total Shell Content:		**72**		**%**	



Nassau Sound
Florida
2016 - 2017

C-24

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
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Boring Designation C-24

DRILLING LOG

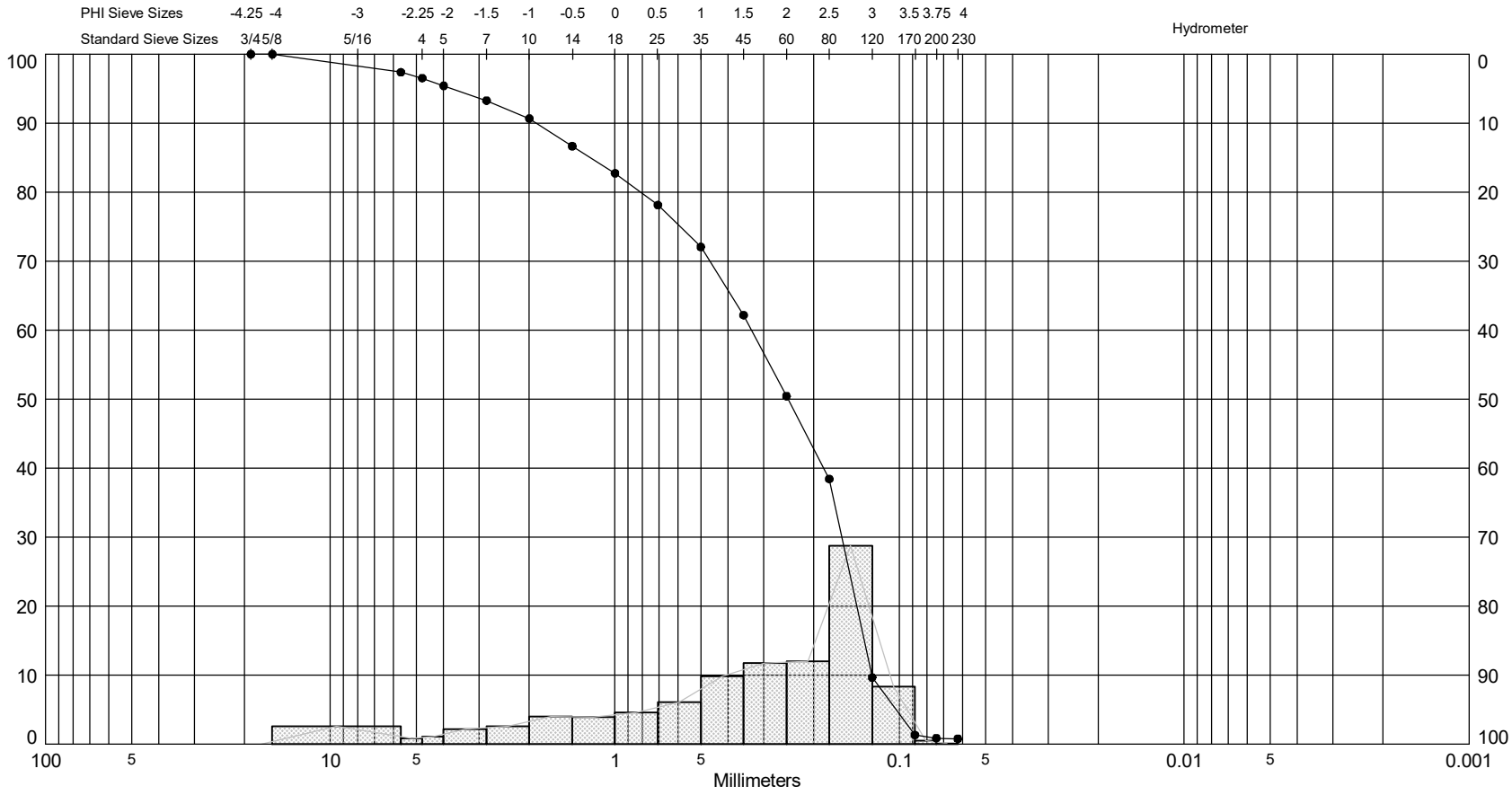
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-24
LOCATION COORDINATES	X = 522,793 Y = 2,249,238
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	12.5 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	9.5 Ft.
15. DATE BORING	STARTED 07-26-16 08:17 / COMPLETED 07-26-16
16. ELEVATION TOP OF BORING	-13.5 Ft.
17. TOTAL RECOVERY FOR BORING	10.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-13.5	0.0					
-15.5	2.0		Fine SAND, trace shell fragment <0.7cm increasing at base, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.19, Phi Sorting: 0.90 Shell: 8%, Fines (#200) - 0.79 (SP)
-16.8	3.3		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).			
-19.2	5.7		Fine to medium SAND, few shell fragments <1.0cm, light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 10.0' Mean (mm): 0.35, Phi Sorting: 1.60 Shell: 28%, Carbonate: 24.2%, Fines (#200) - 0.86 (SP)
-20.3	6.8		Fine to medium SAND, little shell fragments <2.0cm, light greenish gray (10Y-7/1), (SW).			
-21.8	8.3		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).			
-23.7	10.2		Fine to medium SAND, little shell fragments <3.0cm, light greenish gray (10Y-7/1), (SW).		B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.39, Phi Sorting: 1.16 Shell: 27%, Fines (#200) - 0.91 (SP)
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-24 #COMP	—●—	-13.5	SP	#200 - 0.86 #230 - 0.78		24.20	2.02	1.51	-1.2	3.79	1.6

Comments: Sample Interval = 0 - 10.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,793
Northing (Y, ft):	2,249,238
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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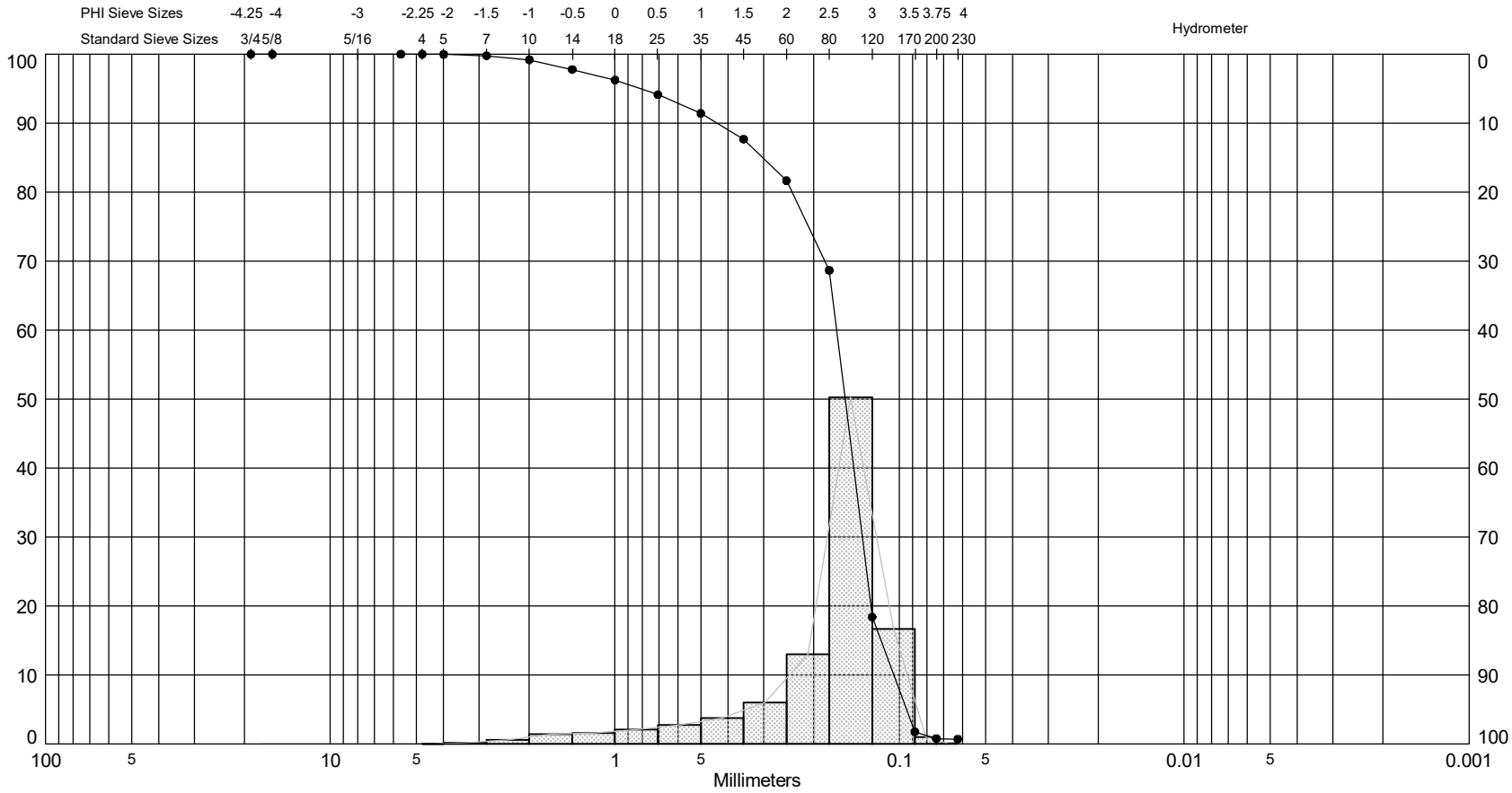
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-10'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-24**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/2**		

Tare Weight, (g):	49.84	
Dry Wt. Before Washing (g):	186.09	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.57	97.38	100	3.57
#4	4.750	1.15	96.54	100	1.15
#5	4.000	1.52	95.42	100	1.52
#7	2.800	2.91	93.28	100	2.91
#10	2.000	3.54	90.69	100	3.54
#14	1.400	5.48	86.66	100	5.48
#18	1.000	5.36	82.73	100	5.36
#25	0.710	6.27	78.13	70	4.39
#35	0.500	8.28	72.05	50	4.14
#45	0.355	13.43	62.19	30	4.03
#60	0.250	15.99	50.46	10	1.60
#80	0.180	16.37	38.44	1	0.16
#120	0.125	39.23	9.65	0	0.00
#170	0.090	11.35	1.32	0	0.00
#200	0.075	0.63	0.86	0	0.00
#230	0.063	0.11	0.78	0	0.00
Total Shell Content:		**28**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-24 #A	—●—	-14.3	SP	#200 - 0.79 #230 - 0.70			2.69	2.42	-2.03	7.32	0.9

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,793
Northing (Y, ft):	2,249,238
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

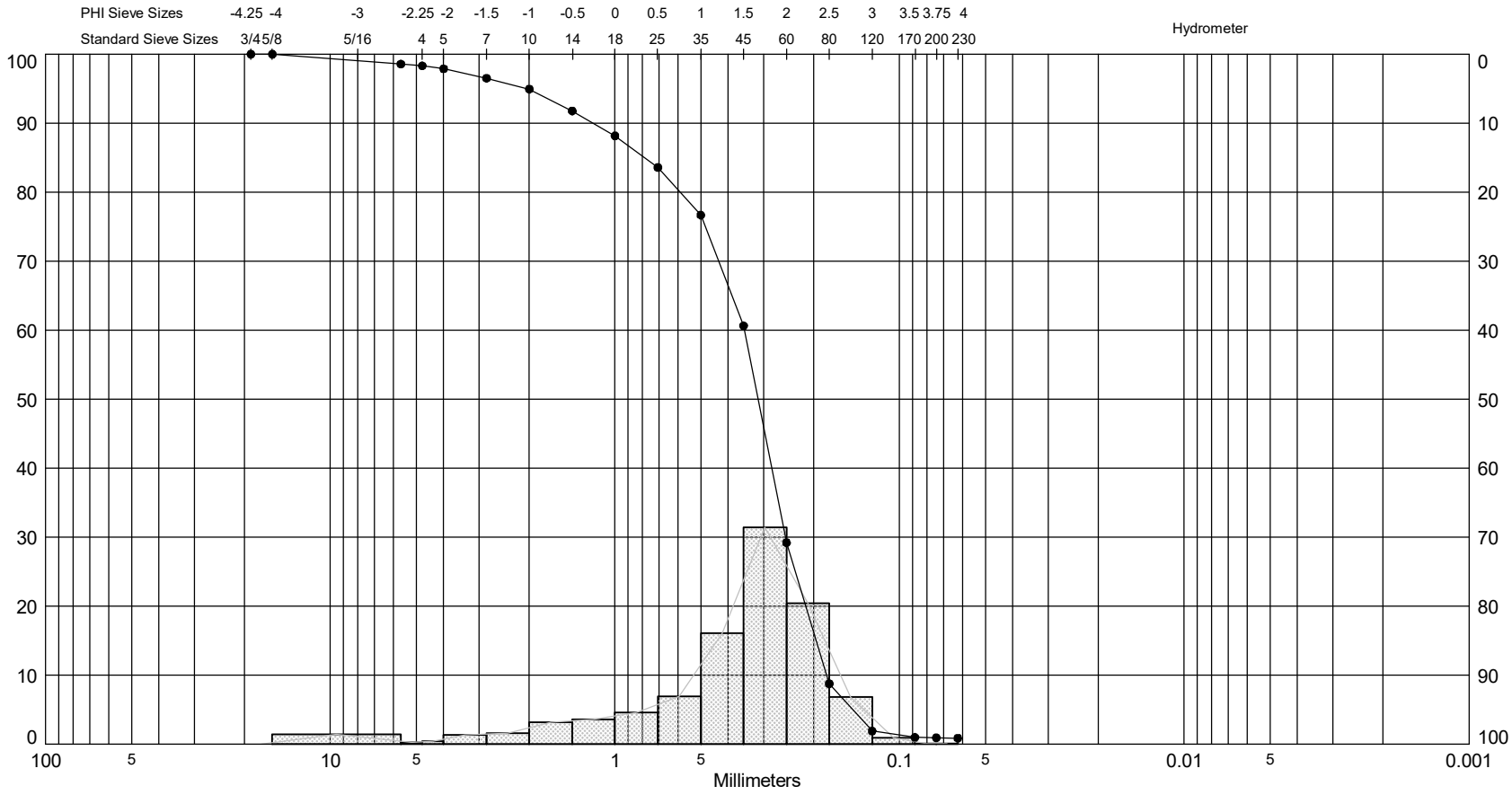
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-24**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	47.74	
Dry Wt. Before Washing (g):	189.98	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.05	99.96	100	0.05
#7	2.800	0.25	99.79	100	0.25
#10	2.000	0.84	99.20	100	0.84
#14	1.400	1.99	97.80	100	1.99
#18	1.000	2.20	96.25	100	2.20
#25	0.710	3.00	94.14	70	2.10
#35	0.500	3.86	91.43	50	1.93
#45	0.355	5.32	87.69	30	1.60
#60	0.250	8.55	81.68	10	0.86
#80	0.180	18.51	68.67	1	0.19
#120	0.125	71.49	18.41	0	0.00
#170	0.090	23.66	1.77	0	0.00
#200	0.075	1.40	0.79	0	0.00
#230	0.063	0.13	0.70	0	0.00
Total Shell Content:		**8**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-24 #B	—●—	-22.3	SP	#200 - 0.91 #230 - 0.86			1.67	1.37	-1.66	6.27	1.16

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,793
Northing (Y, ft):	2,249,238
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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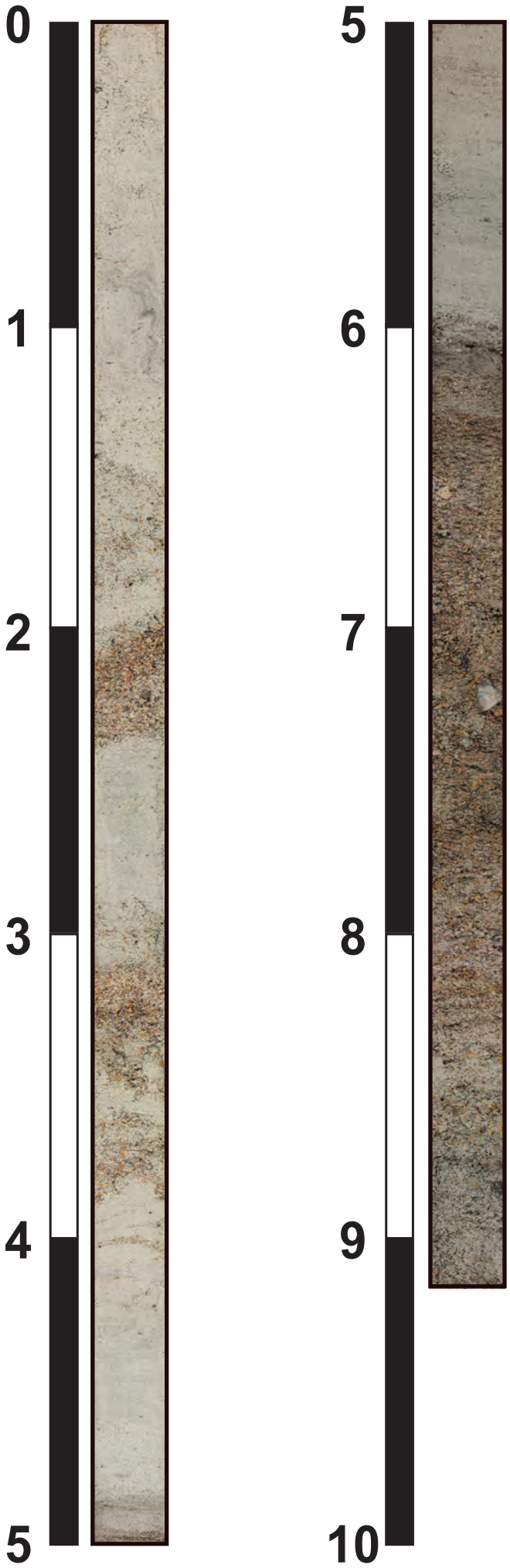
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-24**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/2**		

Tare Weight, (g):	49.83	
Dry Wt. Before Washing (g):	169.17	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.72	98.56	100	1.72
#4	4.750	0.29	98.32	100	0.29
#5	4.000	0.53	97.87	100	0.53
#7	2.800	1.62	96.51	100	1.62
#10	2.000	1.87	94.95	100	1.87
#14	1.400	3.78	91.78	100	3.78
#18	1.000	4.32	88.16	90	3.89
#25	0.710	5.47	83.58	75	4.10
#35	0.500	8.23	76.68	60	4.94
#45	0.355	19.15	60.63	30	5.75
#60	0.250	37.51	29.20	10	3.75
#80	0.180	24.40	8.76	0	0.00
#120	0.125	8.19	1.89	0	0.00
#170	0.090	1.10	0.97	0	0.00
#200	0.075	0.07	0.91	0	0.00
#230	0.063	0.06	0.86	0	0.00
Total Shell Content:		**27**		**%**	



Nassau Sound
Florida
2016 - 2017

C-25

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-25

DRILLING LOG

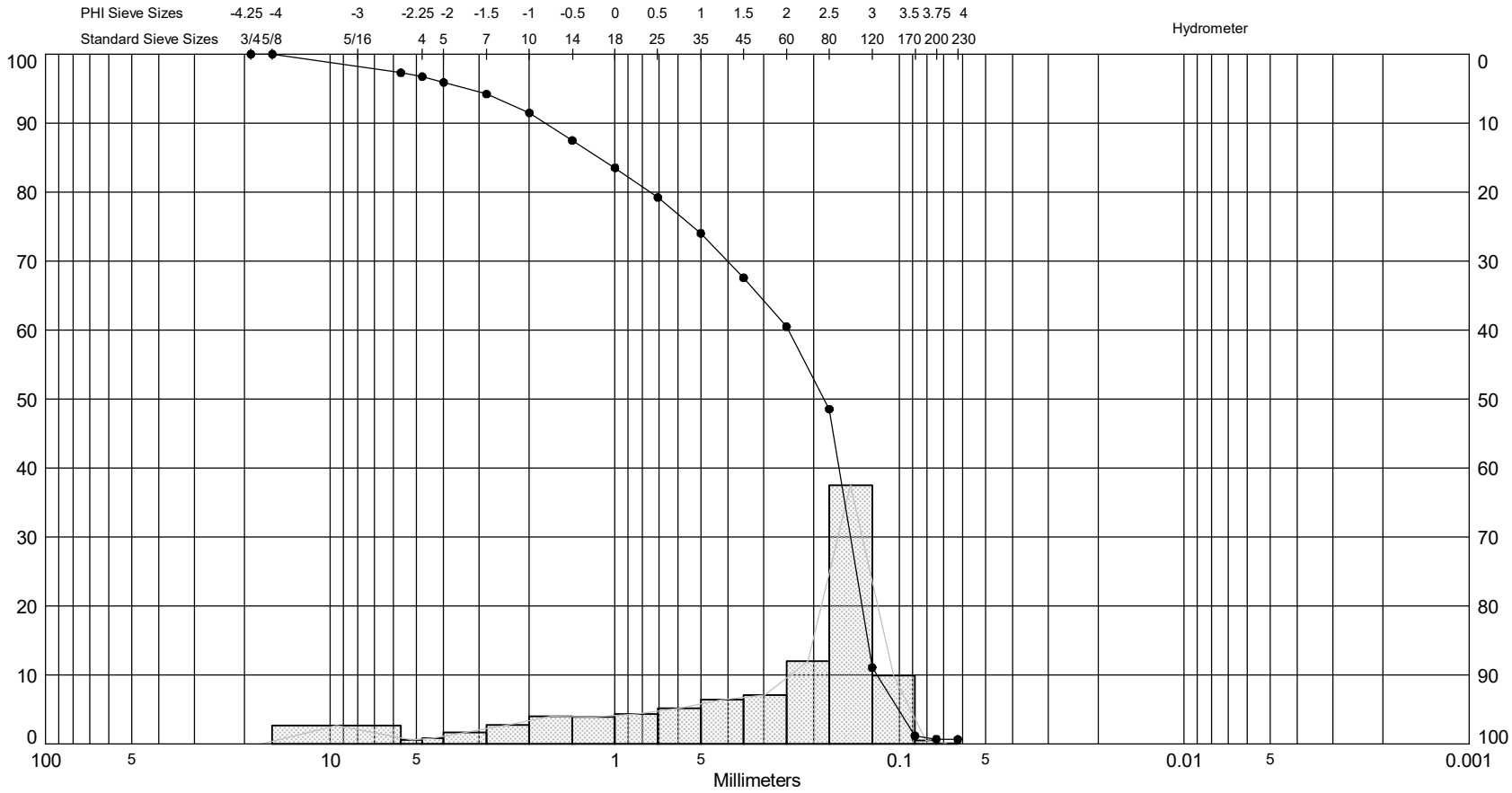
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-25
LOCATION COORDINATES	X = 523,171 Y = 2,248,911
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	19.5 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	7.3 Ft.
15. DATE BORING	STARTED 07-26-16 09:42 / COMPLETED 07-26-16
16. ELEVATION TOP OF BORING	-10.1 Ft.
17. TOTAL RECOVERY FOR BORING	9.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-10.1	0.0					
			Fine SAND, trace shell fragments in layers 2.2-2.5' & 3.1-3.6', light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.48 Shell: 2%, Fines (#200) - 0.65 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 9.0' Mean (mm): 0.31, Phi Sorting: 1.61 Shell: 25%, Carbonate: 22.6%, Fines (#200) - 0.70 (SP)
-16.1	6.0					
			Fine to medium SAND, little shell fragments <2.0cm, light gray (5Y-7/1), (SW).		B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.82, Phi Sorting: 1.93 Shell: 56%, Fines (#200) - 0.71 (SP)
-19.3	9.2					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-25 #COMP	—●—	-10.1	SP	#200 - 0.70 #230 - 0.64		22.60	2.44	1.68	-1.36	4.08	1.61

Comments: Sample Interval = 0 - 9.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,171
Northing (Y, ft):	2,248,911
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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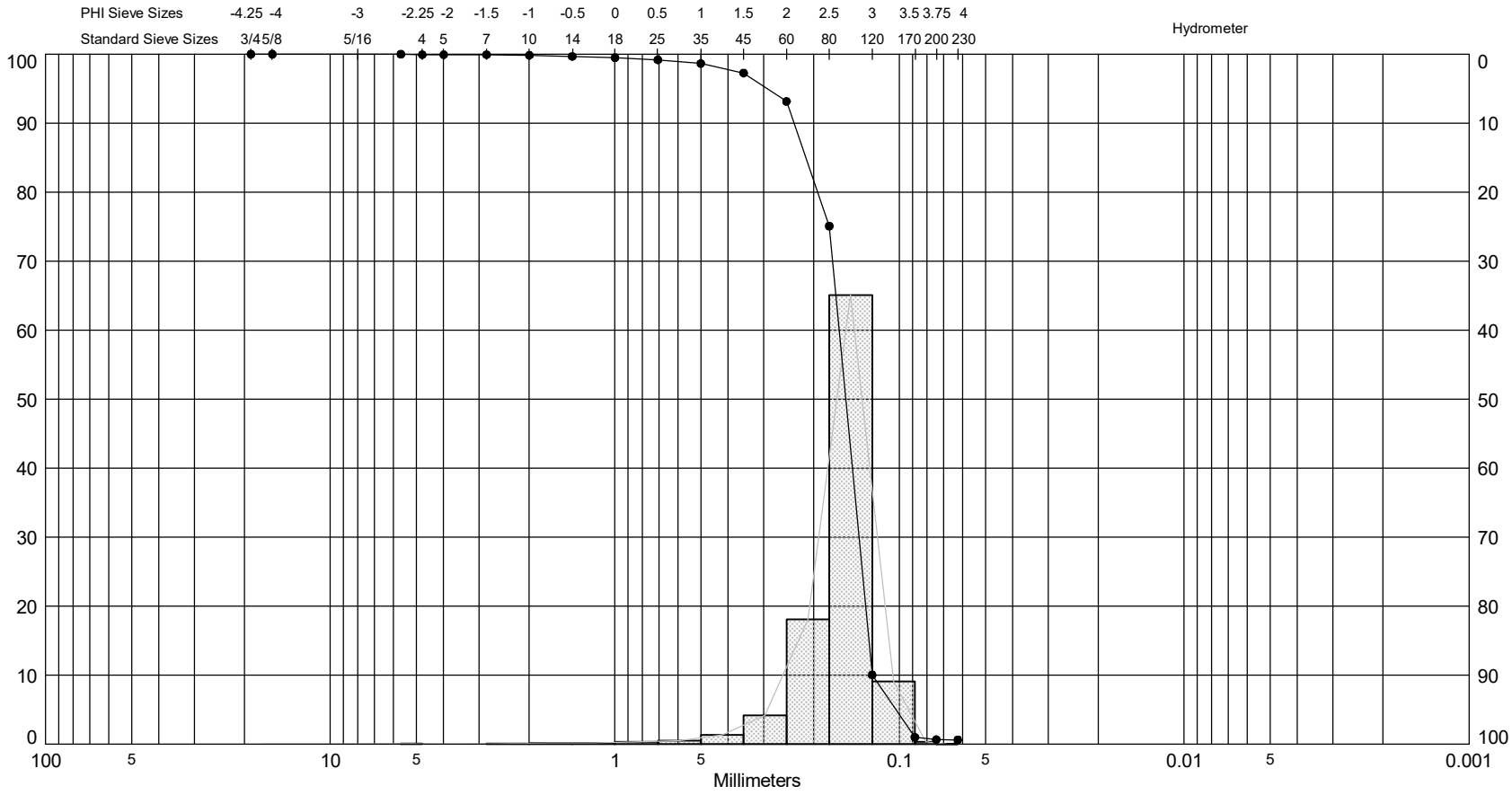
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-25**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	48.78	
Dry Wt. Before Washing (g):	183.41	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.64	97.30	100	3.64
#4	4.750	0.76	96.73	100	0.76
#5	4.000	1.13	95.89	100	1.13
#7	2.800	2.28	94.20	100	2.28
#10	2.000	3.67	91.47	100	3.67
#14	1.400	5.38	87.48	100	5.38
#18	1.000	5.32	83.53	100	5.32
#25	0.710	5.80	79.22	70	4.06
#35	0.500	6.99	74.03	50	3.50
#45	0.355	8.69	67.57	30	2.61
#60	0.250	9.52	60.50	10	0.95
#80	0.180	16.12	48.53	1	0.16
#120	0.125	50.46	11.05	0	0.00
#170	0.090	13.33	1.14	0	0.00
#200	0.075	0.62	0.68	0	0.00
#230	0.063	0.08	0.62	0	0.00
Total Shell Content:		**25**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-25 #A	—●—	-10.9	SP	#200 - 0.65 #230 - 0.61			2.69	2.61	-3.15	22.09	0.48

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,171
Northing (Y, ft):	2,248,911
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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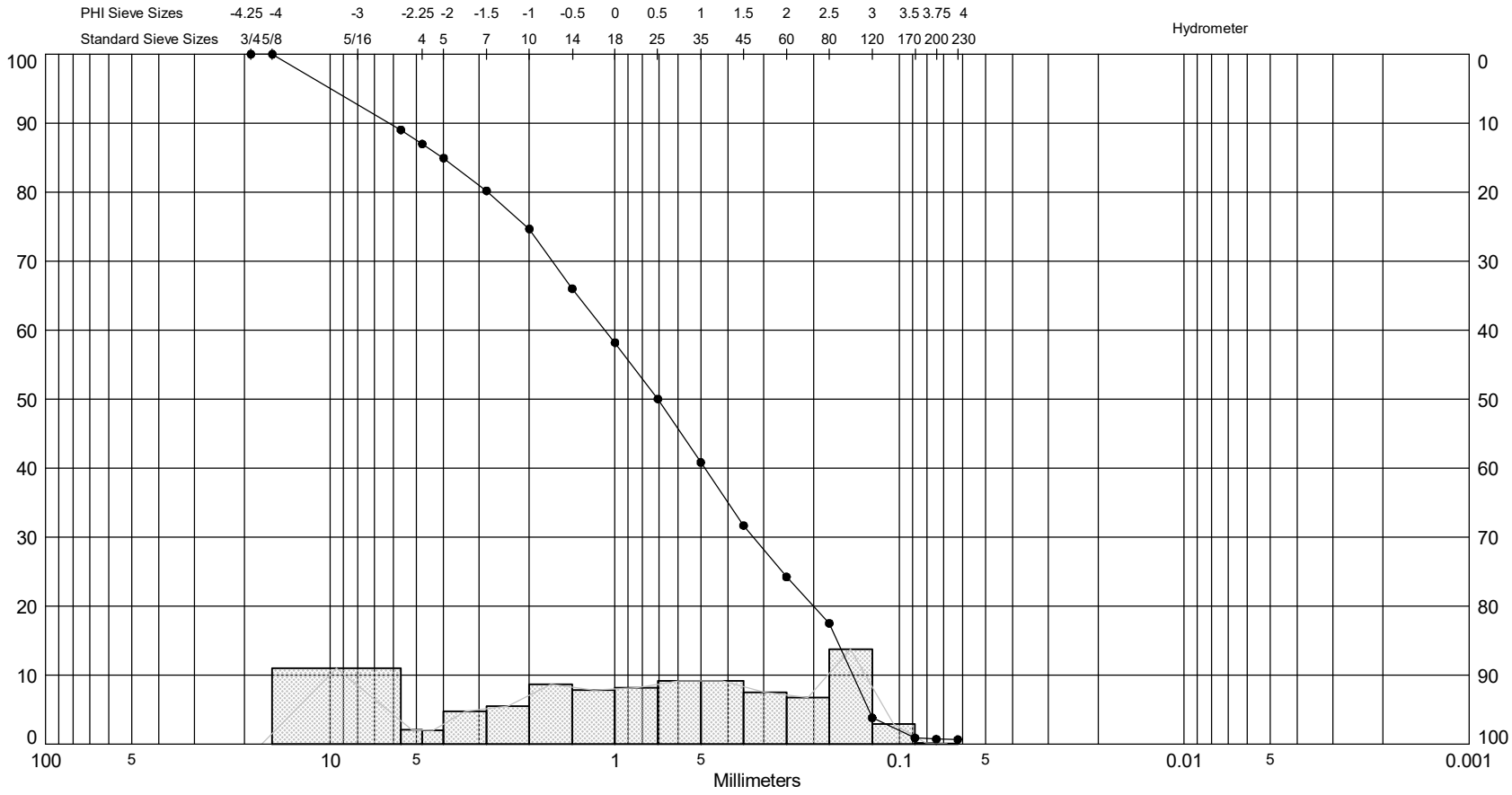
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-25**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.69	
Dry Wt. Before Washing (g):	191.79	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.10	99.93	100	0.10
#5	4.000	0.00	99.93	0	0.00
#7	2.800	0.00	99.93	0	0.00
#10	2.000	0.12	99.85	100	0.12
#14	1.400	0.23	99.68	100	0.23
#18	1.000	0.28	99.49	100	0.28
#25	0.710	0.44	99.18	70	0.31
#35	0.500	0.76	98.64	50	0.38
#45	0.355	1.94	97.28	30	0.58
#60	0.250	5.87	93.15	10	0.59
#80	0.180	25.66	75.09	1	0.26
#120	0.125	92.44	10.04	0	0.00
#170	0.090	12.86	0.99	0	0.00
#200	0.075	0.49	0.64	0	0.00
#230	0.063	0.06	0.60	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-25 #B	—●—	-16.9	SP	#200 - 0.71 #230 - 0.65			0.5	0.28	-0.34	2.09	1.93

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,171
Northing (Y, ft):	2,248,911
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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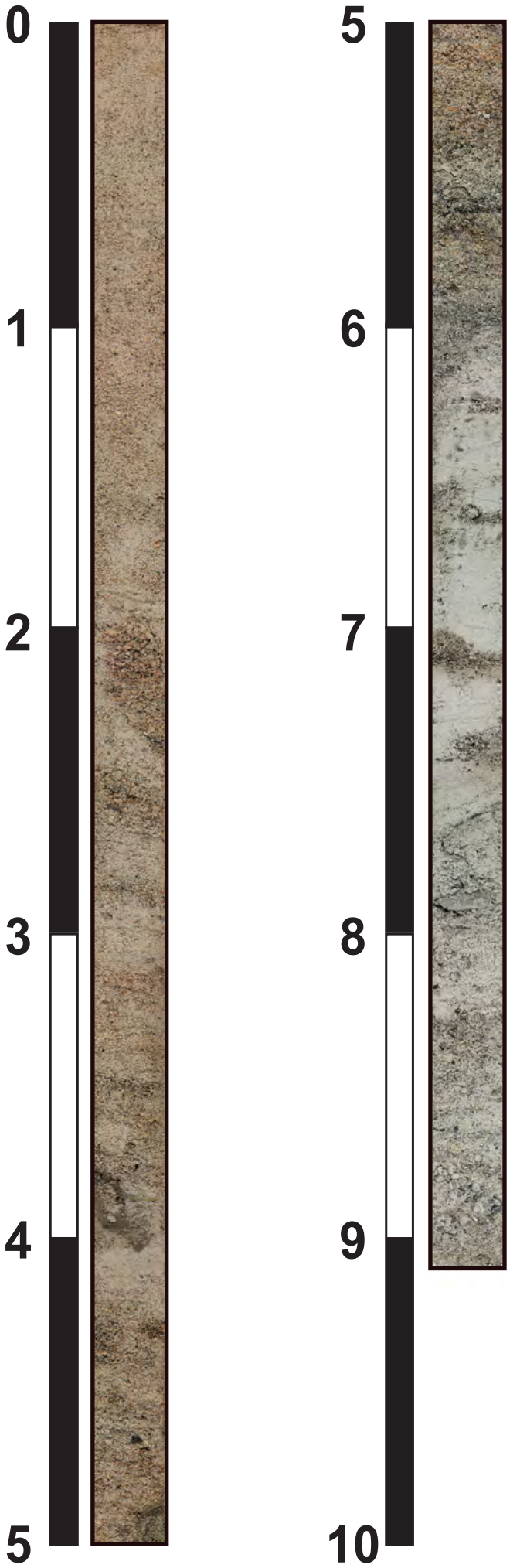
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-25**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 5Y 6/2**		

Tare Weight, (g):	50.07	
Dry Wt. Before Washing (g):	184.96	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	14.80	89.03	100	14.80
#4	4.750	2.77	86.97	100	2.77
#5	4.000	2.75	84.94	100	2.75
#7	2.800	6.40	80.19	100	6.40
#10	2.000	7.46	74.66	100	7.46
#14	1.400	11.68	66.00	100	11.68
#18	1.000	10.55	58.18	100	10.55
#25	0.710	11.01	50.02	70	7.71
#35	0.500	12.39	40.83	50	6.20
#45	0.355	12.34	31.69	30	3.70
#60	0.250	10.07	24.22	10	1.01
#80	0.180	9.05	17.51	1	0.09
#120	0.125	18.49	3.80	0	0.00
#170	0.090	3.93	0.89	0	0.00
#200	0.075	0.24	0.71	0	0.00
#230	0.063	0.08	0.65	0	0.00
Total Shell Content:		**56**		**%**	



Nassau Sound
Florida
2016 - 2017

C-26

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-26

DRILLING LOG

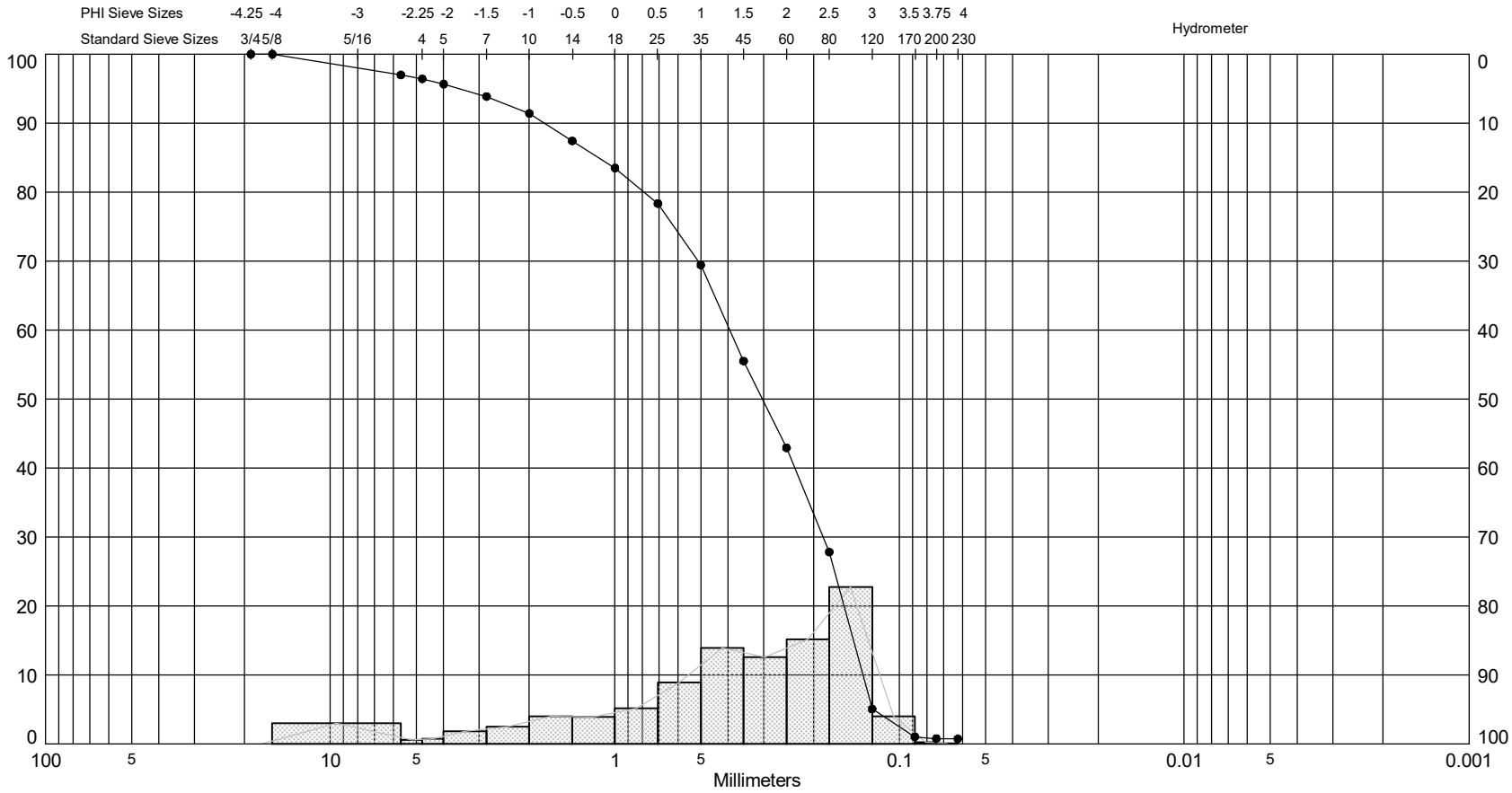
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-26
LOCATION COORDINATES	X = 523,117 Y = 2,249,614
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	10.2 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	9.8 Ft.
15. DATE BORING	STARTED 07-26-16 07:22 / COMPLETED 07-26-16
16. ELEVATION TOP OF BORING	-13.5 Ft.
17. TOTAL RECOVERY FOR BORING	9.1 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-13.5	0.0					
			Fine SAND, little shell fragments <1.0cm, shell contents varies in distinct beds., light greenish gray (10Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.33, Phi Sorting: 1.08 Shell: 26%, Fines (#200) - 0.51 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 9.0' Mean (mm): 0.39, Phi Sorting: 1.51 Shell: 32%, Carbonate: 25.0%, Fines (#200) - 0.78 (SP)
-19.4	5.9					
			Fine SAND, trace shell fragments, light greenish gray (10Y-8/1), (SP).		B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.36, Phi Sorting: 1.77 Shell: 27%, Fines (#200) - 0.69 (SP)
-22.0	8.5					
-22.6	9.1		Fine SAND, little shell fragments <1.0cm, light greenish gray (10Y-8/1), (SW).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-26 #COMP	—●—	-13.5	SP	#200 - 0.78 #230 - 0.73		25.00	1.72	1.36	-1.21	4.12	1.51

Comments: Sample Interval = 0 - 9.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,117
Northing (Y, ft):	2,249,614
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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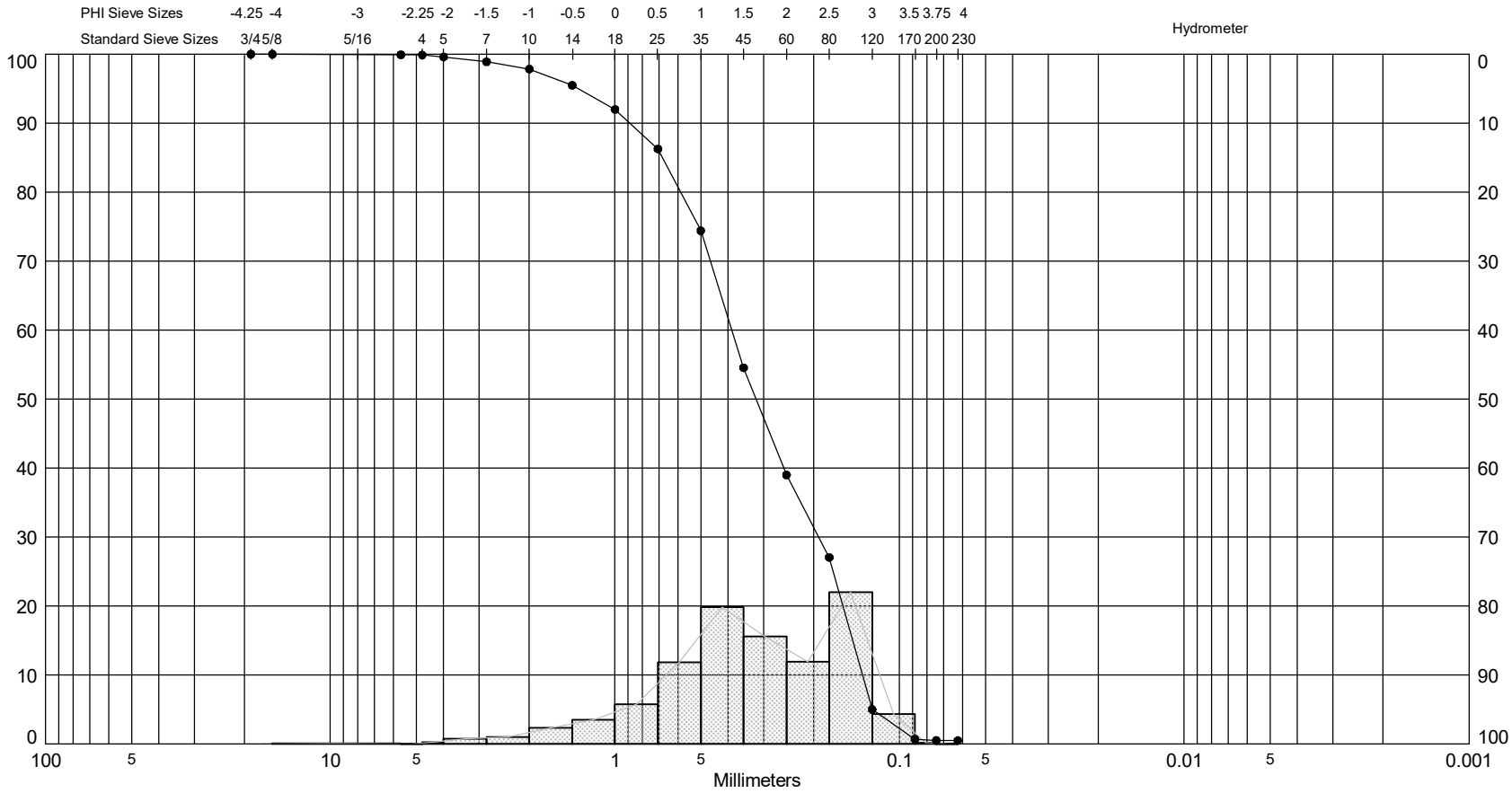
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-26**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.49	
Dry Wt. Before Washing (g):	200.23	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	4.53	96.99	100	4.53
#4	4.750	0.85	96.43	100	0.85
#5	4.000	1.15	95.67	100	1.15
#7	2.800	2.71	93.87	100	2.71
#10	2.000	3.73	91.40	100	3.73
#14	1.400	5.97	87.44	100	5.97
#18	1.000	5.96	83.48	100	5.96
#25	0.710	7.74	78.35	80	6.19
#35	0.500	13.44	69.43	60	8.06
#45	0.355	20.98	55.51	30	6.29
#60	0.250	18.96	42.93	10	1.90
#80	0.180	22.81	27.80	1	0.23
#120	0.125	34.30	5.05	0	0.00
#170	0.090	6.08	1.01	0	0.00
#200	0.075	0.38	0.76	0	0.00
#230	0.063	0.07	0.72	0	0.00
Total Shell Content:		**32**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-26 #A	—●—	-14.3	SP	#200 - 0.51 #230 - 0.48			1.65	1.59	-0.73	3.52	1.08

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,117
Northing (Y, ft):	2,249,614
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

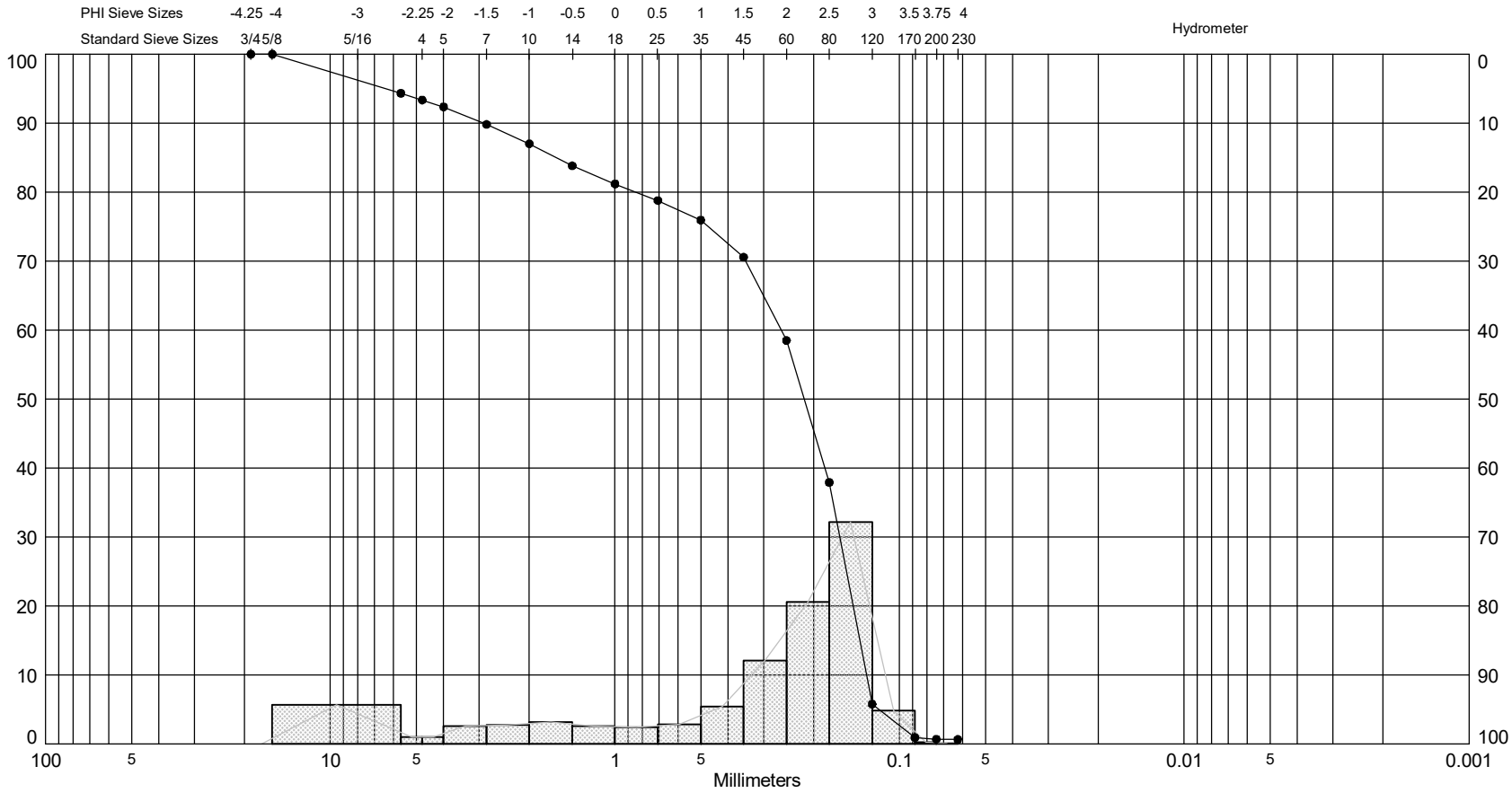
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-26**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	50.01	
Dry Wt. Before Washing (g):	161.14	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.09	99.92	100	0.09
#4	4.750	0.05	99.87	100	0.05
#5	4.000	0.31	99.60	100	0.31
#7	2.800	0.79	98.88	100	0.79
#10	2.000	1.16	97.84	100	1.16
#14	1.400	2.62	95.48	100	2.62
#18	1.000	3.90	91.97	100	3.90
#25	0.710	6.35	86.26	80	5.08
#35	0.500	13.19	74.39	50	6.60
#45	0.355	22.07	54.53	30	6.62
#60	0.250	17.29	38.97	10	1.73
#80	0.180	13.27	27.03	1	0.13
#120	0.125	24.48	5.00	0	0.00
#170	0.090	4.79	0.69	0	0.00
#200	0.075	0.21	0.50	0	0.00
#230	0.063	0.03	0.48	0	0.00
Total Shell Content:		**26**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-26 #B	—●—	-21.3	SP	#200 - 0.69 #230 - 0.64			2.21	1.49	-1.45	4.02	1.77

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,117
Northing (Y, ft):	2,249,614
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
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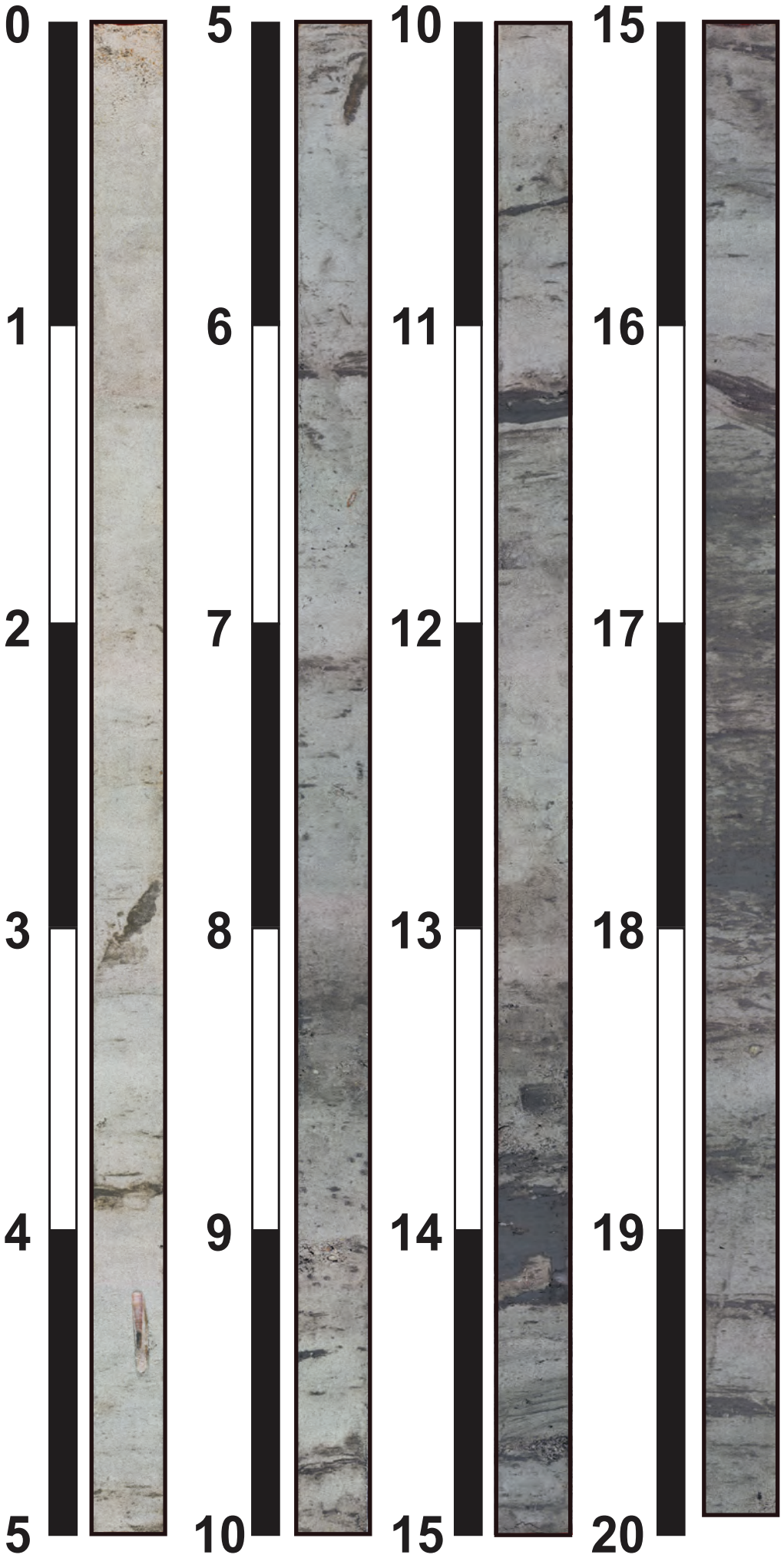
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-26**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.38	
Dry Wt. Before Washing (g):	181.56	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.42	94.34	100	7.42
#4	4.750	1.29	93.36	100	1.29
#5	4.000	1.31	92.36	100	1.31
#7	2.800	3.34	89.82	100	3.34
#10	2.000	3.66	87.03	100	3.66
#14	1.400	4.20	83.82	100	4.20
#18	1.000	3.44	81.20	100	3.44
#25	0.710	3.16	78.79	70	2.21
#35	0.500	3.73	75.95	50	1.87
#45	0.355	7.06	70.57	40	2.82
#60	0.250	15.86	58.48	20	3.17
#80	0.180	26.98	37.91	2	0.54
#120	0.125	42.15	5.78	0	0.00
#170	0.090	6.37	0.92	0	0.00
#200	0.075	0.30	0.69	0	0.00
#230	0.063	0.07	0.64	0	0.00
Total Shell Content:		**27**		**%**	



Nassau Sound
Florida
2016 - 2017

C-27

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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(843) 887-3800

Boring Designation C-27

DRILLING LOG

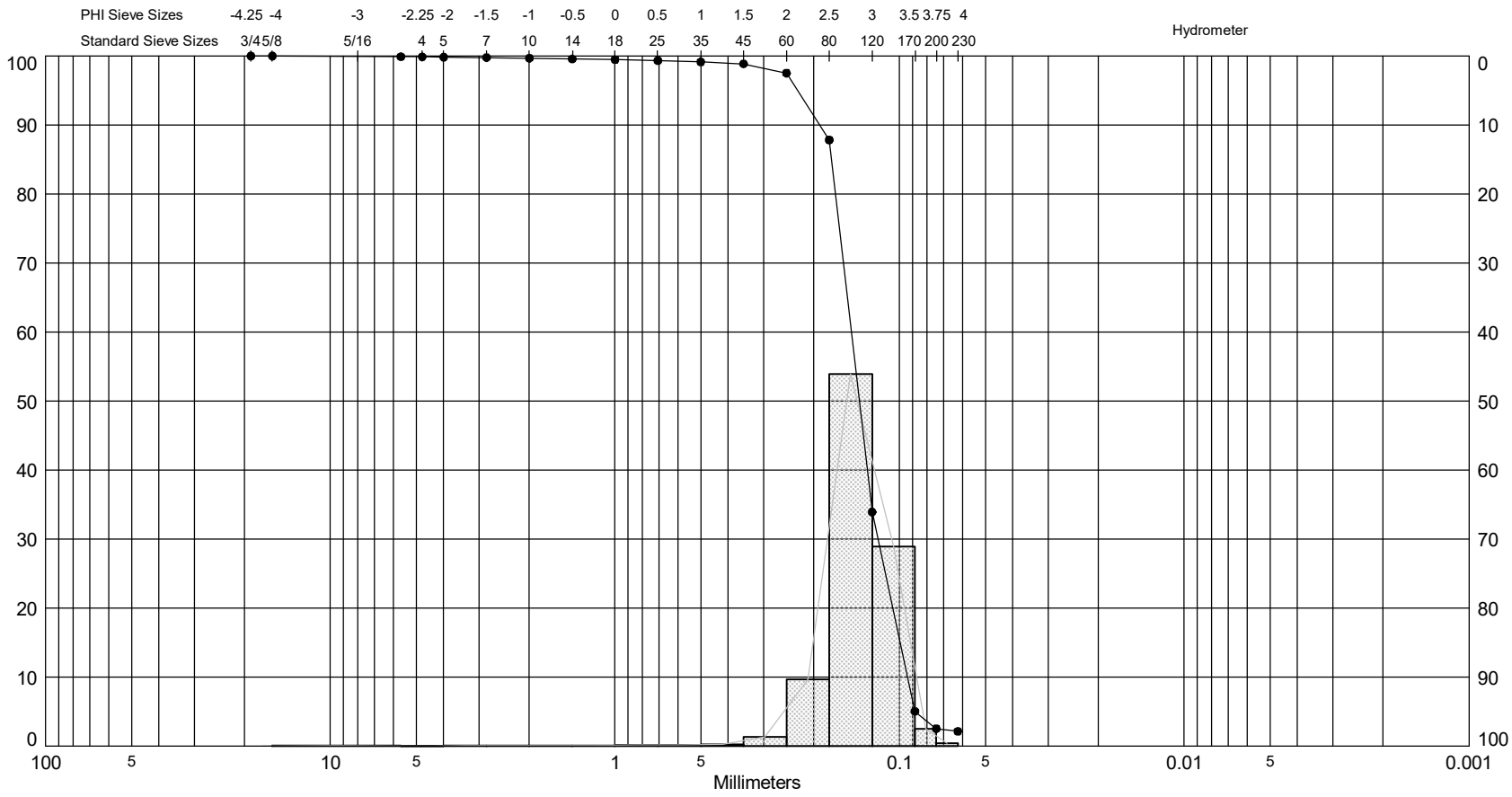
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-27
LOCATION COORDINATES	X = 528,125 Y = 2,248,465
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	21.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	15.5 Ft.
15. DATE BORING	STARTED 02-21-17 09:06 / COMPLETED 02-21-17
16. ELEVATION TOP OF BORING	-18.3 Ft.
17. TOTAL RECOVERY FOR BORING	19.9 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-18.3	0.0					
			Fine quartz SAND, few fine sand-size shell fragments, trace silt in burrows, poorly graded, subangular, loose, 2.8-3.2' = silt-infilled callianassa major (mud shrimp) burrow, 3.8-3.95' = silt laminations, 4.25' = ensis directus (razor clam) shell, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 1.8' - 2.3' Mean (mm): 0.15, Phi Sorting: 0.37 Shell: 6%, Fines (#200) - 1.03 (SP)
-23.1	4.8					
			Fine quartz SAND, few fine to medium sand-size shell fragments, occasional (intact) donax variabilis (coquina clam) shells present, trace to few silt in burrows and laminations, poorly graded, subangular, loose, 5.2' = silt-lined callianassa major burrow, gray (5Y-6/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 13.5' Mean (mm): 0.14, Phi Sorting: 0.51 Shell: 1%, Carbonate: 2.6%, Fines (#200) - 2.53 (SP)
					B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.16, Phi Sorting: 0.93 Shell: 4%, Fines (#200) - 1.46 (SP)
-32.0	13.8					
-32.5	14.3		SILT, little fine quartz SAND in burrows, soft, dark gray (5Y-4/1), (ML).			
-32.8	14.5		Same as 4.8-13.75' interval, (SP).			
			Fine quartz SAND, trace silt in burrows, trace fine sand-size shell fragments, poorly graded, subangular, loose, gray (5Y-6/1), (SP).			
-34.4	16.1					
			Fine quartz SAND, few silt in burrows and laminations, trace fine sand-size shell fragments, poorly graded, subangular, loose, gray (5Y-5/1), (SP-SM).			
-36.0	17.8					
			Fine quartz SAND, trace silt in burrows and laminations, trace fine sand-size shell fragments, poorly graded, subangular, loose, gray (5Y-6/1), (SP).			
-38.2	19.9					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL_DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-27 #COMP	—●—	-18.3	SP	#200 - 2.53 #230 - 2.13		2.60	2.85	2.83	-4.32	41.71	0.51

Comments: Sample Interval = 0 - 13.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	528,125
Northing (Y, ft):	2,248,465
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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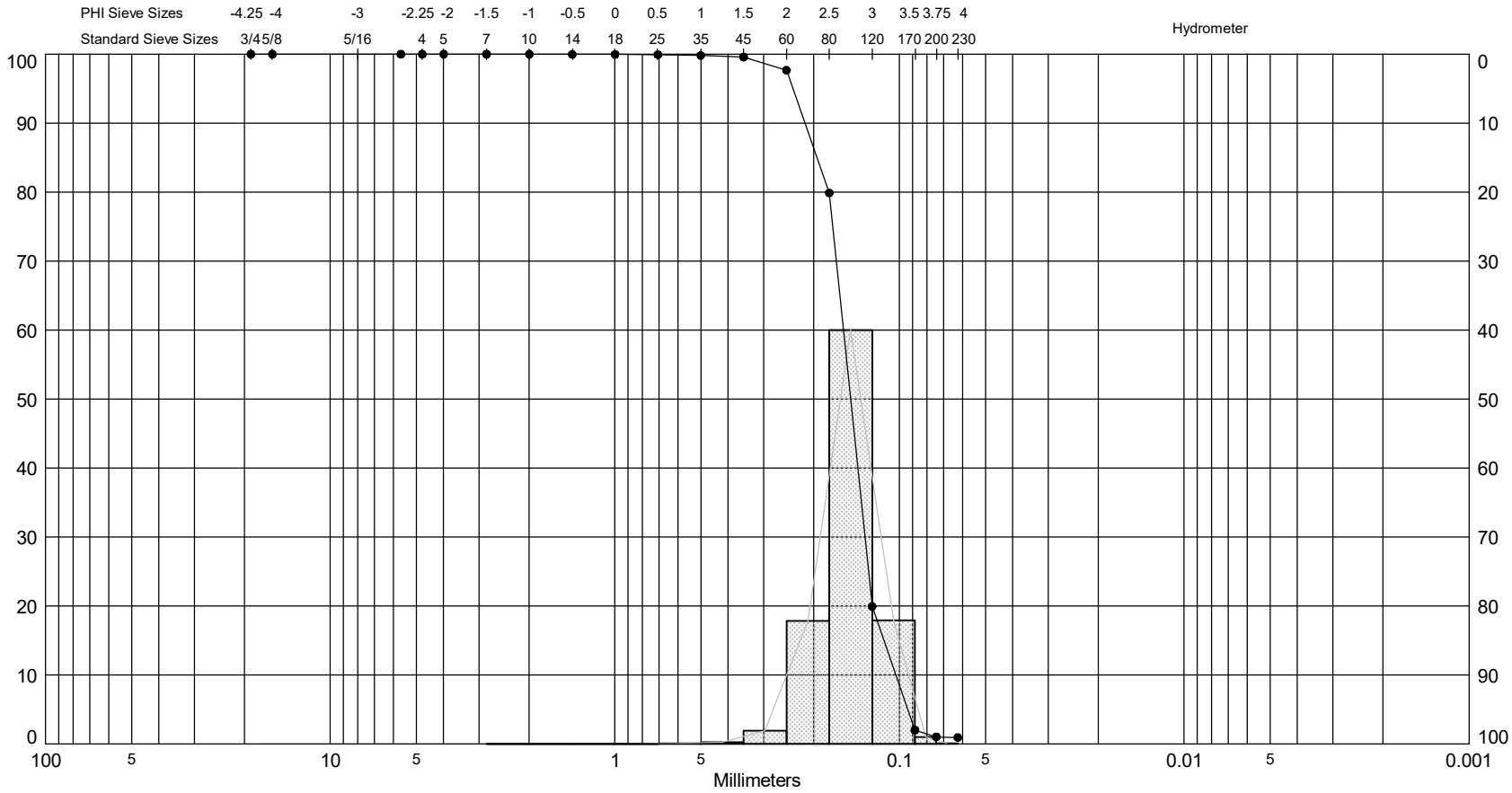
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-13.5'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-27**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	48.44	
Dry Wt. Before Washing (g):	172.17	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.12	99.90	100	0.12
#4	4.750	0.03	99.88	100	0.03
#5	4.000	0.05	99.84	100	0.05
#7	2.800	0.08	99.77	100	0.08
#10	2.000	0.11	99.68	90	0.10
#14	1.400	0.15	99.56	60	0.09
#18	1.000	0.14	99.45	50	0.07
#25	0.710	0.16	99.32	40	0.06
#35	0.500	0.23	99.14	35	0.08
#45	0.355	0.33	98.87	20	0.07
#60	0.250	1.66	97.53	10	0.17
#80	0.180	12.00	87.83	1	0.12
#120	0.125	66.70	33.92	0	0.00
#170	0.090	35.73	5.04	0	0.00
#200	0.075	3.11	2.53	0	0.00
#230	0.063	0.50	2.13	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-27 #A	—●—	-20.1	SP	#200 - 1.03 #230 - 0.93			2.75	2.73	-0.96	9.08	0.37

Comments: Sample Depth = 2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	528,125
Northing (Y, ft):	2,248,465
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
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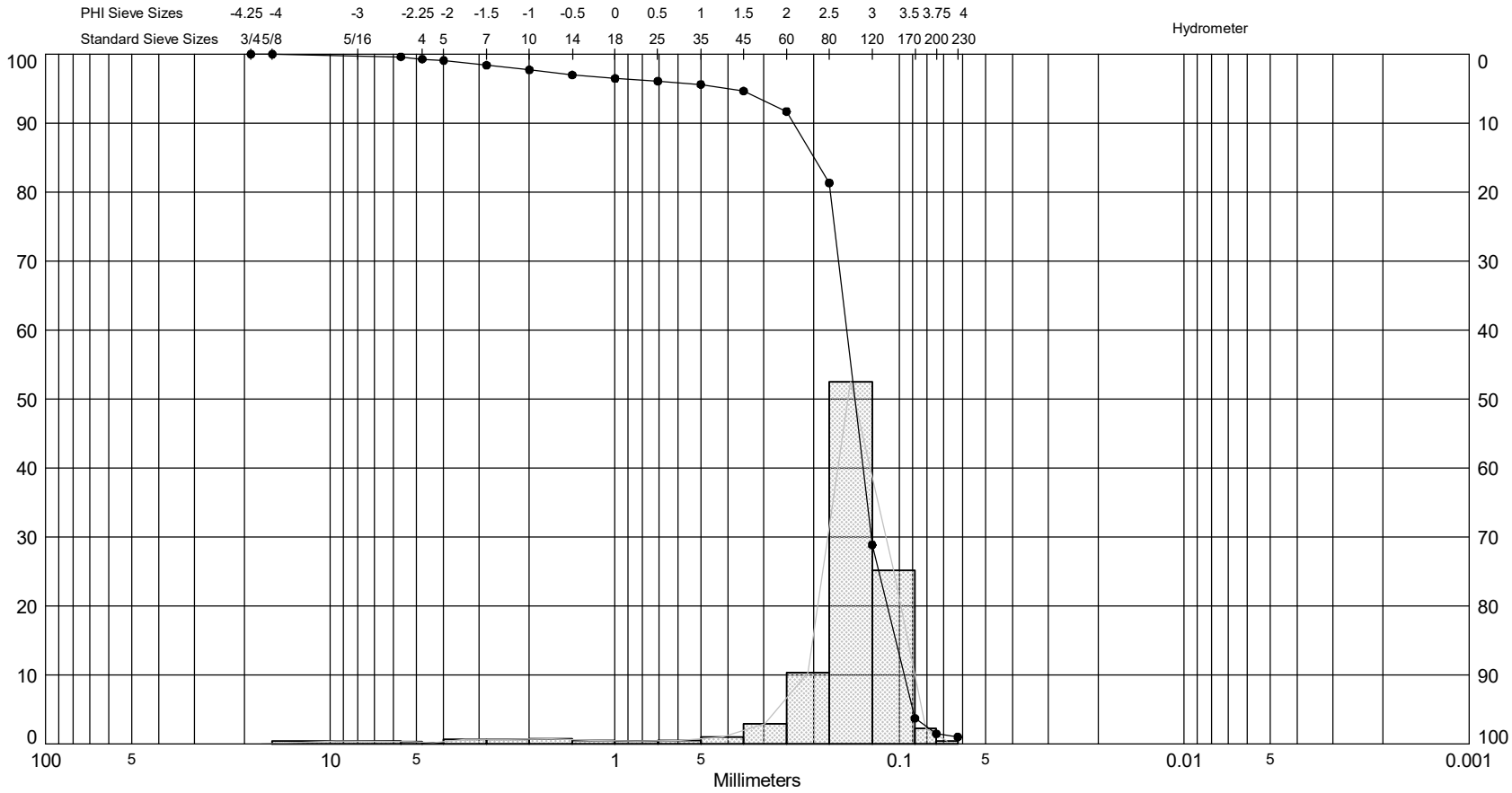
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**2'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-27**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.92	
Dry Wt. Before Washing (g):	194.45	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.02	99.99	100	0.02
#14	1.400	0.03	99.97	100	0.03
#18	1.000	0.02	99.95	100	0.02
#25	0.710	0.05	99.92	90	0.05
#35	0.500	0.16	99.81	70	0.11
#45	0.355	0.34	99.57	60	0.20
#60	0.250	2.75	97.67	50	1.38
#80	0.180	25.73	79.87	25	6.43
#120	0.125	86.67	19.90	1	0.87
#170	0.090	25.88	1.99	0	0.00
#200	0.075	1.40	1.02	0	0.00
#230	0.063	0.15	0.92	0	0.00
Total Shell Content:		**6**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-27 #B	—●—	-27.1	SP	#200 - 1.46 #230 - 1.02			2.8	2.64	-3.62	18.41	0.93

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	528,125
Northing (Y, ft):	2,248,465
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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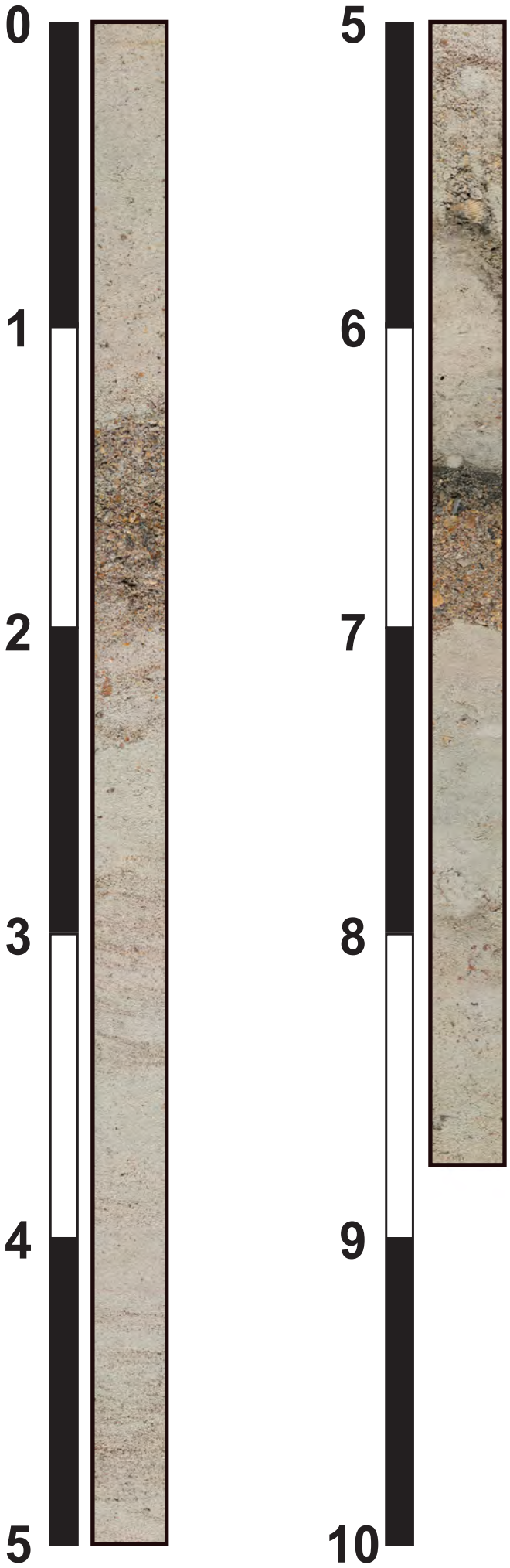
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-27**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.93	
Dry Wt. Before Washing (g):	196.36	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.55	99.62	100	0.55
#4	4.750	0.48	99.30	100	0.48
#5	4.000	0.29	99.10	100	0.29
#7	2.800	1.03	98.40	75	0.77
#10	2.000	0.98	97.73	70	0.69
#14	1.400	1.08	96.99	70	0.76
#18	1.000	0.75	96.48	60	0.45
#25	0.710	0.56	96.09	50	0.28
#35	0.500	0.71	95.61	40	0.28
#45	0.355	1.40	94.65	30	0.42
#60	0.250	4.32	91.70	20	0.86
#80	0.180	15.18	81.34	2	0.30
#120	0.125	76.83	28.87	0	0.00
#170	0.090	36.82	3.72	0	0.00
#200	0.075	3.30	1.47	0	0.00
#230	0.063	0.64	1.03	0	0.00
Total Shell Content:		**4**		**%**	



Nassau Sound
Florida
2016 - 2017

C-28

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA
TECHNOLOGIES, INC.

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Boring Designation C-28

DRILLING LOG

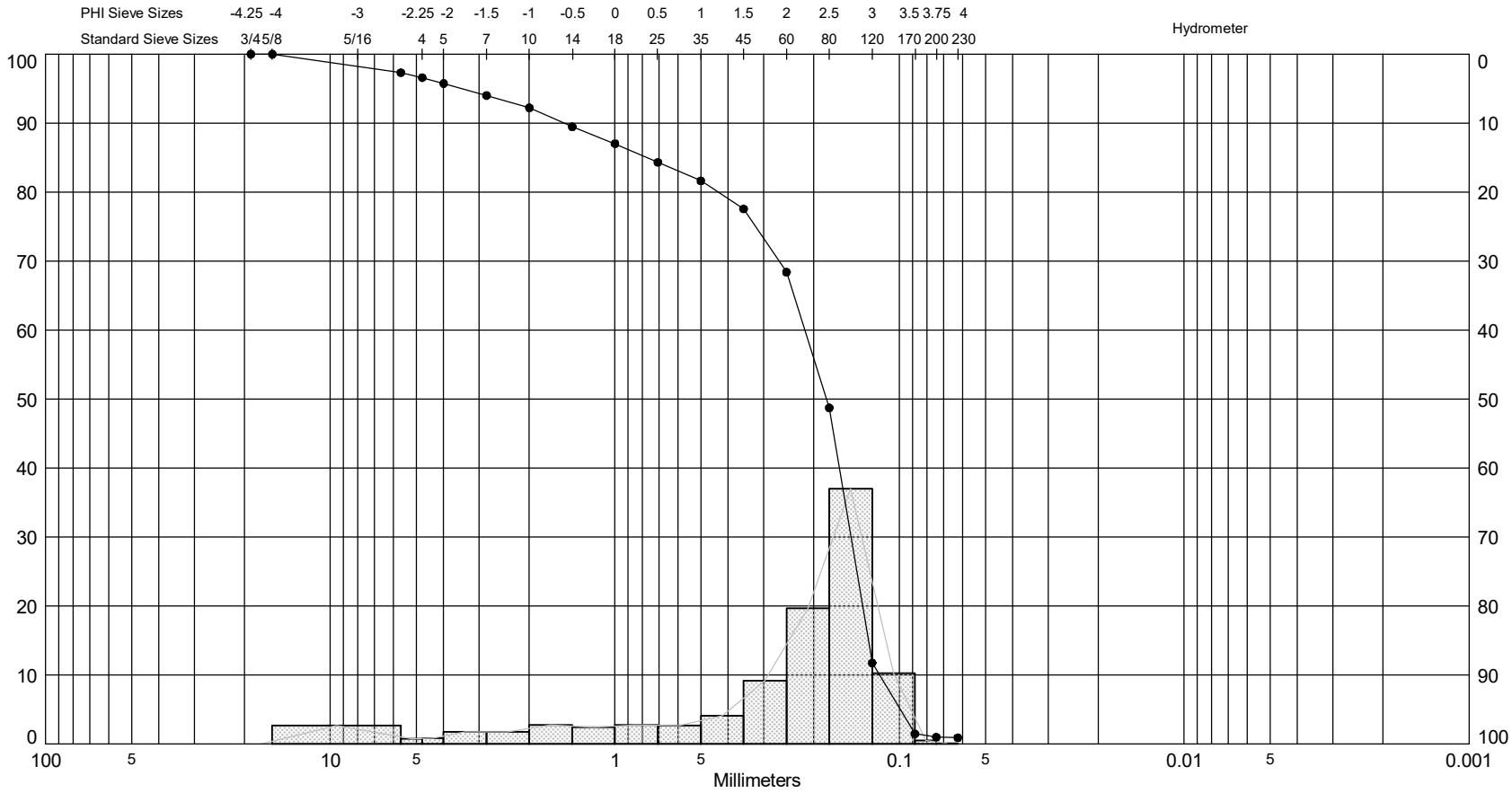
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-28
LOCATION COORDINATES	X = 523,753 Y = 2,245,763
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	9.5 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	7.2 Ft.
15. DATE BORING	STARTED 07-12-16 11:47 / COMPLETED 07-12-16
16. ELEVATION TOP OF BORING	-7.7 Ft.
17. TOTAL RECOVERY FOR BORING	8.7 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-7.7	0.0					
-9.0	1.3		Fine SAND, trace shell fragments, white (2.5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.24, Phi Sorting: 1.28 Shell: 12%, Fines (#200) - 1.47 (SP)
-9.6	1.9		Fine to medium SAND, little shell fragments <1.5cm, gray (2.5Y-6/1), (SW).		COMP	Sample #COMP, Depth = 0.0' - 8.5' Mean (mm): 0.27, Phi Sorting: 1.53 Shell: 19%, Carbonate: 16.5%, Fines (#200) - 0.97 (SP)
-14.2	6.5		Fine SAND, trace shell fragments, white (2.5Y-8/1), (SP).		B	Sample #B, Depth = 4.8' - 5.3' Mean (mm): 0.32, Phi Sorting: 1.50 Shell: 22%, Fines (#200) - 0.57 (SP)
-14.8	7.1		Fine to medium SAND, little shell fragments <1.5cm, gray (2.5Y-6/1), (SW).			
-16.4	8.7		Fine SAND, trace shell fragments, white (2.5Y-8/1), (SP).			
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-28 #COMP	—●—	-7.7	SP	#200 - 0.97 #230 - 0.88		16.50	2.47	1.87	-1.79	5.57	1.53

Comments: Sample Interval = 0 - 8.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,753
Northing (Y, ft):	2,245,763
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

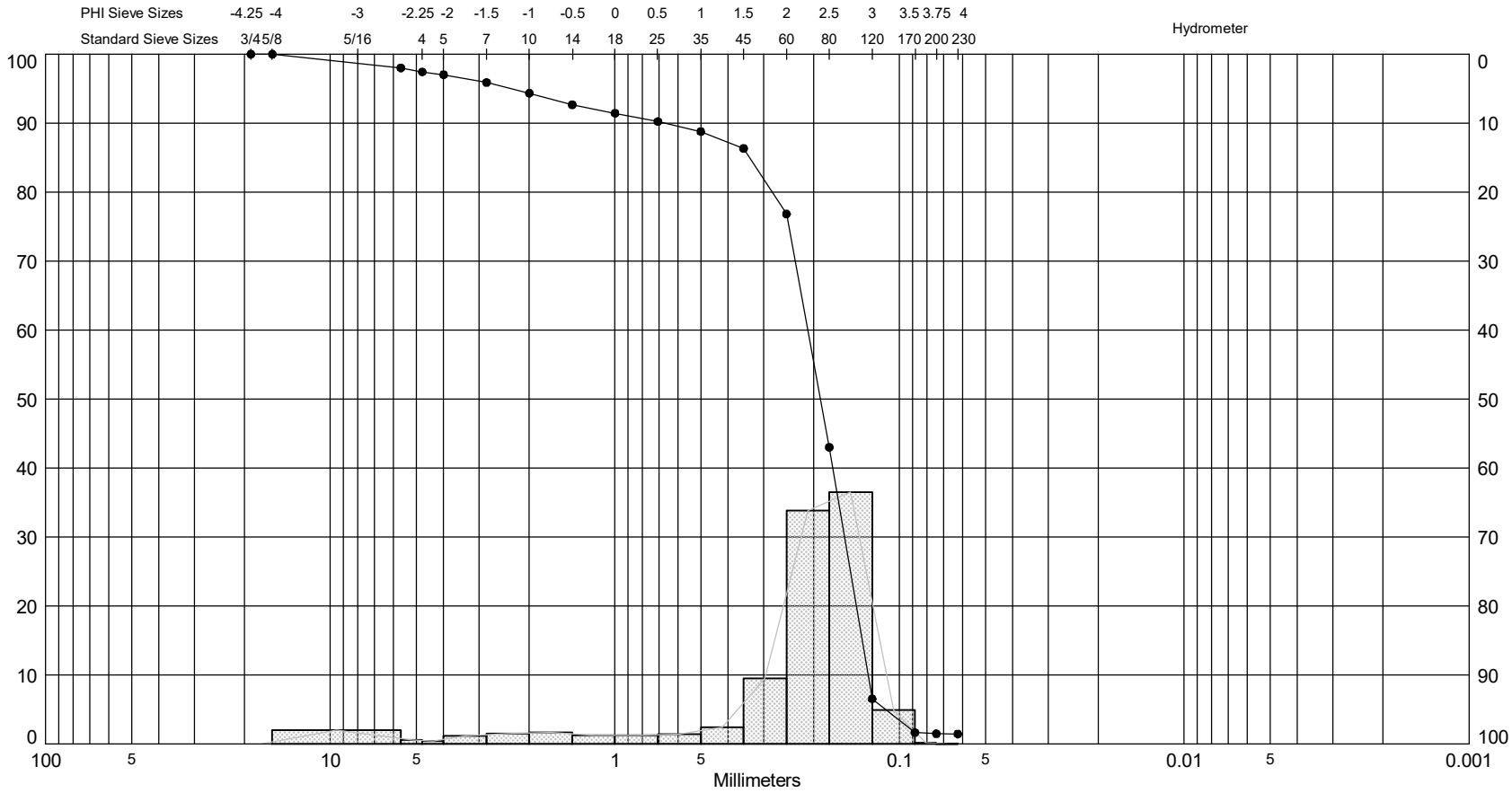
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-8.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-28**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.85	
Dry Wt. Before Washing (g):	180.22	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.51	97.31	100	3.51
#4	4.750	0.93	96.59	100	0.93
#5	4.000	1.09	95.76	100	1.09
#7	2.800	2.28	94.01	100	2.28
#10	2.000	2.34	92.21	100	2.34
#14	1.400	3.59	89.46	100	3.59
#18	1.000	3.18	87.02	80	2.54
#25	0.710	3.53	84.31	60	2.12
#35	0.500	3.51	81.62	40	1.40
#45	0.355	5.31	77.55	30	1.59
#60	0.250	11.95	68.38	20	2.39
#80	0.180	25.65	48.71	2	0.51
#120	0.125	48.22	11.72	0	0.00
#170	0.090	13.39	1.45	0	0.00
#200	0.075	0.64	0.96	0	0.00
#230	0.063	0.12	0.87	0	0.00
Total Shell Content:		**19**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-28 #A	—●—	-8.5	SP	#200 - 1.47 #230 - 1.44			2.4	2.03	-2.51	9.19	1.28

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,753
Northing (Y, ft):	2,245,763
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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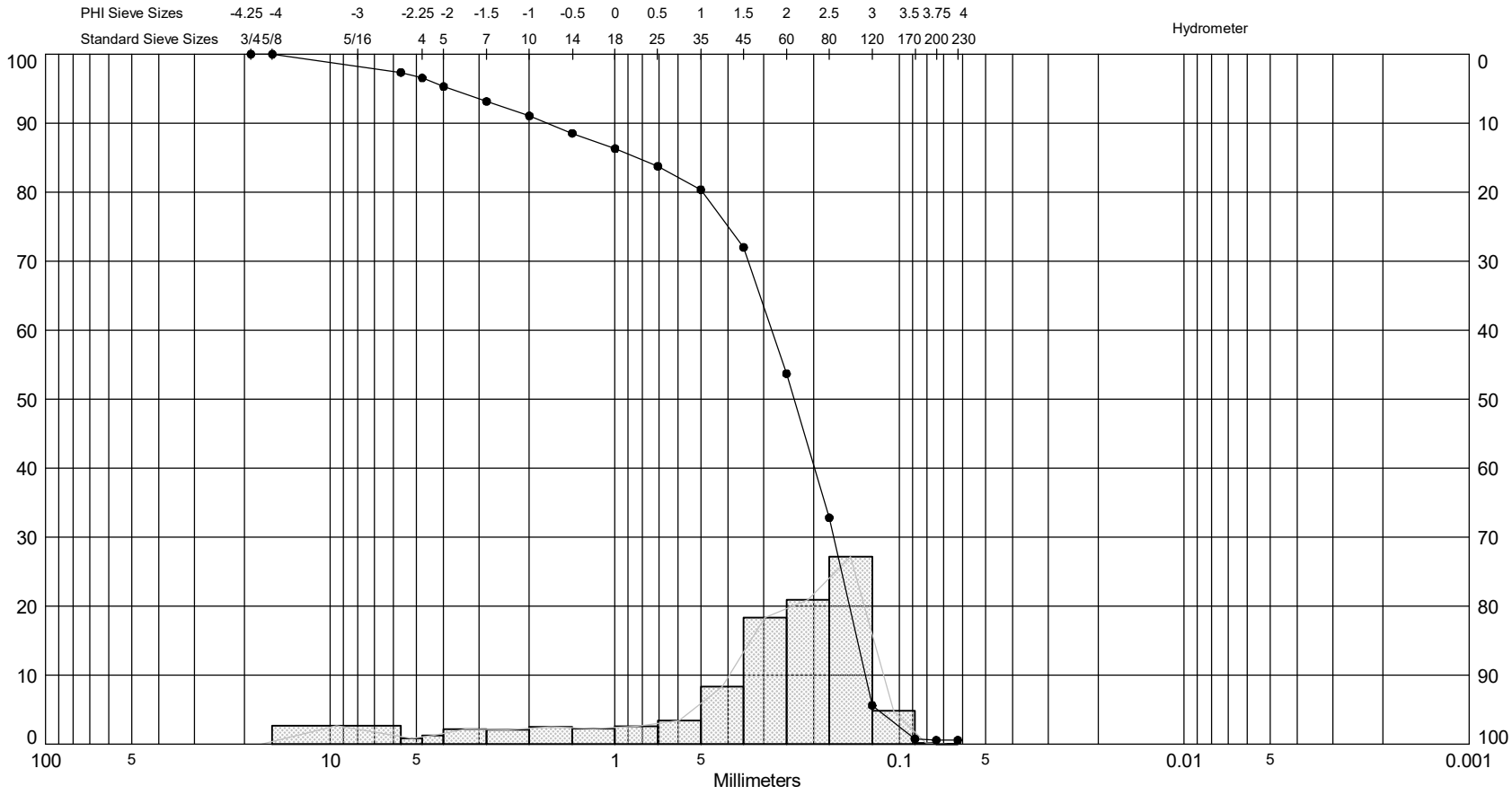
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-28**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.23	
Dry Wt. Before Washing (g):	166.44	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.31	98.01	100	2.31
#4	4.750	0.67	97.44	100	0.67
#5	4.000	0.47	97.03	100	0.47
#7	2.800	1.32	95.90	100	1.32
#10	2.000	1.79	94.36	100	1.79
#14	1.400	1.95	92.68	100	1.95
#18	1.000	1.43	91.45	100	1.43
#25	0.710	1.41	90.23	70	0.99
#35	0.500	1.67	88.80	50	0.84
#45	0.355	2.85	86.34	30	0.86
#60	0.250	11.05	76.84	10	1.11
#80	0.180	39.30	43.02	1	0.39
#120	0.125	42.38	6.55	0	0.00
#170	0.090	5.70	1.64	0	0.00
#200	0.075	0.20	1.47	0	0.00
#230	0.063	0.04	1.44	0	0.00
Total Shell Content:		**12**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-28 #B	—●—	-12.5	SP	#200 - 0.57 #230 - 0.55			2.09	1.63	-1.65	5.19	1.5

Comments: Sample Depth = 5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,753
Northing (Y, ft):	2,245,763
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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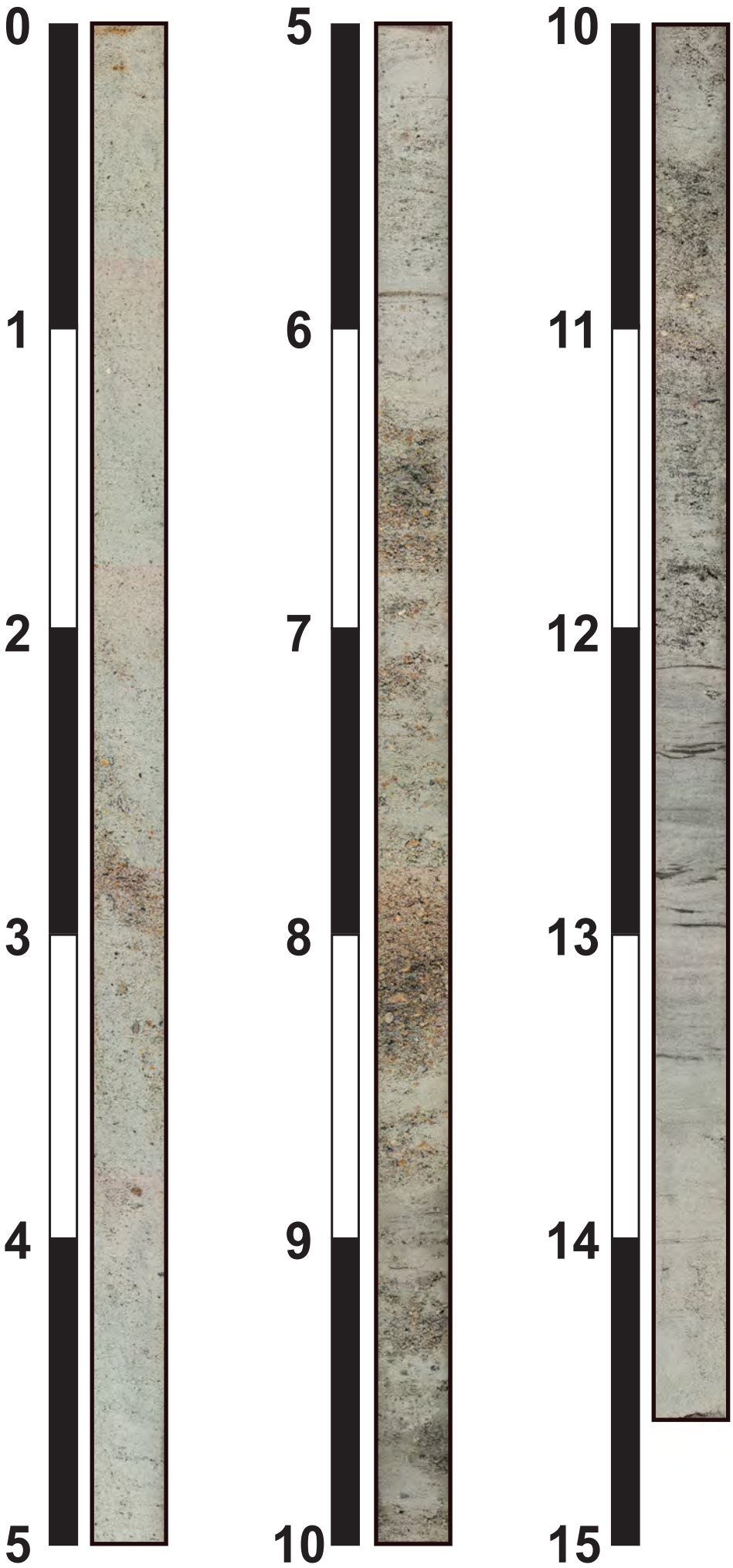
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-28**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.93	
Dry Wt. Before Washing (g):	176.80	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.35	97.36	100	3.35
#4	4.750	1.03	96.55	100	1.03
#5	4.000	1.59	95.29	100	1.59
#7	2.800	2.73	93.14	100	2.73
#10	2.000	2.67	91.04	100	2.67
#14	1.400	3.18	88.53	100	3.18
#18	1.000	2.84	86.29	100	2.84
#25	0.710	3.24	83.74	70	2.27
#35	0.500	4.30	80.35	50	2.15
#45	0.355	10.61	71.99	30	3.18
#60	0.250	23.22	53.68	10	2.32
#80	0.180	26.52	32.78	0	0.00
#120	0.125	34.50	5.59	0	0.00
#170	0.090	6.15	0.74	0	0.00
#200	0.075	0.24	0.55	0	0.00
#230	0.063	0.02	0.54	0	0.00
Total Shell Content:		**22**		**%**	



Nassau Sound
Florida
2016 - 2017

C-29

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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(843) 887-3800

Boring Designation C-29

DRILLING LOG

CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-29
LOCATION COORDINATES	X = 523,705 Y = 2,246,467
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	17.3 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.3 Ft.
15. DATE BORING	STARTED 08-22-16 07:20 / COMPLETED 08-22-16
16. ELEVATION TOP OF BORING*	-6.1 Ft.
17. TOTAL RECOVERY FOR BORING	14.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

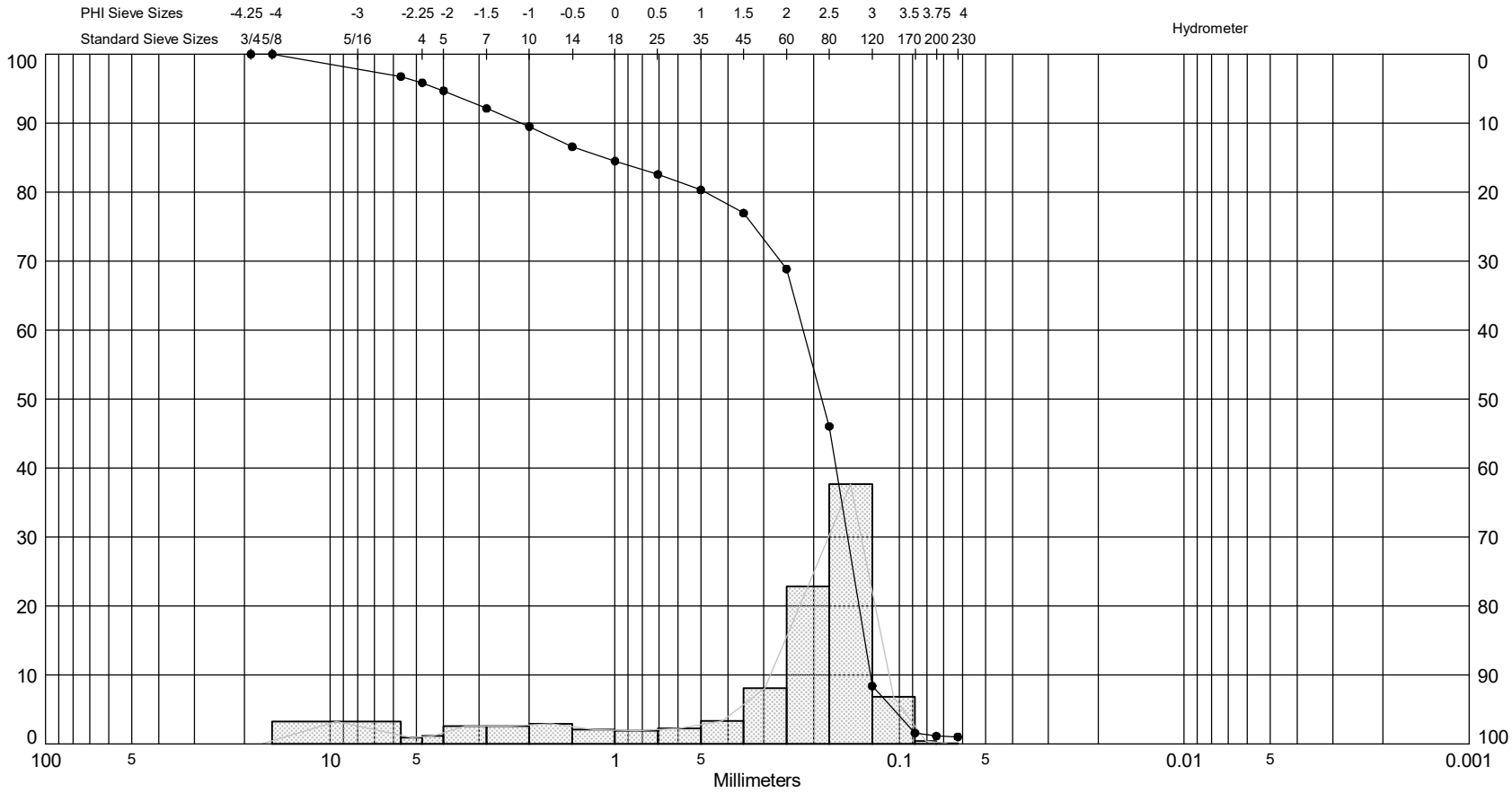
ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-6.1	0.0					
			Fine SAND, trace shell fragments, light greenish gray (10Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.68 Shell: 13%, Fines (#200) - 0.21 (SP)
-12.4	6.3				COMP	Sample #COMP, Depth = 0.0' - 14.5' Mean (mm): 0.30, Phi Sorting: 1.63 Shell: 22%, Carbonate: 19.2%, Fines (#200) - 1.13 (SP)
			Fine SAND, few shell fragments <2.0cm in layers, light greenish gray (10Y-7/1), (SP).			
-14.9	8.8				B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.22, Phi Sorting: 1.49 Shell: 14%, Fines (#200) - 1.16 (SP)
-16.4	10.3		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).			
-18.2	12.1		Fine SAND, trace shell fragments increasing from unit above, light greenish gray (10Y-7/1), (SP).			
-20.6	14.5		Fine SAND, trace silt in lenses, light greenish gray (10Y-8/1), (SP).			
			End of Boring			

0 5 10 15 20 25

* = Top of boring elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-29 #COMP	—●—	-6.1	SP	#200 - 1.13 #230 - 1.03		19.20	2.41	1.76	-1.69	4.85	1.63

Comments: Sample Interval = 0 - 14.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,705
Northing (Y, ft):	2,246,467
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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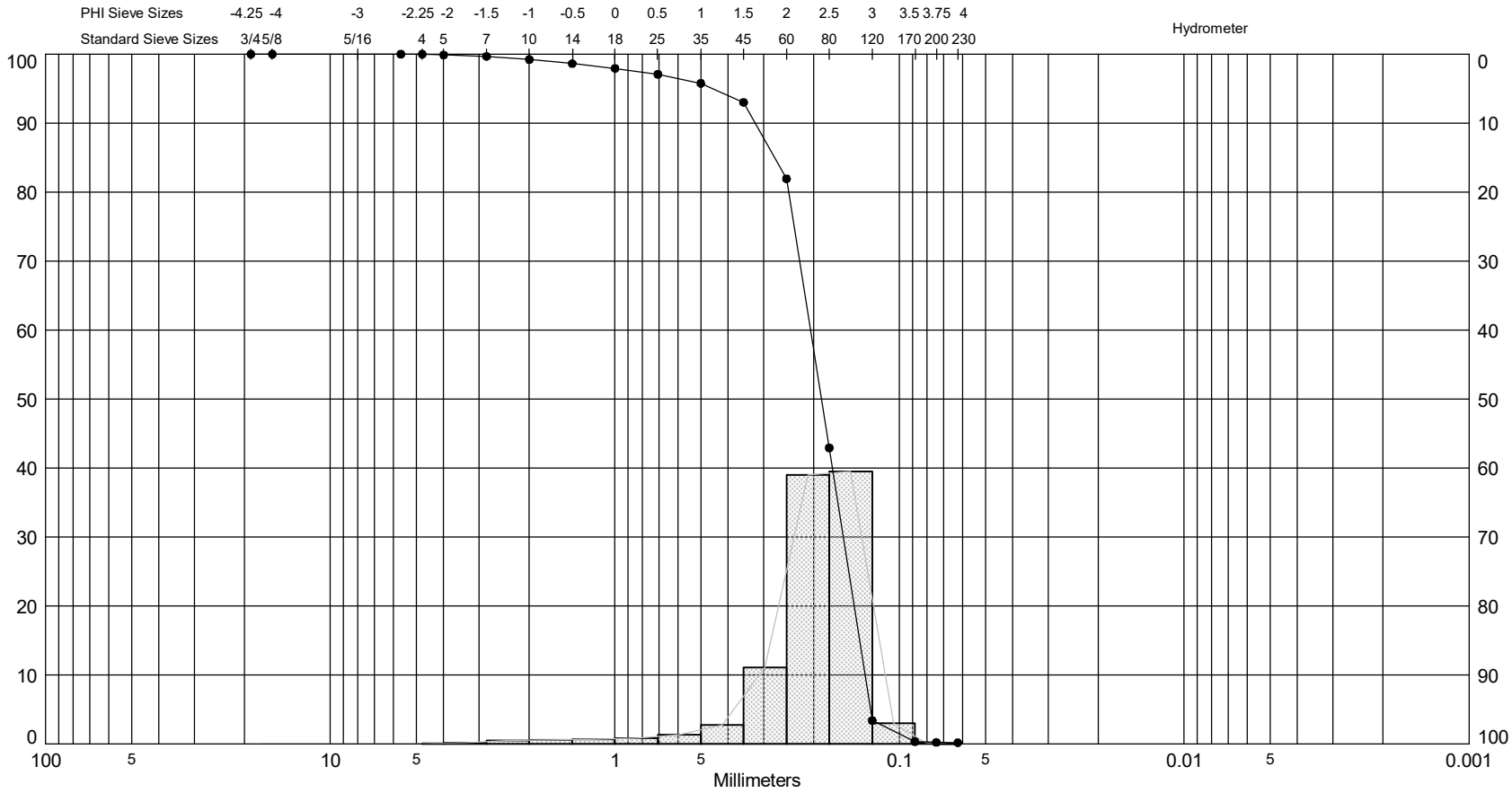
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14.5'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-29**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.21	
Dry Wt. Before Washing (g):	216.75	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	5.40	96.76	100	5.40
#4	4.750	1.50	95.86	100	1.50
#5	4.000	1.94	94.69	100	1.94
#7	2.800	4.28	92.12	100	4.28
#10	2.000	4.37	89.50	100	4.37
#14	1.400	4.88	86.57	100	4.88
#18	1.000	3.48	84.48	100	3.48
#25	0.710	3.21	82.55	70	2.25
#35	0.500	3.75	80.30	50	1.88
#45	0.355	5.58	76.95	30	1.67
#60	0.250	13.49	68.85	20	2.70
#80	0.180	38.00	46.03	5	1.90
#120	0.125	62.70	8.38	0	0.00
#170	0.090	11.37	1.56	0	0.00
#200	0.075	0.71	1.13	0	0.00
#230	0.063	0.16	1.03	0	0.00
Total Shell Content:		**22**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-29 #A	—●—	-6.9	SP	#200 - 0.21 #230 - 0.18			2.41	2.3	-2.68	13.6	0.68

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,705
Northing (Y, ft):	2,246,467
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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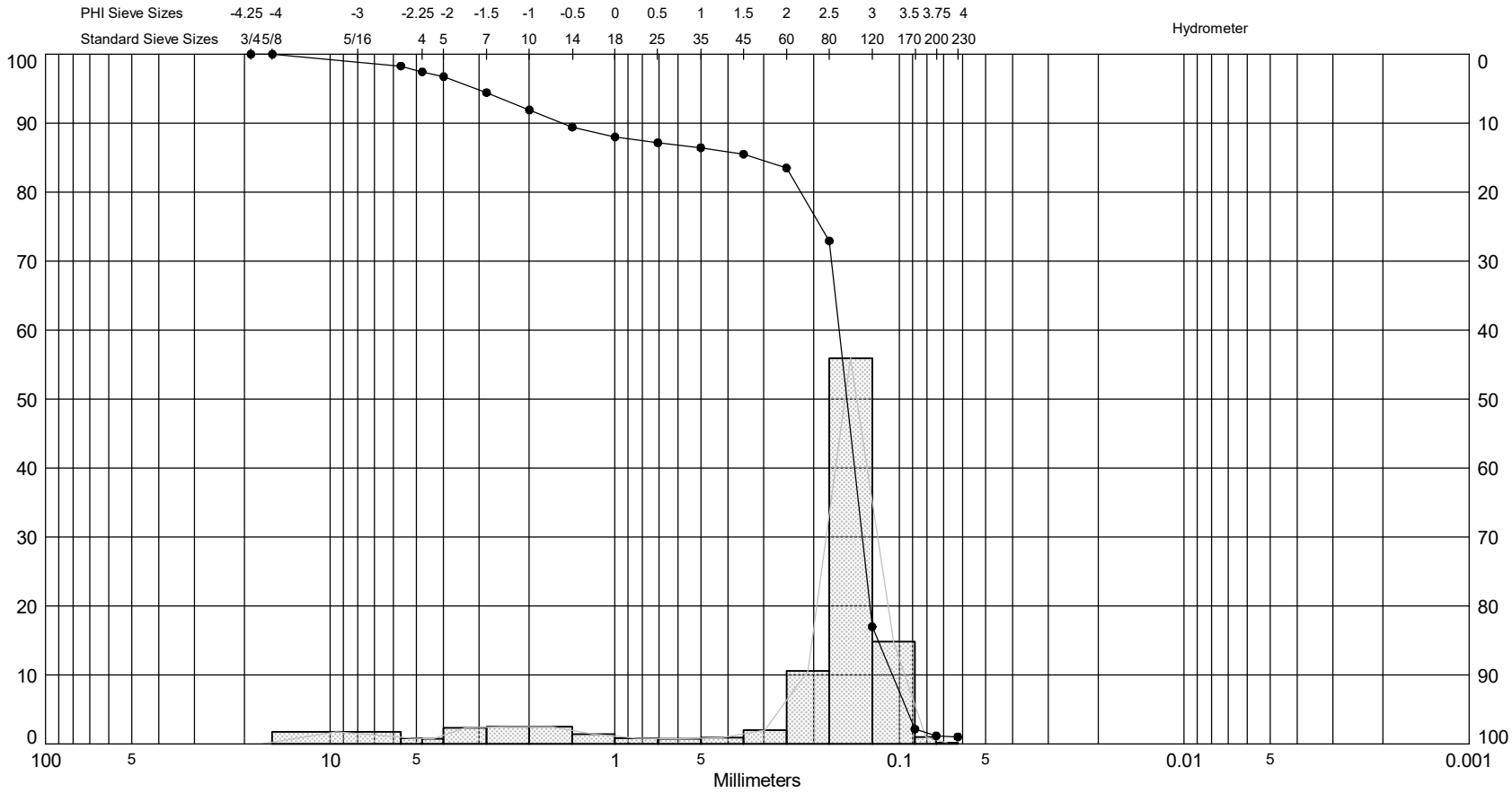
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-29**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.65	
Dry Wt. Before Washing (g):	209.71	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.20	99.88	100	0.20
#7	2.800	0.32	99.68	100	0.32
#10	2.000	0.73	99.22	100	0.73
#14	1.400	0.94	98.63	100	0.94
#18	1.000	1.11	97.94	100	1.11
#25	0.710	1.37	97.08	100	1.37
#35	0.500	2.09	95.78	70	1.46
#45	0.355	4.42	93.02	50	2.21
#60	0.250	17.72	81.95	30	5.32
#80	0.180	62.47	42.92	10	6.25
#120	0.125	63.28	3.38	1	0.63
#170	0.090	4.86	0.35	0	0.00
#200	0.075	0.21	0.22	0	0.00
#230	0.063	0.05	0.18	0	0.00
Total Shell Content:		**13**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-29 #B	—●—	-14.9	SP	#200 - 1.16 #230 - 1.03			2.71	2.19	-2.2	6.79	1.49

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,705
Northing (Y, ft):	2,246,467
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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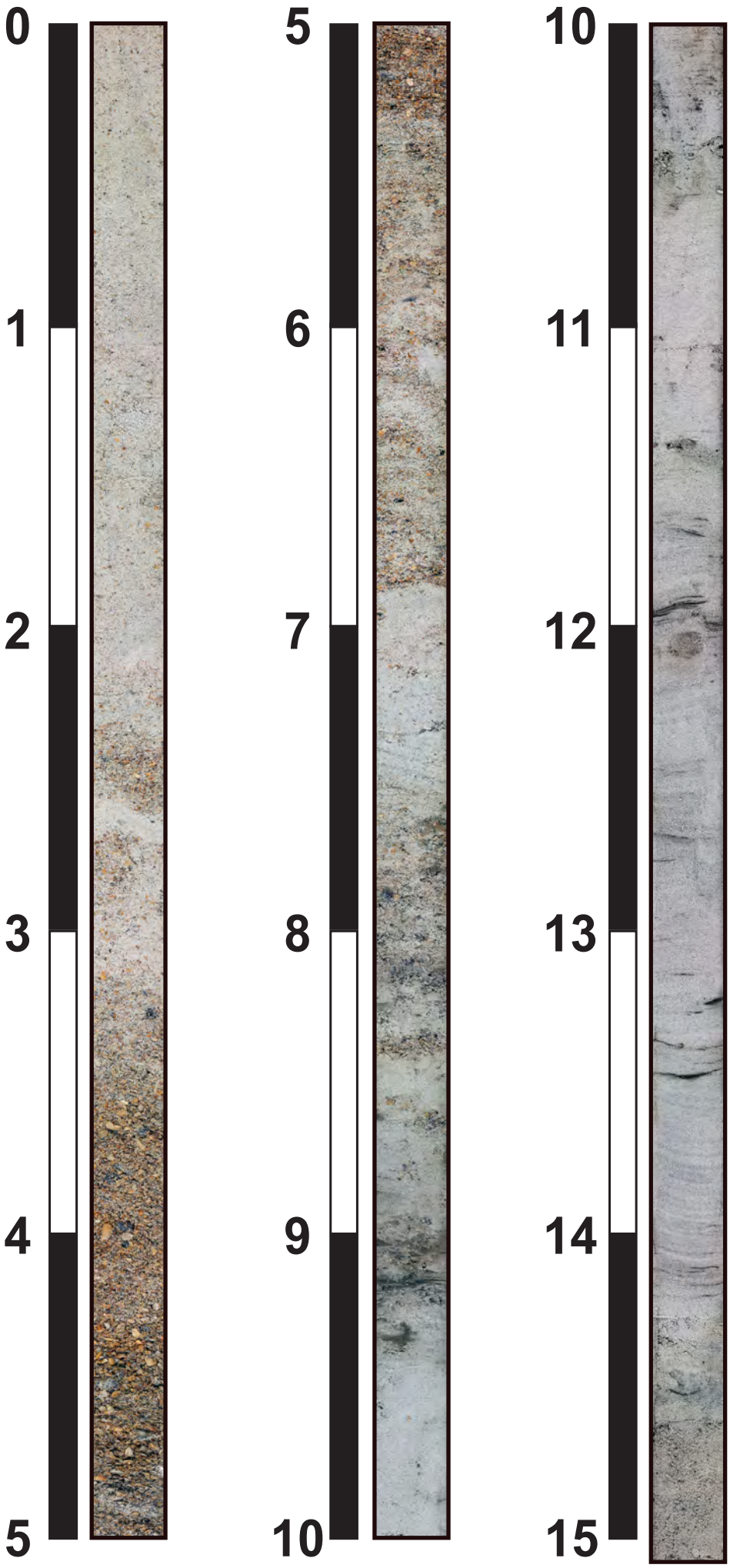
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-29**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.17	
Dry Wt. Before Washing (g):	208.05	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.68	98.29	100	2.68
#4	4.750	1.31	97.46	100	1.31
#5	4.000	1.12	96.74	100	1.12
#7	2.800	3.62	94.44	100	3.62
#10	2.000	3.94	91.92	100	3.94
#14	1.400	3.89	89.44	100	3.89
#18	1.000	2.24	88.02	100	2.24
#25	0.710	1.34	87.16	80	1.07
#35	0.500	1.11	86.45	70	0.78
#45	0.355	1.48	85.51	50	0.74
#60	0.250	3.13	83.52	25	0.78
#80	0.180	16.58	72.95	2	0.33
#120	0.125	87.77	17.00	0	0.00
#170	0.090	23.28	2.16	0	0.00
#200	0.075	1.56	1.17	0	0.00
#230	0.063	0.21	1.03	0	0.00
Total Shell Content:		**14**		**%**	



Nassau Sound
Florida
2016 - 2017

C-30

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-30

DRILLING LOG

CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-30
LOCATION COORDINATES	X = 523,653 Y = 2,247,172
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	10.3 Ft.
15. DATE BORING	STARTED 08-22-16 10:36 / COMPLETED 08-22-16
16. ELEVATION TOP OF BORING*	-8.0 Ft.
17. TOTAL RECOVERY FOR BORING	15.1 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

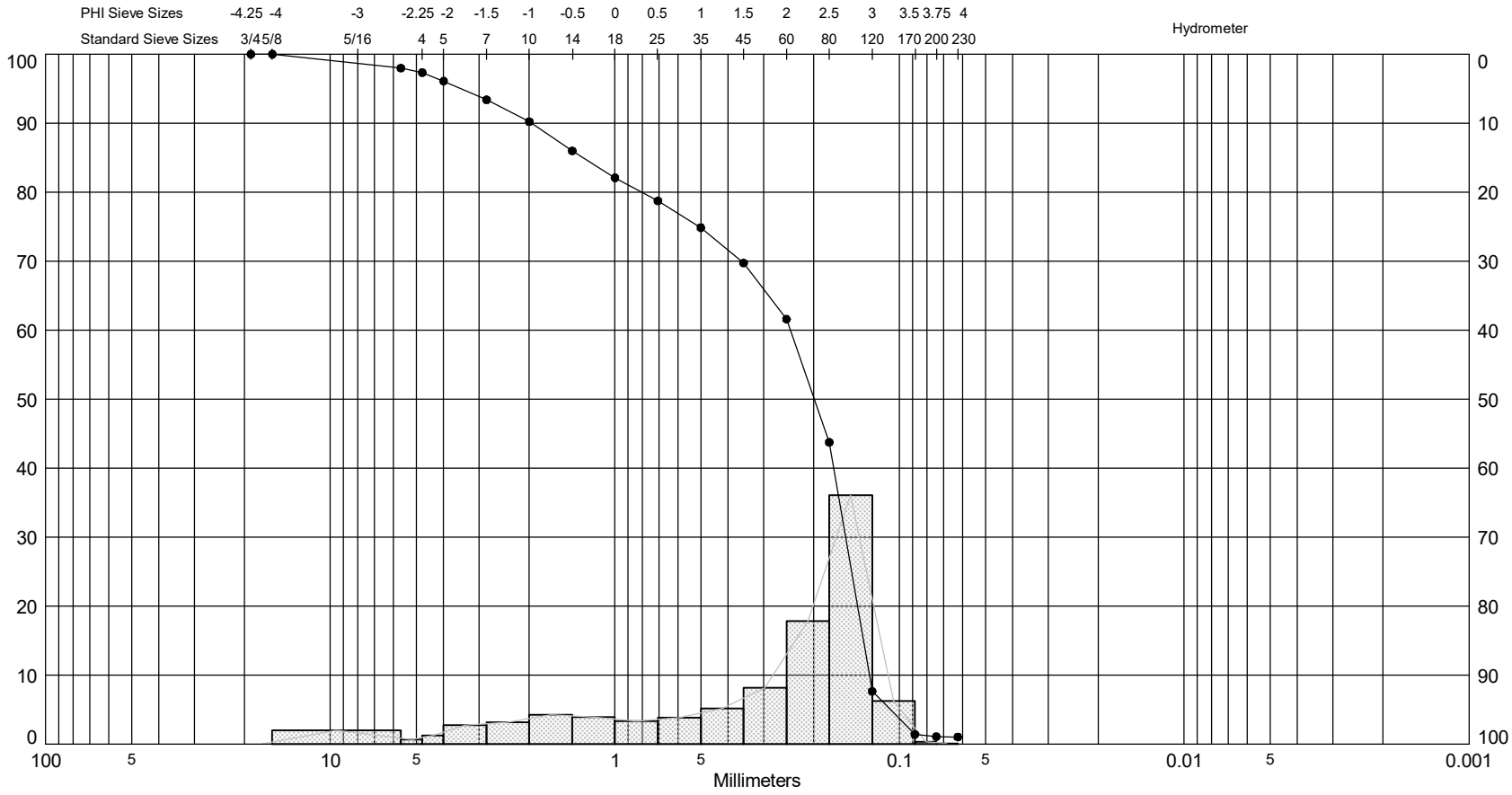
ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-8.0	0.0					
-11.5	3.5		Fine SAND, trace shell fragments, 3 shell layer at 2.5', white (5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.24, Phi Sorting: 0.87 Shell: 11%, Fines (#200) - 0.77 (SP)
-13.3	5.3		Fine to medium SAND, little shell fragments <3.0cm, light olive gray (5Y-6/2), (SW).			
-14.8	6.8		Fine SAND, few shell fragments <1.5cm, light greenish gray (5GY-8/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 15.1' Mean (mm): 0.32, Phi Sorting: 1.59 Shell: 26%, Carbonate: 22.6%, Fines (#200) - 1.09 (SP)
-15.6	7.6		Fine SAND, trace shell fragments, trace silt, light greenish gray (10Y-7/1), (SP).			
-16.3	8.3		Fine SAND, few shell fragments <4.0cm, light greenish gray (10Y-7/1), (SP).			
					B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.18, Phi Sorting: 1.18 Shell: 11%, Fines (#200) - 2.81 (SP)
-23.1	15.1		Fine SAND, trace silt in lenses, (2.5Y-9/1), (SP).			
			End of Boring			

0 5 10 15 20 25

* = Top of boring elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-30 #COMP	—●—	-8.0	SP	#200 - 1.09 #230 - 1.04		22.60	2.32	1.64	-1.34	3.84	1.59

Comments: Sample Interval = 0 - 15.1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,653
Northing (Y, ft):	2,247,172
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

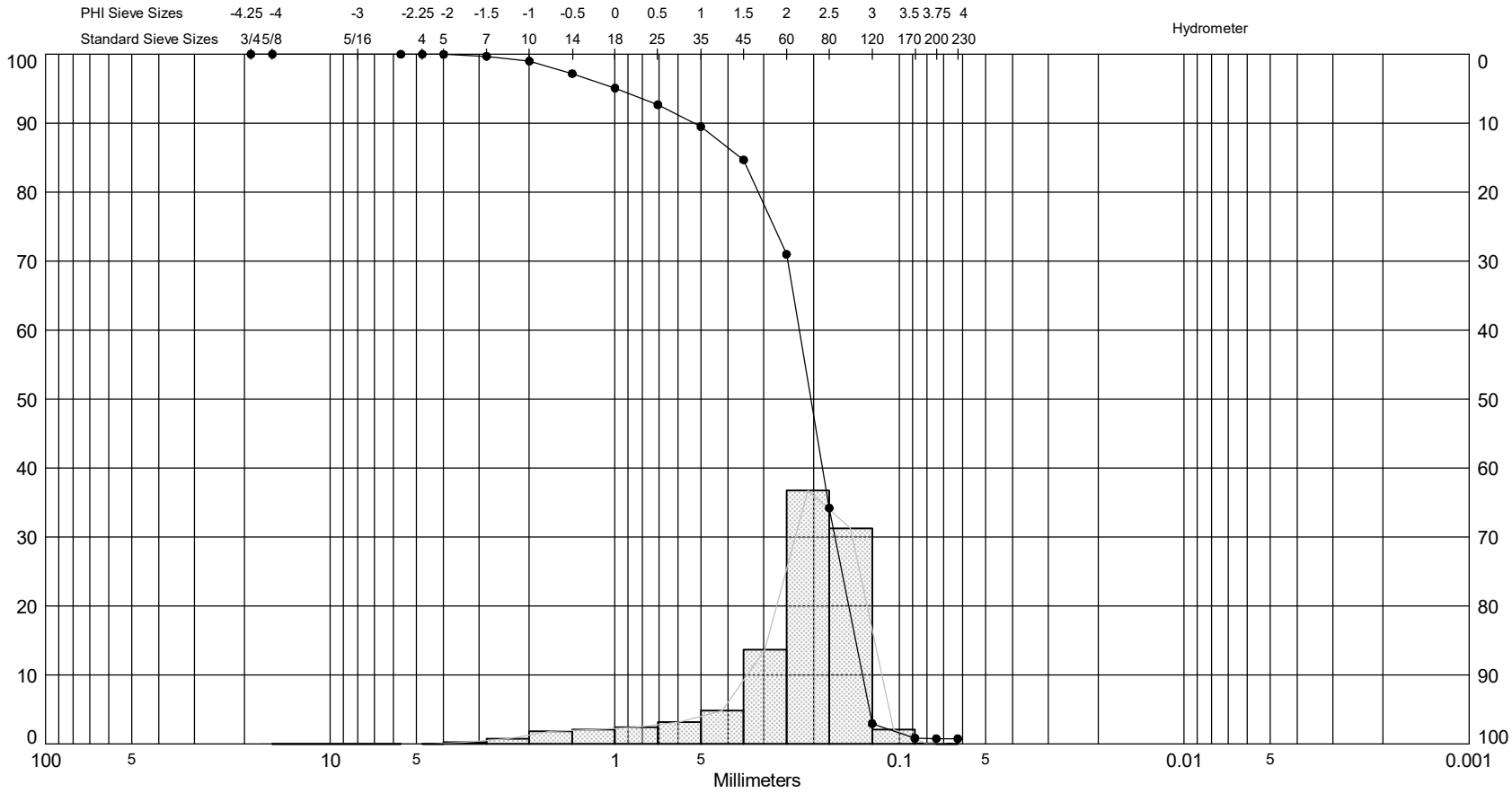
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-15.1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-30**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.41	
Dry Wt. Before Washing (g):	224.75	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.54	97.98	100	3.54
#4	4.750	1.13	97.34	100	1.13
#5	4.000	2.17	96.10	100	2.17
#7	2.800	4.75	93.39	100	4.75
#10	2.000	5.58	90.21	100	5.58
#14	1.400	7.41	85.98	100	7.41
#18	1.000	6.84	82.08	90	6.16
#25	0.710	5.87	78.73	70	4.11
#35	0.500	6.78	74.87	50	3.39
#45	0.355	8.99	69.74	40	3.60
#60	0.250	14.25	61.61	20	2.85
#80	0.180	31.31	43.75	2	0.63
#120	0.125	63.28	7.67	0	0.00
#170	0.090	10.95	1.42	0	0.00
#200	0.075	0.54	1.11	0	0.00
#230	0.063	0.09	1.06	0	0.00
Total Shell Content:		**26**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-30 #A	—●—	-8.8	SP	#200 - 0.77 #230 - 0.76			2.29	2.07	-1.88	6.79	0.87

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,653
Northing (Y, ft):	2,247,172
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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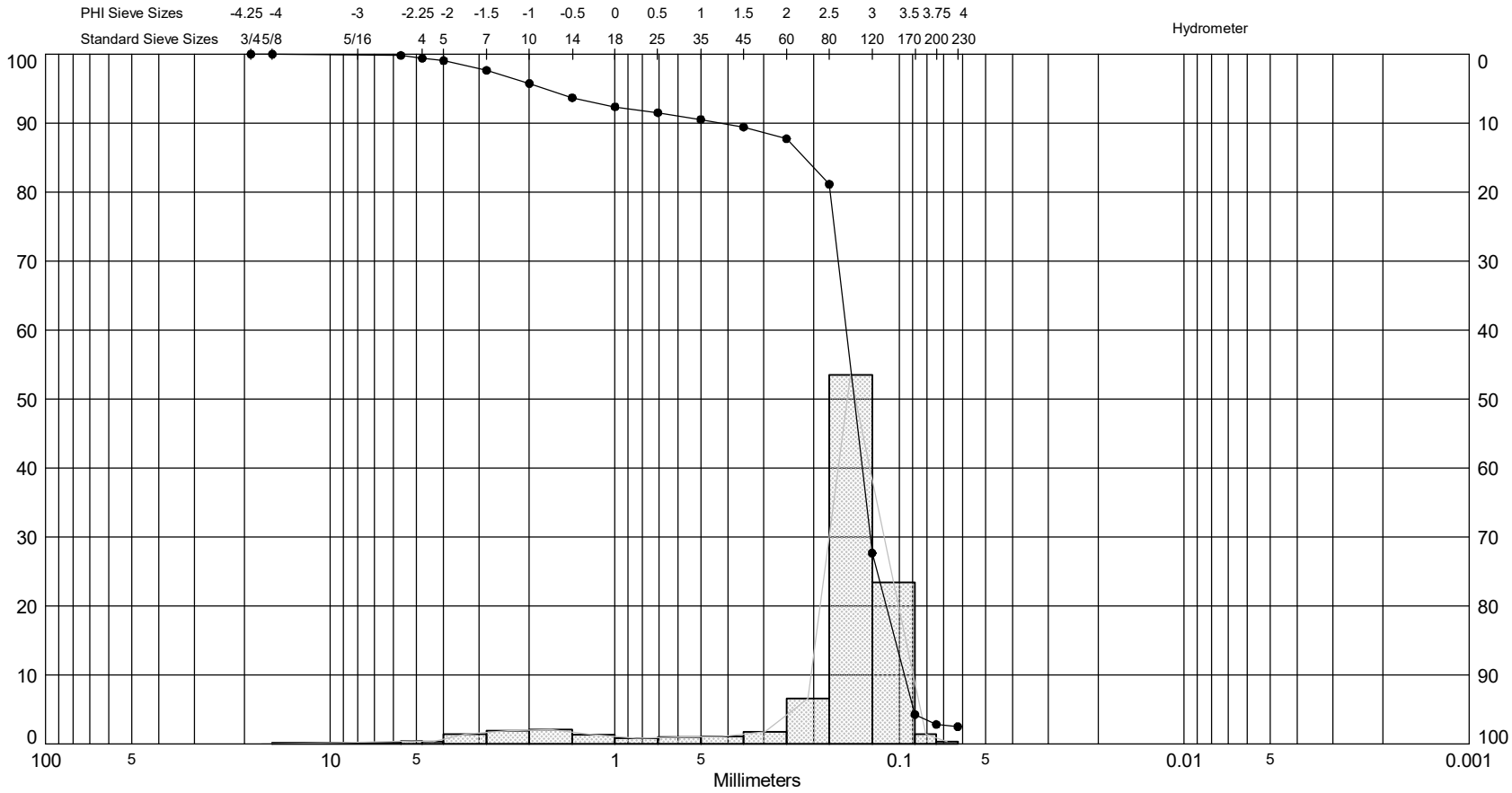
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-30**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.12	
Dry Wt. Before Washing (g):	218.37	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.02	99.99	100	0.02
#4	4.750	0.00	99.99	0	0.00
#5	4.000	0.05	99.96	100	0.05
#7	2.800	0.44	99.70	100	0.44
#10	2.000	1.20	98.98	100	1.20
#14	1.400	3.05	97.17	100	3.05
#18	1.000	3.51	95.08	90	3.16
#25	0.710	4.07	92.67	70	2.85
#35	0.500	5.31	89.51	50	2.66
#45	0.355	8.12	84.68	30	2.44
#60	0.250	23.05	70.98	10	2.31
#80	0.180	61.88	34.21	0	0.00
#120	0.125	52.58	2.95	0	0.00
#170	0.090	3.55	0.84	0	0.00
#200	0.075	0.12	0.77	0	0.00
#230	0.063	0.01	0.77	0	0.00
Total Shell Content:		**11**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-30 #B	—●—	-16.8	SP	#200 - 2.81 #230 - 2.49			2.79	2.47	-2.57	9.03	1.18

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,653
Northing (Y, ft):	2,247,172
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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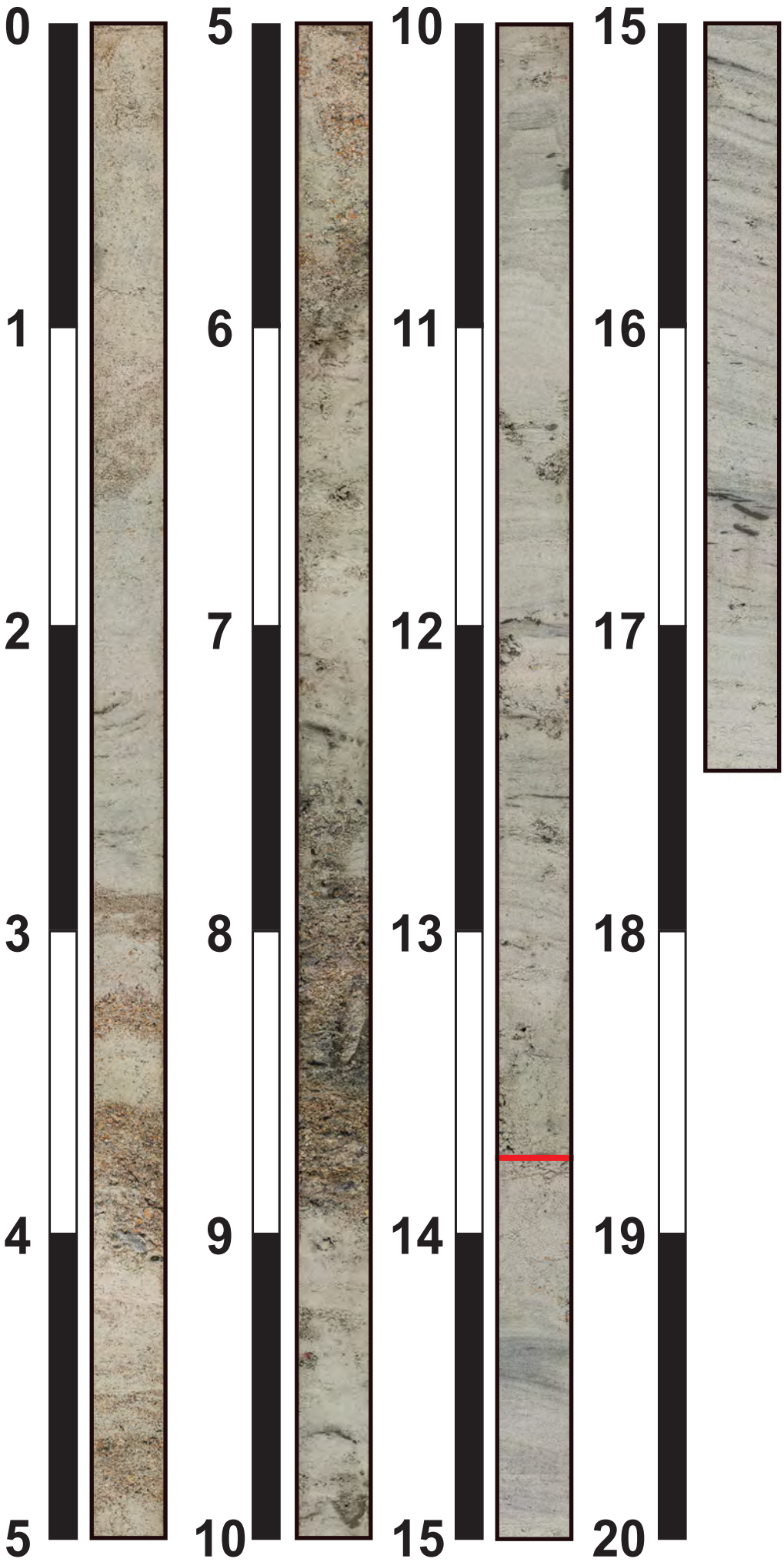
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-30**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.52	
Dry Wt. Before Washing (g):	212.54	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.29	99.82	100	0.29
#4	4.750	0.69	99.40	100	0.69
#5	4.000	0.57	99.05	100	0.57
#7	2.800	2.28	97.65	100	2.28
#10	2.000	3.10	95.75	100	3.10
#14	1.400	3.38	93.68	100	3.38
#18	1.000	2.14	92.36	100	2.14
#25	0.710	1.39	91.51	80	1.11
#35	0.500	1.59	90.53	60	0.95
#45	0.355	1.79	89.44	50	0.90
#60	0.250	2.79	87.73	30	0.84
#80	0.180	10.74	81.14	20	2.15
#120	0.125	87.19	27.65	0	0.00
#170	0.090	38.15	4.25	0	0.00
#200	0.075	2.36	2.80	0	0.00
#230	0.063	0.52	2.48	0	0.00
Total Shell Content:		**11**		**%**	



Nassau Sound
Florida
2016 - 2017

C-31

Notes:
Scale in Feet
Photo Mosaic Image
= Jet Depth

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-31

DRILLING LOG

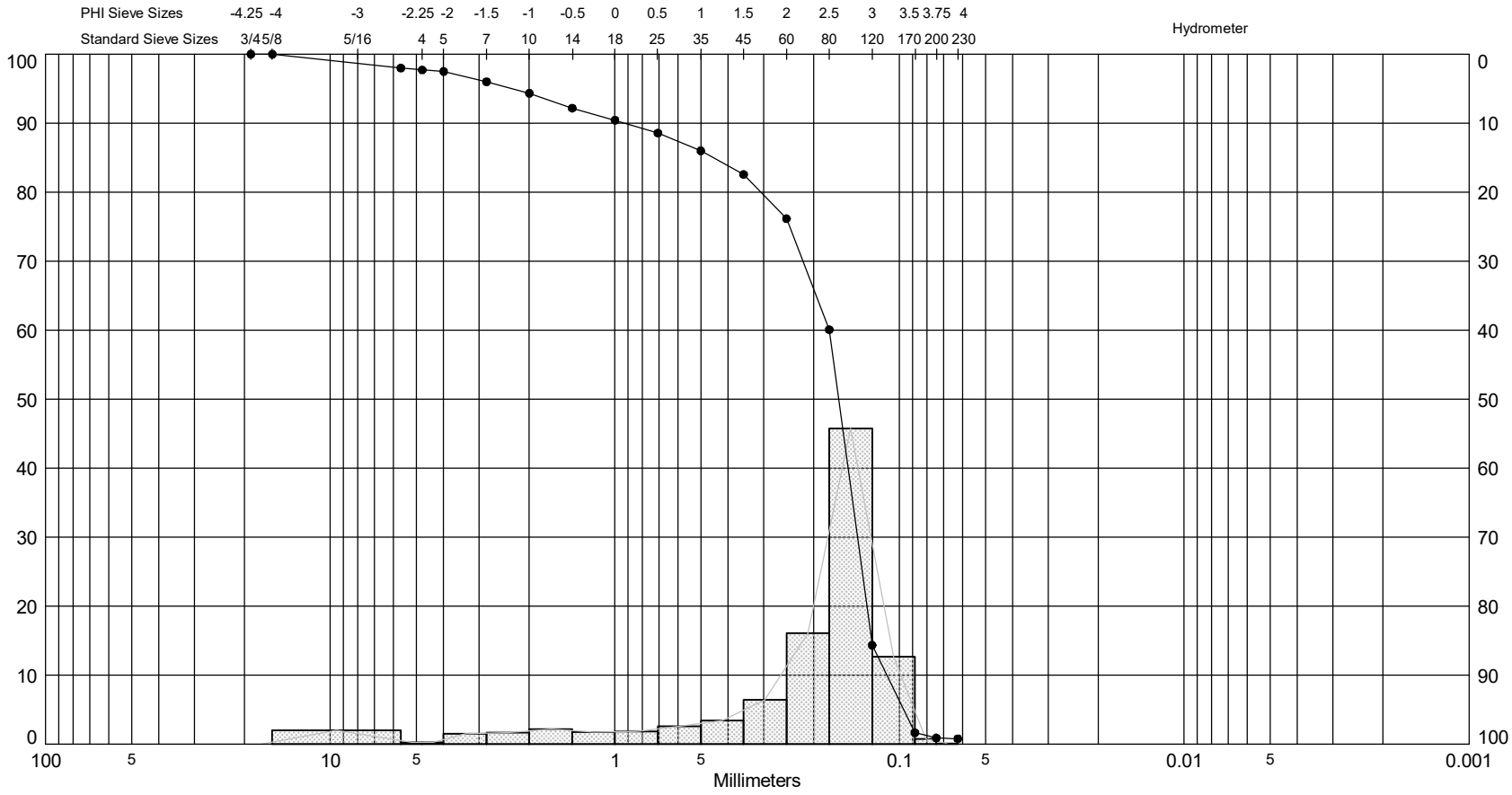
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-31
LOCATION COORDINATES	X = 523,600 Y = 2,247,874
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	18.7 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	5.6 Ft.
15. DATE BORING	STARTED: 07-27-16 07:31 / COMPLETED: 07-27-16
16. ELEVATION TOP OF BORING	-9.7 Ft.
17. TOTAL RECOVERY FOR BORING	17.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-9.7	0.0					
-11.2	1.5		Fine SAND, trace shell fragments, white (5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.22, Phi Sorting: 0.76 Shell: 13%, Fines (#200) - 0.98 (SP)
-12.5	2.8		Fine SAND, trace silt in lenses, light gray (5Y-7/1), (SP).			
-13.7	4.0		Interbedded fine SAND and sand and shell fragments <0.5cm, trace silt, light gray (5Y-7/1), (SP).			
-15.6	5.9		Fine SAND, few shell fragments <1.0cm, white (5Y-8/1), (SP).			
-17.3	7.6		Fine SAND, trace shell fragments, trace silt in lenses, light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 17.5' Mean (mm): 0.23, Phi Sorting: 1.38 Shell: 17%, Carbonate: 12.9%, Fines (#200) - 0.89 (SP)
-18.6	8.9		Fine to medium SAND, little shell fragments <8.0cm, gray (5Y-6/1), (SW).		B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.25, Phi Sorting: 1.65 Shell: 18%, Fines (#200) - 1.57 (SP)
-27.2	17.5		Fine SAND, bedding present, trace silt in lenses and burrows, light greenish gray (10Y-7/1), (SP).		C	Sample #C, Depth = 12.8' - 13.3' Mean (mm): 0.17, Phi Sorting: 0.62 Shell: 7%, Fines (#200) - 1.10 (SP)
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-31 #COMP	—●—	-9.7	SP	#200 - 0.89 #230 - 0.79		12.90	2.61	2.11	-2.18	7.49	1.38

Comments: Sample Interval = 0 - 17.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,600
Northing (Y, ft):	2,247,874
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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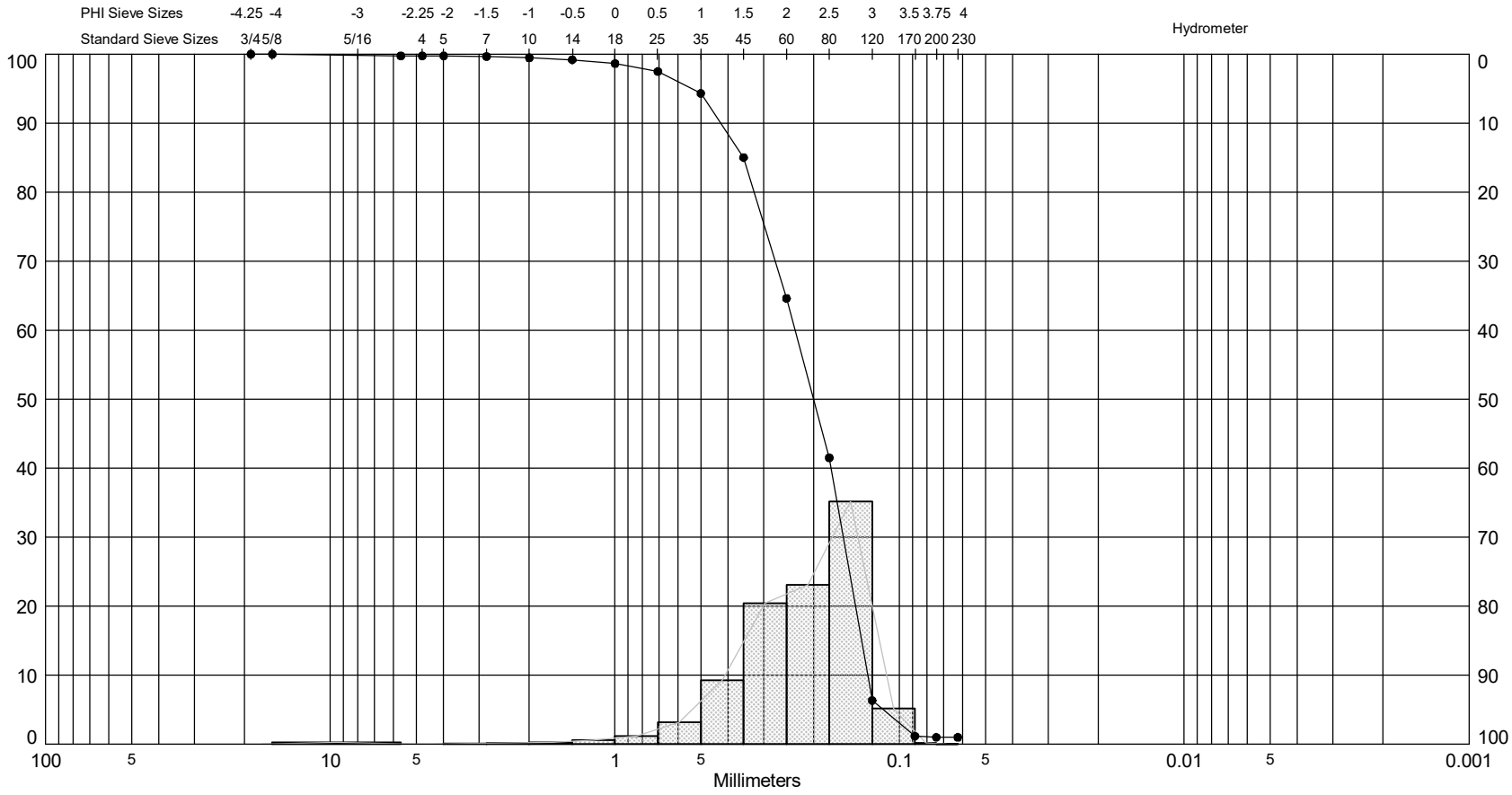
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-17.5'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-31**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.58	
Dry Wt. Before Washing (g):	204.88	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.12	97.99	100	3.12
#4	4.750	0.44	97.71	90	0.40
#5	4.000	0.34	97.49	100	0.34
#7	2.800	2.32	95.99	100	2.32
#10	2.000	2.58	94.33	100	2.58
#14	1.400	3.35	92.18	100	3.35
#18	1.000	2.70	90.44	100	2.70
#25	0.710	2.91	88.56	80	2.33
#35	0.500	3.98	86.00	60	2.39
#45	0.355	5.36	82.55	40	2.14
#60	0.250	9.95	76.14	25	2.49
#80	0.180	24.97	60.06	10	2.50
#120	0.125	71.03	14.33	0	0.00
#170	0.090	19.71	1.64	0	0.00
#200	0.075	1.16	0.89	0	0.00
#230	0.063	0.16	0.79	0	0.00
Total Shell Content:		**17**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-31 #A	—●—	-10.5	SP	#200 - 0.98 #230 - 0.97			2.32	2.17	-1.82	10.56	0.76

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,600
Northing (Y, ft):	2,247,874
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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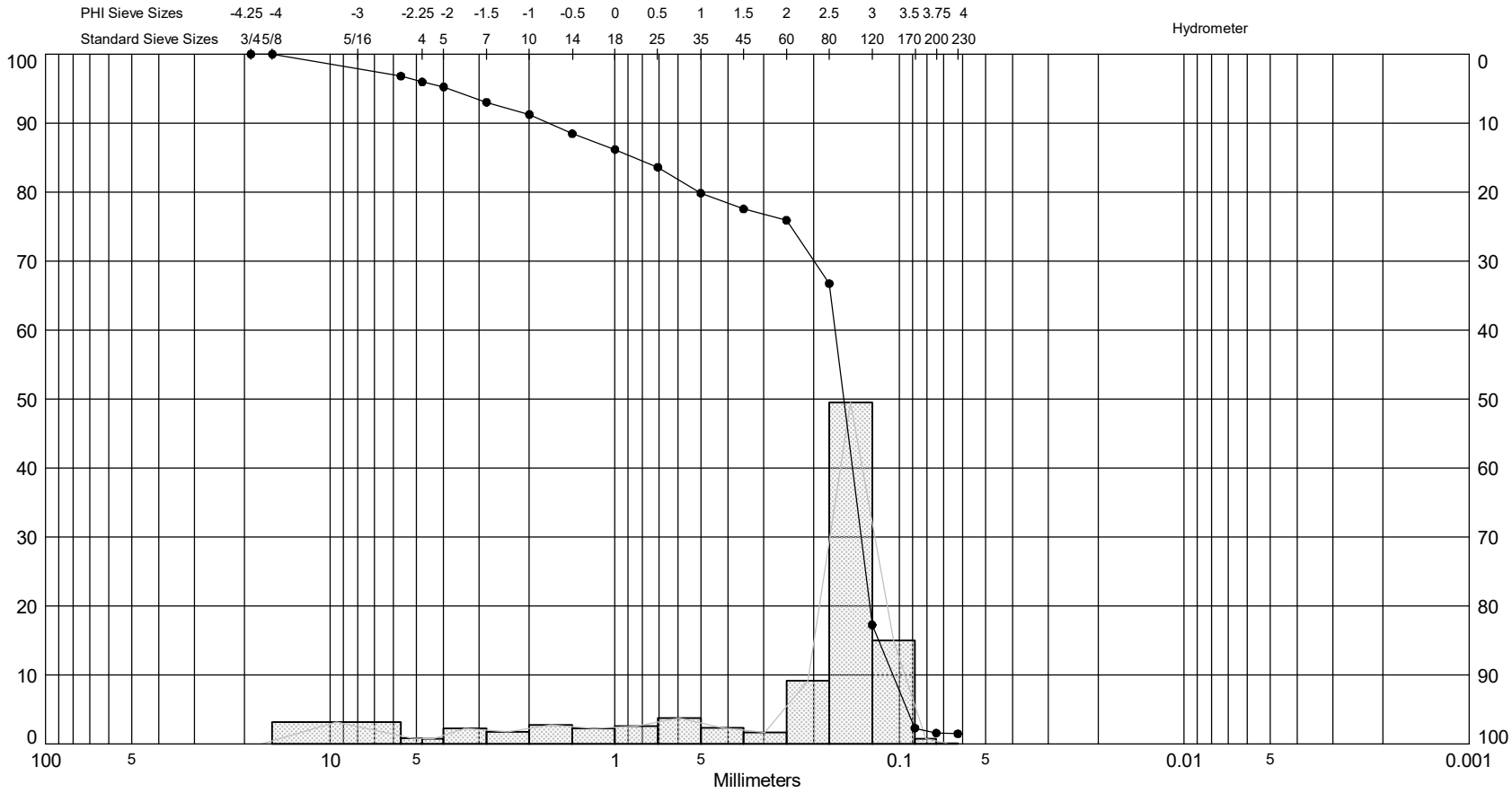
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-31**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.27	
Dry Wt. Before Washing (g):	204.69	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.38	99.75	100	0.38
#4	4.750	0.00	99.75	0	0.00
#5	4.000	0.00	99.75	0	0.00
#7	2.800	0.14	99.66	100	0.14
#10	2.000	0.29	99.48	100	0.29
#14	1.400	0.42	99.20	100	0.42
#18	1.000	0.87	98.64	80	0.70
#25	0.710	1.77	97.49	70	1.24
#35	0.500	4.89	94.33	60	2.93
#45	0.355	14.35	85.03	40	5.74
#60	0.250	31.54	64.61	20	6.31
#80	0.180	35.68	41.50	5	1.78
#120	0.125	54.32	6.33	0	0.00
#170	0.090	7.99	1.15	0	0.00
#200	0.075	0.26	0.98	0	0.00
#230	0.063	0.02	0.97	0	0.00
Total Shell Content:		**13**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-31 #B	—●—	-18.5	SP	#200 - 1.57 #230 - 1.46			2.67	1.98	-1.8	5.24	1.65

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,600
Northing (Y, ft):	2,247,874
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

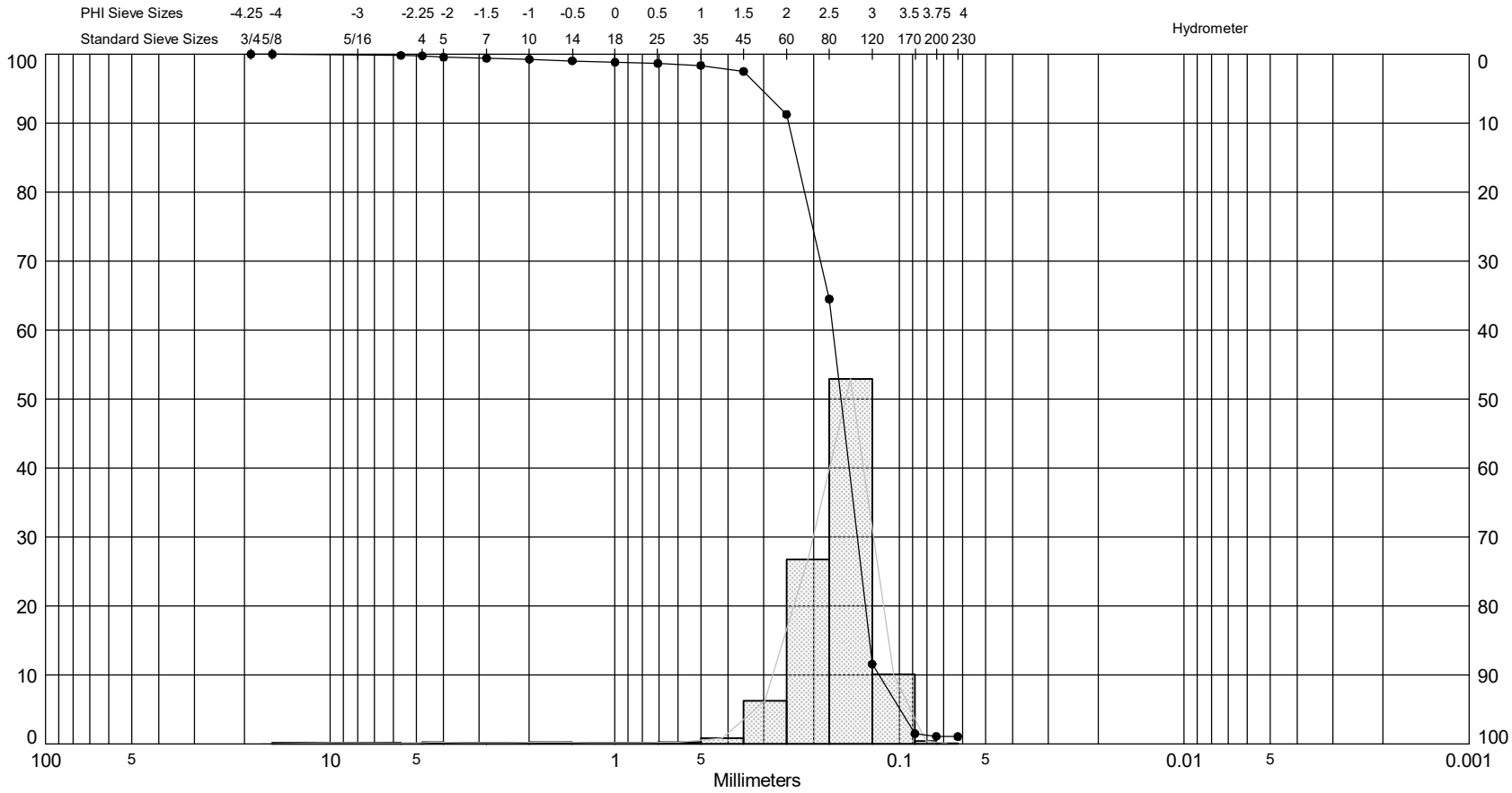
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-31**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.11	
Dry Wt. Before Washing (g):	222.83	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	5.49	96.82	100	5.49
#4	4.750	1.46	95.98	100	1.46
#5	4.000	1.24	95.26	100	1.24
#7	2.800	3.83	93.04	100	3.83
#10	2.000	3.08	91.26	100	3.08
#14	1.400	4.81	88.47	90	4.33
#18	1.000	3.95	86.19	80	3.16
#25	0.710	4.44	83.62	70	3.11
#35	0.500	6.50	79.85	50	3.25
#45	0.355	3.98	77.55	30	1.19
#60	0.250	2.82	75.91	20	0.56
#80	0.180	15.88	66.72	5	0.79
#120	0.125	85.44	17.25	0	0.00
#170	0.090	25.86	2.28	0	0.00
#200	0.075	1.25	1.56	0	0.00
#230	0.063	0.19	1.45	0	0.00
Total Shell Content:		**18**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-31 #C	—●—	-22.5	SP	#200 - 1.10 #230 - 1.05			2.64	2.53	-4.19	32.01	0.62

Comments: Sample Depth = 13'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	523,600
Northing (Y, ft):	2,247,874
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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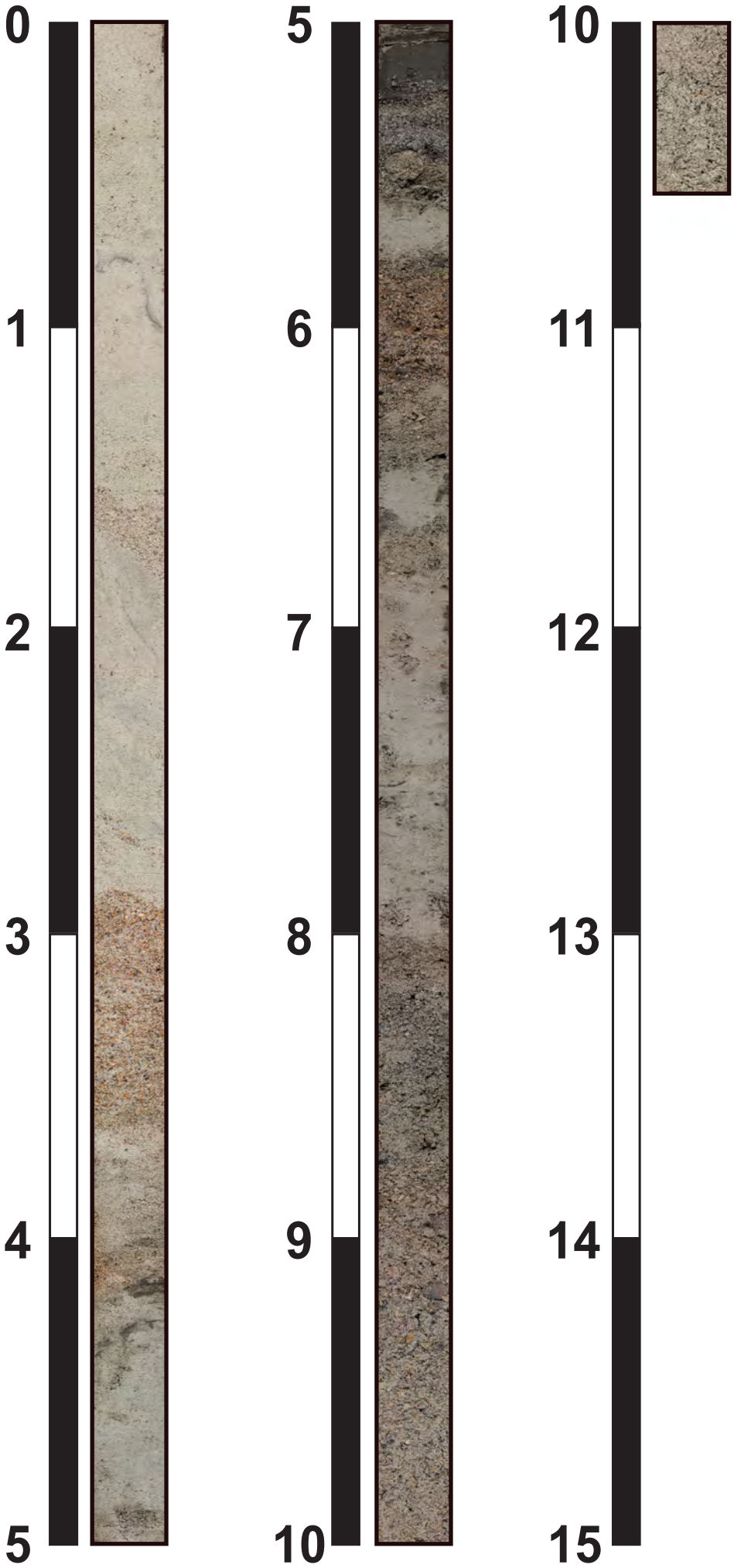
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-31**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.14	
Dry Wt. Before Washing (g):	220.05	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.33	99.81	100	0.33
#4	4.750	0.08	99.76	100	0.08
#5	4.000	0.36	99.55	100	0.36
#7	2.800	0.26	99.39	100	0.26
#10	2.000	0.22	99.26	100	0.22
#14	1.400	0.39	99.03	100	0.39
#18	1.000	0.34	98.83	100	0.34
#25	0.710	0.31	98.65	100	0.31
#35	0.500	0.49	98.36	80	0.39
#45	0.355	1.48	97.49	60	0.89
#60	0.250	10.57	91.27	40	4.23
#80	0.180	45.51	64.49	10	4.55
#120	0.125	89.94	11.55	0	0.00
#170	0.090	17.12	1.48	0	0.00
#200	0.075	0.66	1.09	0	0.00
#230	0.063	0.08	1.04	0	0.00
Total Shell Content:		**7**		**%**	



Nassau Sound
Florida
2016 - 2017

C-32

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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1293 Graham Farm Road
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Boring Designation C-32

DRILLING LOG	CLIENT	PROJECT OWNER	SHEET 1 OF 1 SHEETS
	Olsen Associates, Inc.		

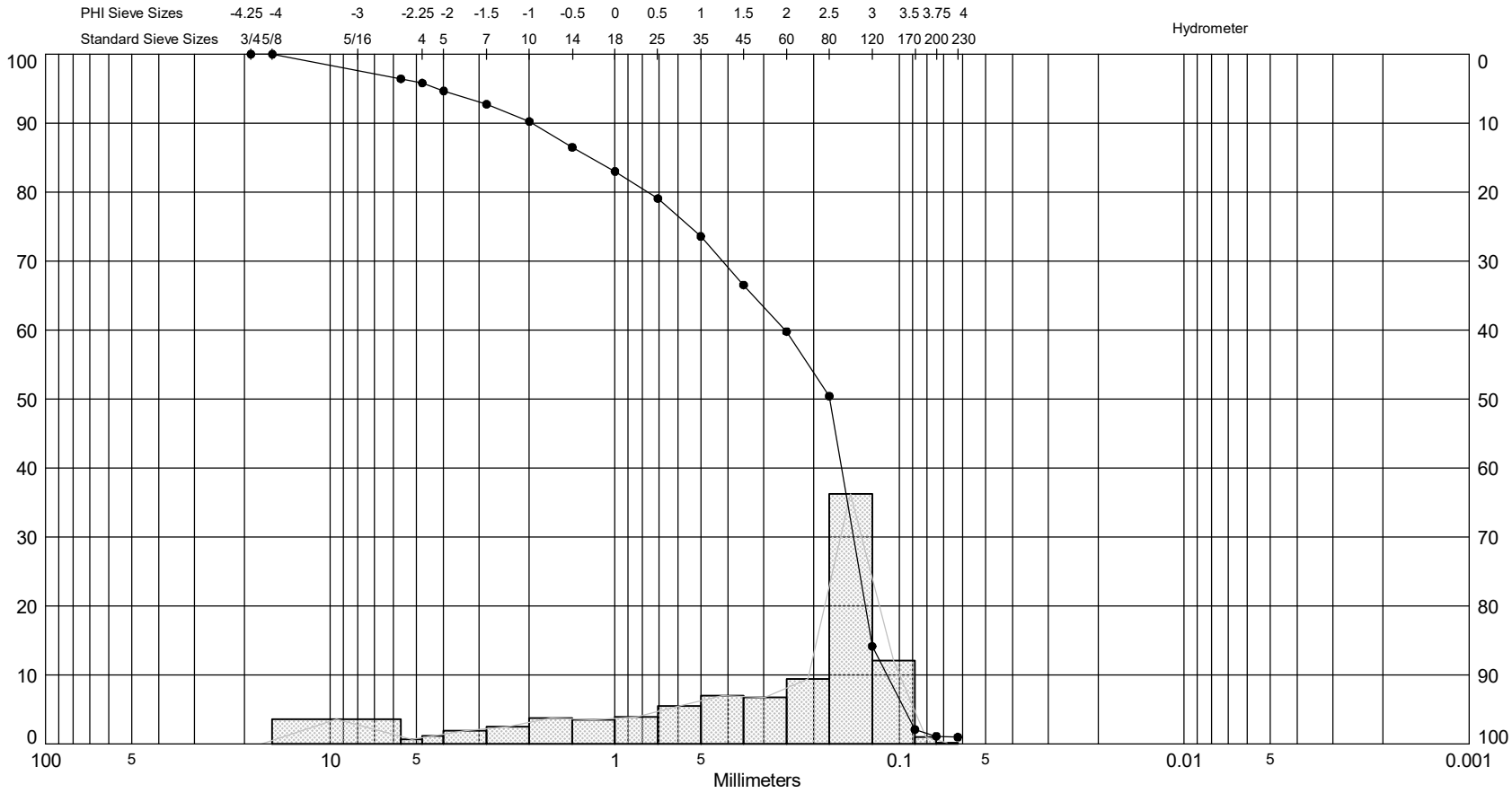
1. PROJECT Geotechnical Evaluation Nassau Sound (Amelia Island), Florida		9. SIZE AND TYPE OF BIT 3.0 In.	
		10. COORDINATE SYSTEM/DATUM Florida State Plane East	HORIZONTAL NAD 1983 / VERTICAL NAVD 88
2. BORING DESIGNATION C-32	LOCATION COORDINATES X = 523,543 Y = 2,248,578	11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY Athena Technologies, Inc.	CONTRACTOR FILE NO.	12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
4. NAME OF DRILLER McClellan		13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG. FROM VERTICAL / BEARING	14. WATER DEPTH 9.1 Ft.	
		15. DATE BORING	STARTED 07-12-16 08:52 / COMPLETED 07-12-16
6. THICKNESS OF OVERBURDEN 0.0 Ft.		16. ELEVATION TOP OF BORING -12.2 Ft.	
7. DEPTH DRILLED INTO ROCK 0.0 Ft.		17. TOTAL RECOVERY FOR BORING 10.5 Ft.	
8. TOTAL DEPTH OF BORING 12.1 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR SEXTON	

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-12.2	0.0					
			Fine SAND, trace shell fragments, white (2.5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.60 Shell: 2%, Fines (#200) - 1.65 (SP)
-15.0	2.8					
-15.8	3.6		Fine SAND with few shell fragments <1.0cm, light yellowish brown (2.5Y-6/3), (SP).			
			Fine SAND, trace silt., greenish gray (10Y-6/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 10.5' Mean (mm): 0.32, Phi Sorting: 1.70 Shell: 25%, Carbonate: 22.6%, Fines (#200) - 1.11 (SP)
-17.2	5.0					
-17.5	5.3		Soft CLAY, very dark greenish gray (10Y-3/1), (CH).			
-18.5	6.3		Fine to medium SAND, little shell fragments <4.0cm,, light greenish gray (10Y-7/1), (SW).			
-20.0	7.8		Fine SAND, trace silt, light greenish gray (10Y-7/1), (SP).			Sample #B, Depth = 8.3' - 8.8' Mean (mm): 0.74, Phi Sorting: 2.09 Shell: 52%, Fines (#200) - 0.85 (SP)
			Fine SAND, little shell fragments <3.0cm, greenish gray (10Y-6/1), (SW).		B	
-22.7	10.5					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 9/5/17

SAJ FORM 1836 JUN 02 MODIFIED FOR THE FLORIDA DEP JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-32 #COMP	—●—	-12.2	SP	#200 - 1.11 #230 - 0.97		22.60	2.51	1.66	-1.33	3.94	1.7

Comments: Sample Interval = 0 - 10.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,543
Northing (Y, ft):	2,248,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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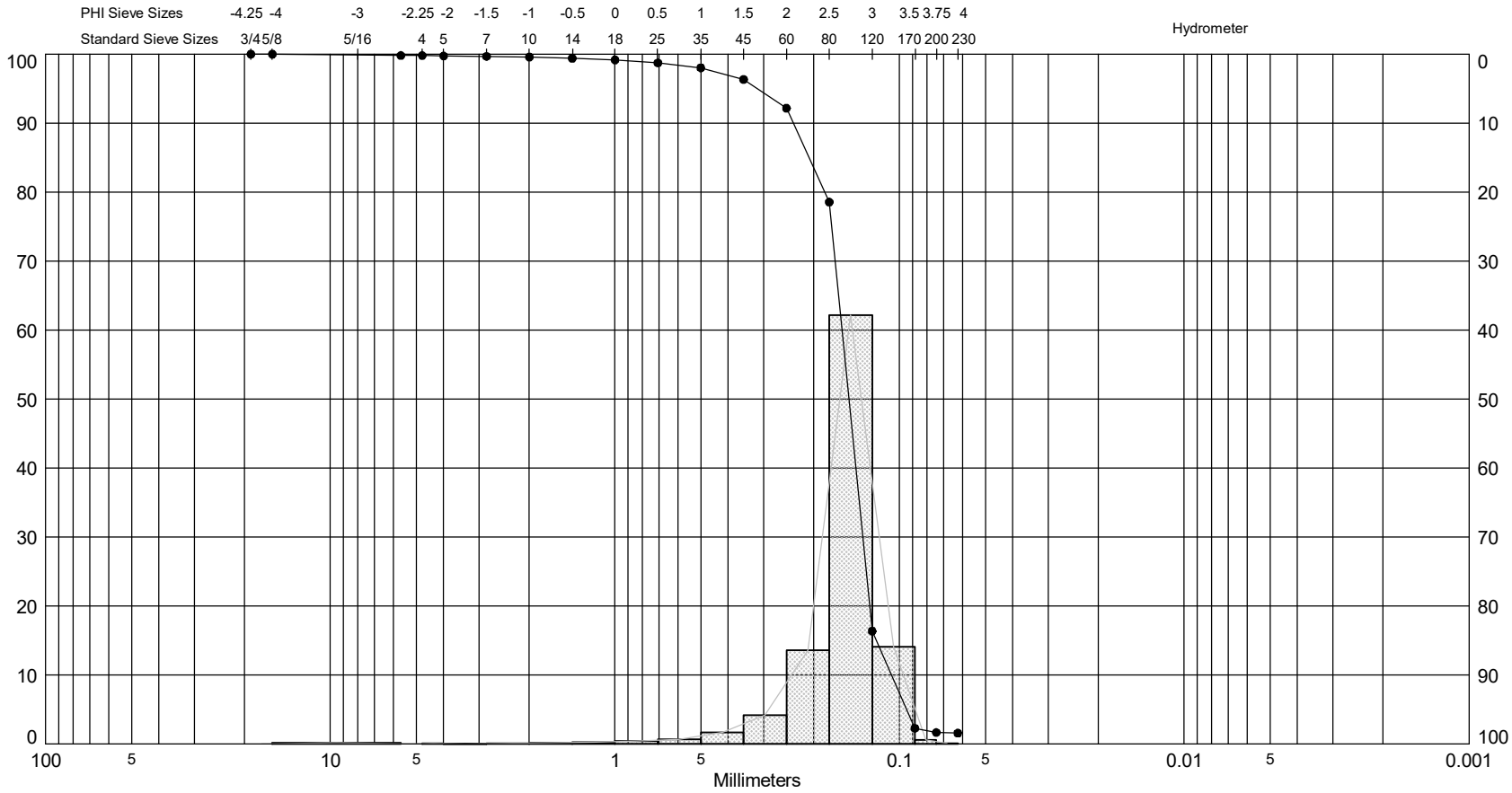
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-10.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-32**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.91	
Dry Wt. Before Washing (g):	174.83	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	4.45	96.44	100	4.45
#4	4.750	0.79	95.81	100	0.79
#5	4.000	1.44	94.65	100	1.44
#7	2.800	2.40	92.73	100	2.40
#10	2.000	3.13	90.23	100	3.13
#14	1.400	4.66	86.50	100	4.66
#18	1.000	4.37	83.00	80	3.50
#25	0.710	4.92	79.06	70	3.44
#35	0.500	6.85	73.58	50	3.43
#45	0.355	8.80	66.53	30	2.64
#60	0.250	8.43	59.78	10	0.84
#80	0.180	11.72	50.40	1	0.12
#120	0.125	45.30	14.14	0	0.00
#170	0.090	15.06	2.08	0	0.00
#200	0.075	1.22	1.10	0	0.00
#230	0.063	0.17	0.97	0	0.00
Total Shell Content:		**25**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-32 #A	—●—	-13.0	SP	#200 - 1.65 #230 - 1.55			2.73	2.63	-4	30.56	0.6

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,543
Northing (Y, ft):	2,248,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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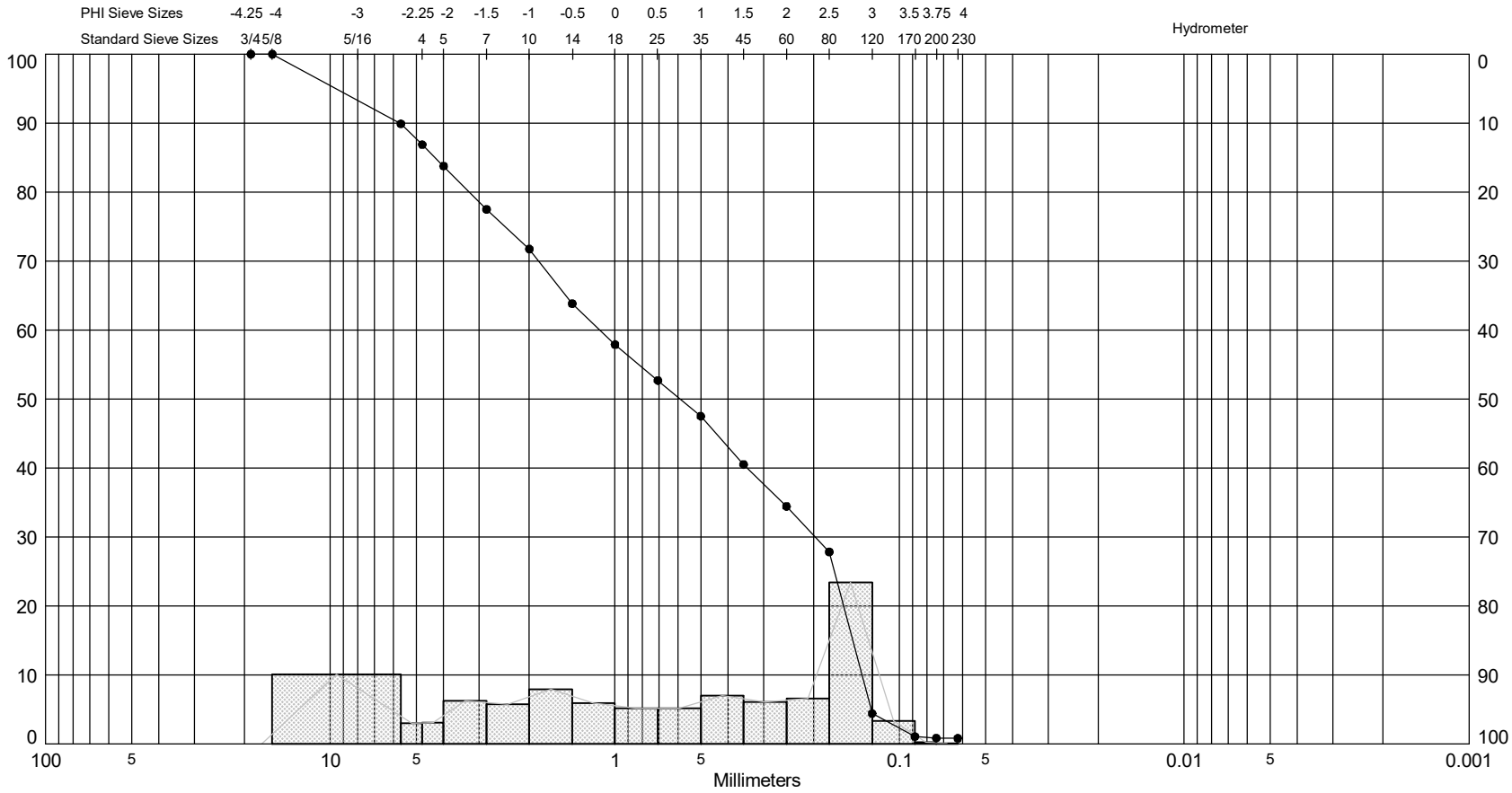
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-32**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.94	
Dry Wt. Before Washing (g):	165.20	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.23	99.80	100	0.23
#4	4.750	0.00	99.80	0	0.00
#5	4.000	0.08	99.73	100	0.08
#7	2.800	0.05	99.69	100	0.05
#10	2.000	0.11	99.59	100	0.11
#14	1.400	0.23	99.39	100	0.23
#18	1.000	0.26	99.17	100	0.26
#25	0.710	0.50	98.73	70	0.35
#35	0.500	0.81	98.03	50	0.41
#45	0.355	1.96	96.33	30	0.59
#60	0.250	4.81	92.16	10	0.48
#80	0.180	15.69	78.54	0	0.00
#120	0.125	71.68	16.35	0	0.00
#170	0.090	16.24	2.26	0	0.00
#200	0.075	0.71	1.65	0	0.00
#230	0.063	0.12	1.54	0	0.00
Total Shell Content:		**2**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-32 #B	—●—	-20.5	SP	#200 - 0.85 #230 - 0.80			0.76	0.44	-0.34	1.79	2.09

Comments: Sample Depth = 8.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,543
Northing (Y, ft):	2,248,578
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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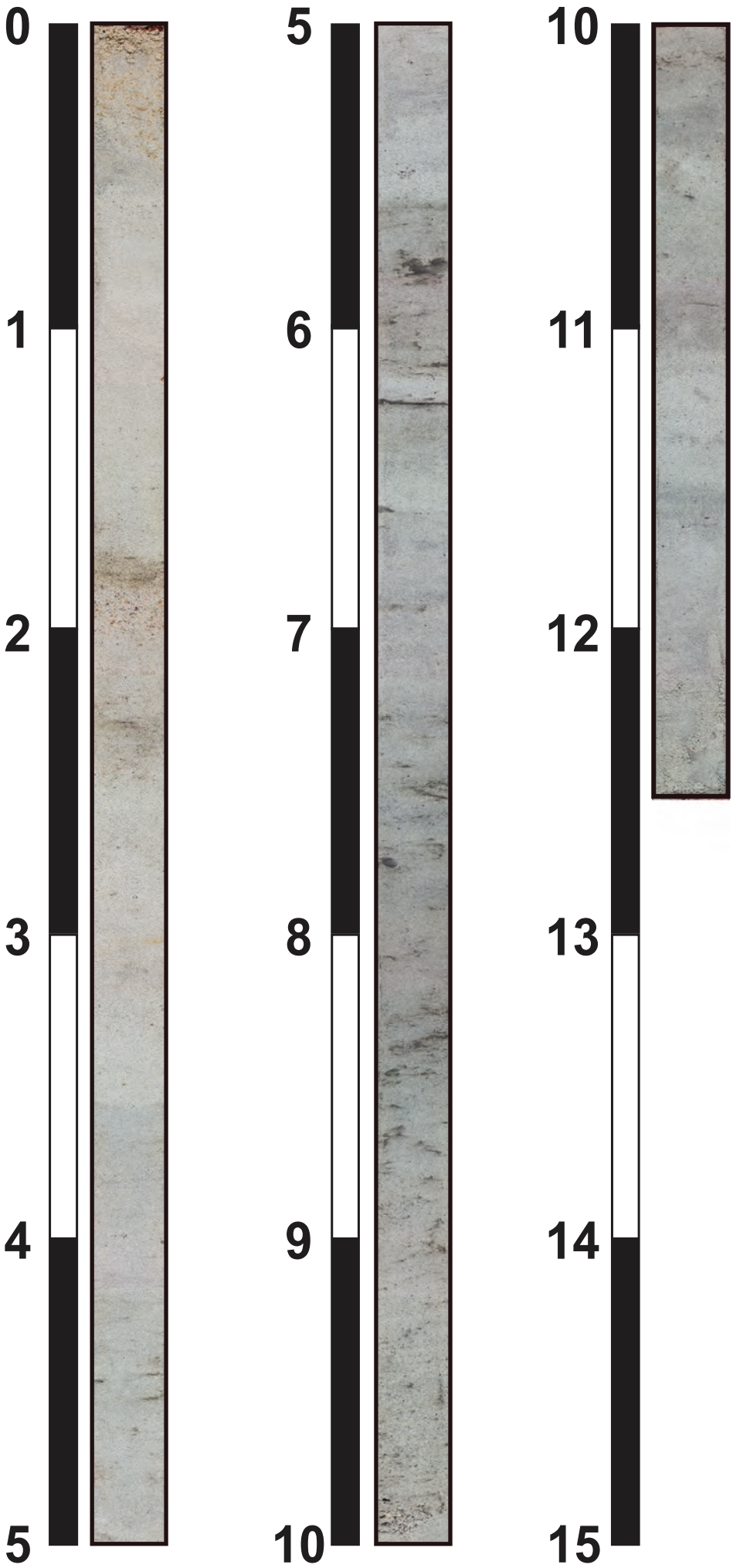
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-32**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 5Y 5/2**		

Tare Weight, (g):	48.00	
Dry Wt. Before Washing (g):	185.96	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	13.94	89.90	100	13.94
#4	4.750	4.16	86.88	100	4.16
#5	4.000	4.26	83.79	100	4.26
#7	2.800	8.68	77.50	100	8.68
#10	2.000	7.94	71.75	100	7.94
#14	1.400	10.91	63.84	100	10.91
#18	1.000	8.20	57.89	100	8.20
#25	0.710	7.16	52.70	70	5.01
#35	0.500	7.14	47.53	50	3.57
#45	0.355	9.65	40.53	30	2.90
#60	0.250	8.39	34.45	20	1.68
#80	0.180	9.13	27.83	10	0.91
#120	0.125	32.33	4.40	0	0.00
#170	0.090	4.60	1.06	0	0.00
#200	0.075	0.30	0.85	0	0.00
#230	0.063	0.07	0.80	0	0.00
Total Shell Content:		**52**		**%**	



Nassau Sound
Florida
2016 - 2017

C-33

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
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(843) 887-3800

Boring Designation C-33

DRILLING LOG

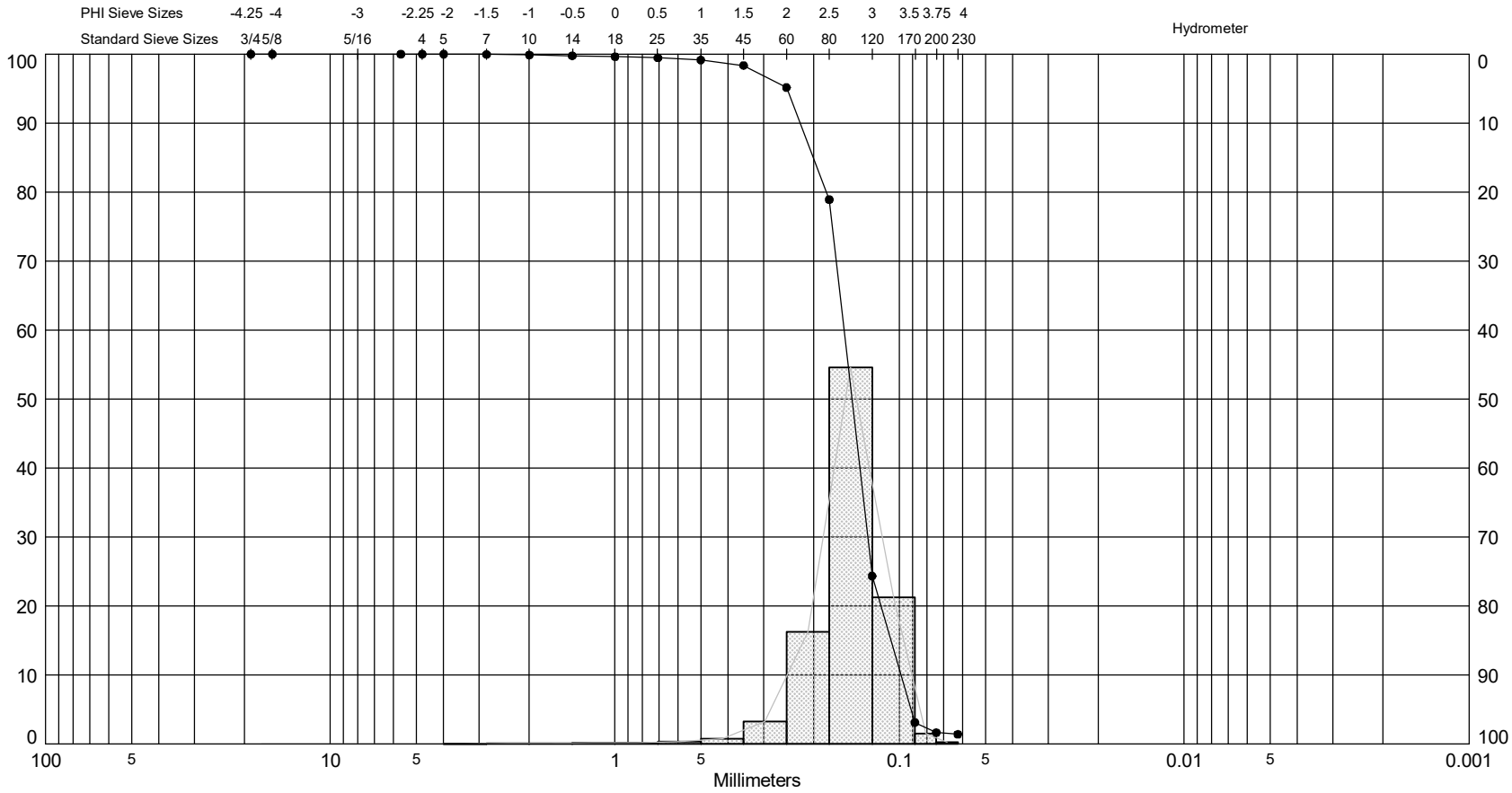
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-33
LOCATION COORDINATES	X = 528,160 Y = 2,247,701
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	15.1 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	12.5 Ft.
15. DATE BORING	STARTED 02-21-17 08:04 / COMPLETED 02-21-17
16. ELEVATION TOP OF BORING	-14.2 Ft.
17. TOTAL RECOVERY FOR BORING	12.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-14.2	0.0					
			Fine quartz SAND, few fine sand-size shell fragments, trace silt, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.38 Shell: 1%, Fines (#200) - 1.02 (SP)
-17.7	3.5					
			Fine quartz SAND, trace silt in burrows, trace fine sand-size shell fragments, poorly graded, subangular, loose, light gray (5Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 12.5' Mean (mm): 0.15, Phi Sorting: 0.48 Shell: 2%, Carbonate: 2.5%, Fines (#200) - 1.63 (SP)
-19.8	5.6					
			Fine quartz SAND, trace silt in burrows, trace fine to medium sand-size shell fragments, poorly graded, subangular, loose, light gray (5Y-7/2), (SP).		B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 0.16, Phi Sorting: 1.01 Shell: 6%, Fines (#200) - 1.47 (SP)
-26.7	12.5					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-33 #COMP	—●—	-14.2	SP	#200 - 1.63 #230 - 1.38		2.50	2.76	2.72	-2.24	16.11	0.48

Comments: Sample Interval = 0 - 12.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	528,160
Northing (Y, ft):	2,247,701
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

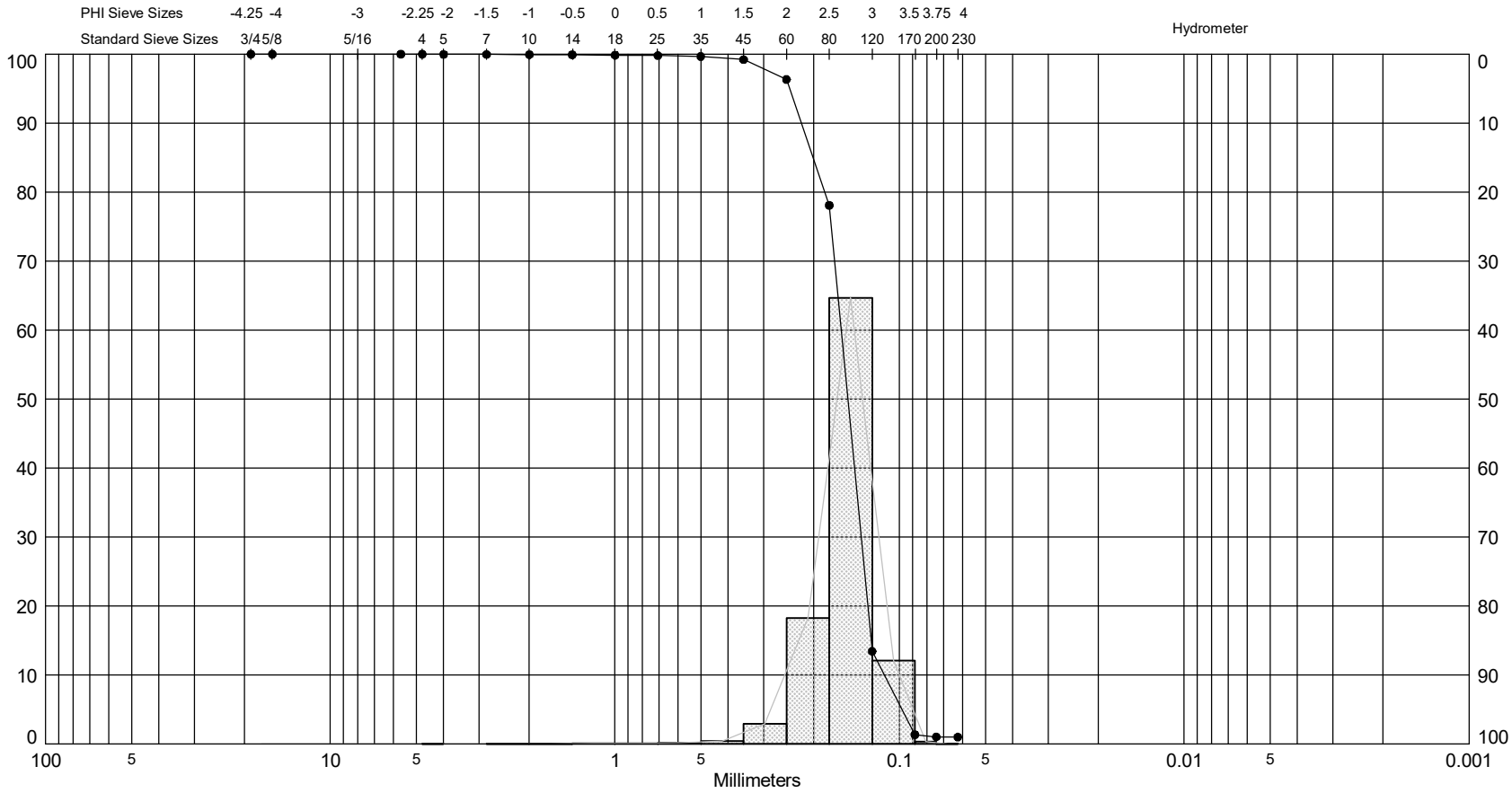
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-33**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.91	
Dry Wt. Before Washing (g):	157.72	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.04	99.96	100	0.04
#10	2.000	0.09	99.88	100	0.09
#14	1.400	0.12	99.77	100	0.12
#18	1.000	0.15	99.63	100	0.15
#25	0.710	0.18	99.46	70	0.13
#35	0.500	0.33	99.16	50	0.17
#45	0.355	0.84	98.38	30	0.25
#60	0.250	3.46	95.17	20	0.69
#80	0.180	17.51	78.93	5	0.88
#120	0.125	58.84	24.35	0	0.00
#170	0.090	22.89	3.12	0	0.00
#200	0.075	1.60	1.63	0	0.00
#230	0.063	0.27	1.38	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-33 #A	—●—	-15.0	SP	#200 - 1.02 #230 - 0.98			2.72	2.68	-2.23	20.95	0.38

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	528,160
Northing (Y, ft):	2,247,701
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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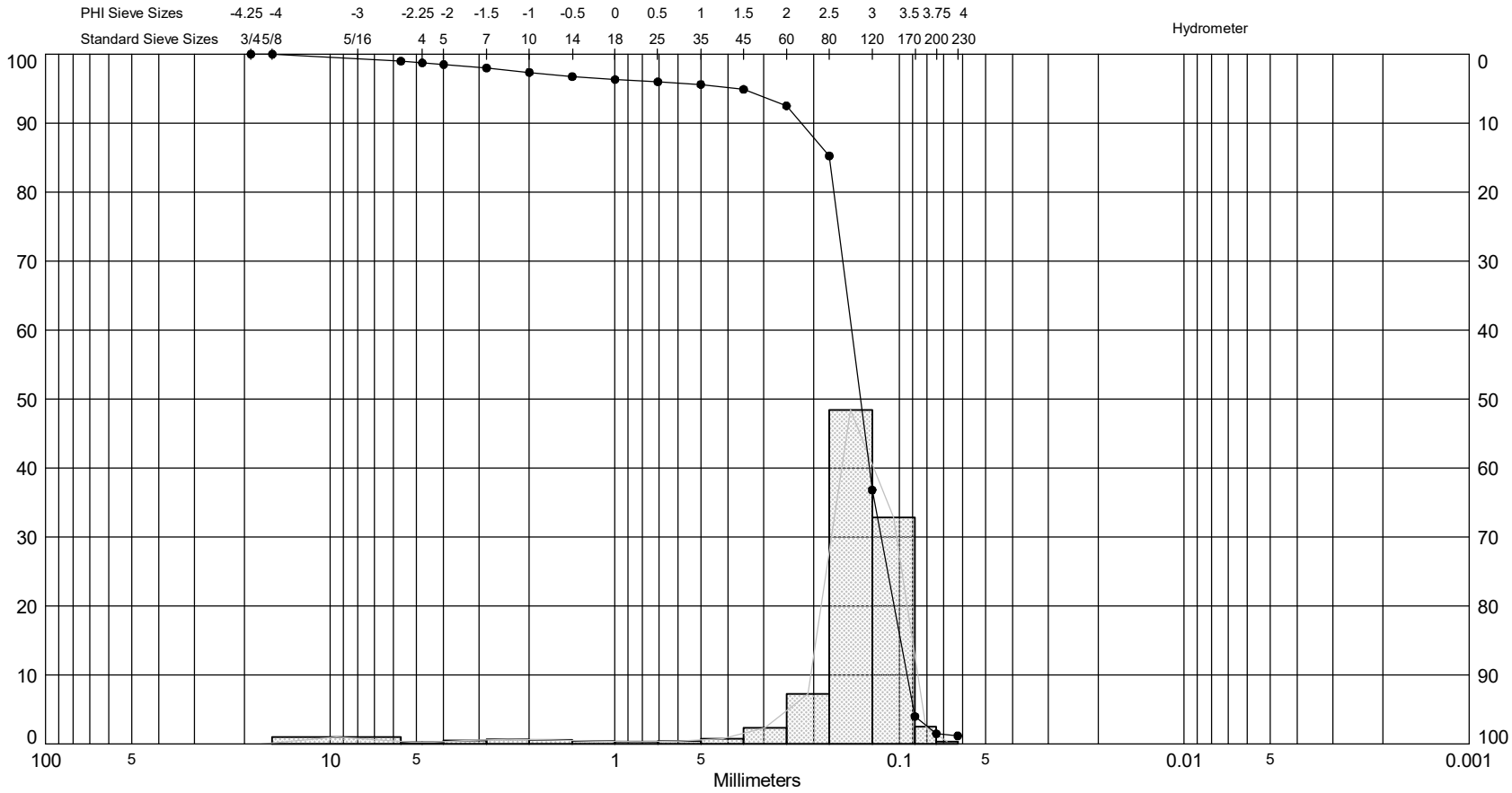
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-33**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	50.13	
Dry Wt. Before Washing (g):	176.24	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.05	99.96	100	0.05
#7	2.800	0.00	99.96	0	0.00
#10	2.000	0.02	99.94	100	0.02
#14	1.400	0.03	99.92	100	0.03
#18	1.000	0.07	99.87	100	0.07
#25	0.710	0.07	99.81	70	0.05
#35	0.500	0.18	99.67	50	0.09
#45	0.355	0.57	99.21	30	0.17
#60	0.250	3.63	96.34	10	0.36
#80	0.180	23.01	78.09	1	0.23
#120	0.125	81.53	13.44	0	0.00
#170	0.090	15.26	1.34	0	0.00
#200	0.075	0.39	1.03	0	0.00
#230	0.063	0.05	0.99	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-33 #B	—●—	-24.0	SP	#200 - 1.47 #230 - 1.17			2.86	2.68	-3.91	20.21	1.01

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	528,160
Northing (Y, ft):	2,247,701
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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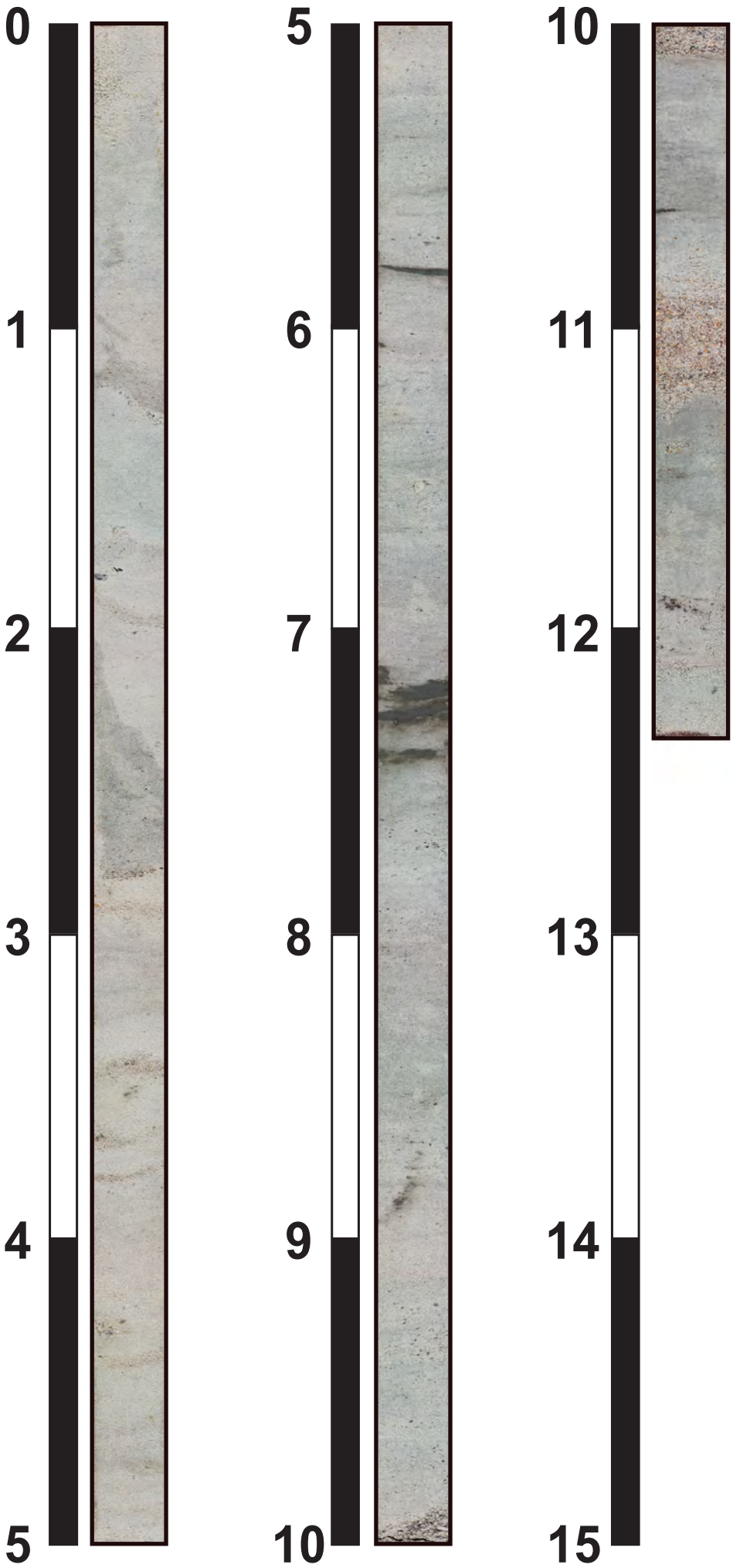
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-33**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.95	
Dry Wt. Before Washing (g):	155.45	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.07	98.99	100	1.07
#4	4.750	0.26	98.74	100	0.26
#5	4.000	0.25	98.50	100	0.25
#7	2.800	0.53	98.00	100	0.53
#10	2.000	0.68	97.36	100	0.68
#14	1.400	0.64	96.75	100	0.64
#18	1.000	0.45	96.32	100	0.45
#25	0.710	0.35	95.99	70	0.25
#35	0.500	0.40	95.61	50	0.20
#45	0.355	0.76	94.89	40	0.30
#60	0.250	2.50	92.52	30	0.75
#80	0.180	7.67	85.25	10	0.77
#120	0.125	51.11	36.81	0	0.00
#170	0.090	34.62	3.99	0	0.00
#200	0.075	2.65	1.48	0	0.00
#230	0.063	0.32	1.18	0	0.00
Total Shell Content:		**6**		**%**	



Nassau Sound
Florida
2016 - 2017

C-34

Notes:
Scale in Feet
Photo Mosaic Image

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(843) 887-3800

Boring Designation C-34

DRILLING LOG

CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-34
LOCATION COORDINATES	X = 527,483 Y = 2,247,007
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL / BEARING	
14. WATER DEPTH	10.3 Ft.
15. DATE BORING	STARTED: 03-17-17 14:45 / COMPLETED: 03-17-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-11.1 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	12.4 Ft.
8. TOTAL DEPTH OF BORING	13.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-11.1	0.0					
			Fine quartz SAND, trace silt in laminations and occasional burrow, trace fine to coarse sand-size shell (primarily in thin [i.e., <1] layers), poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.51 Shell: 2%, Fines (#200) - 1.27 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 12.0' Mean (mm): 0.16, Phi Sorting: 0.58 Shell: 5%, Carbonate: 3.1%, Fines (#200) - 2.86 (SP)
-18.3	7.2					
-18.5	7.4		Interbedded/bioturbated, silty fine quartz SAND (SM; gray [5Y 6/1]) and sandy SILT (ML; dark gray [5Y 4/1]), gray (5Y-5/1), (SM).			
			Fine quartz SAND, trace silt in laminations and occasional burrow, trace fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
-21.0	9.9					
-21.2	10.1		Medium quartz SAND, little medium to coarse sand-size shell, poorly graded, loose, subangular, light gray (2.5Y-7/2), (SP).			
-21.9	10.8				B	Sample #B, Depth = 10.8' - 11.3' Mean (mm): 0.39, Phi Sorting: 1.24 Shell: 30%, Fines (#200) - 0.36 (SP)
-22.3	11.2		Fine quartz SAND, trace silt in lamination, trace medium sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
			Medium quartz SAND, little medium to coarse sand-size shell, poorly graded, loose, subangular, light gray (2.5Y-7/2), (SP).			
-23.5	12.4		Fine quartz SAND, trace organic silt in burrows, trace medium to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

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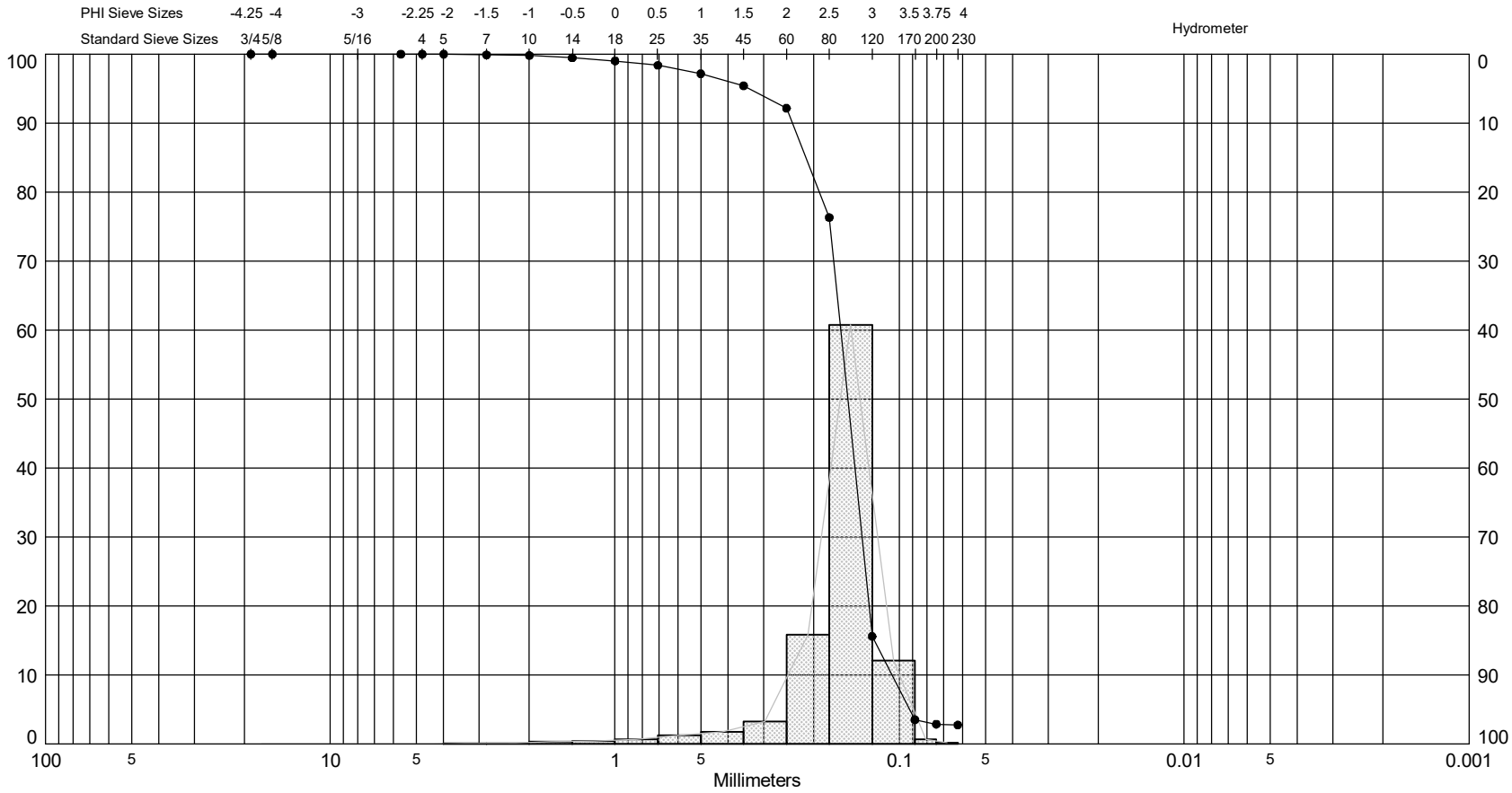

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-34 #COMP	—●—	-11.1	SP	#200 - 2.86 #230 - 2.73		3.10	2.72	2.6	-2.84	15.31	0.58

Comments: Sample Interval = 0 - 12.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,483
Northing (Y, ft):	2,247,007
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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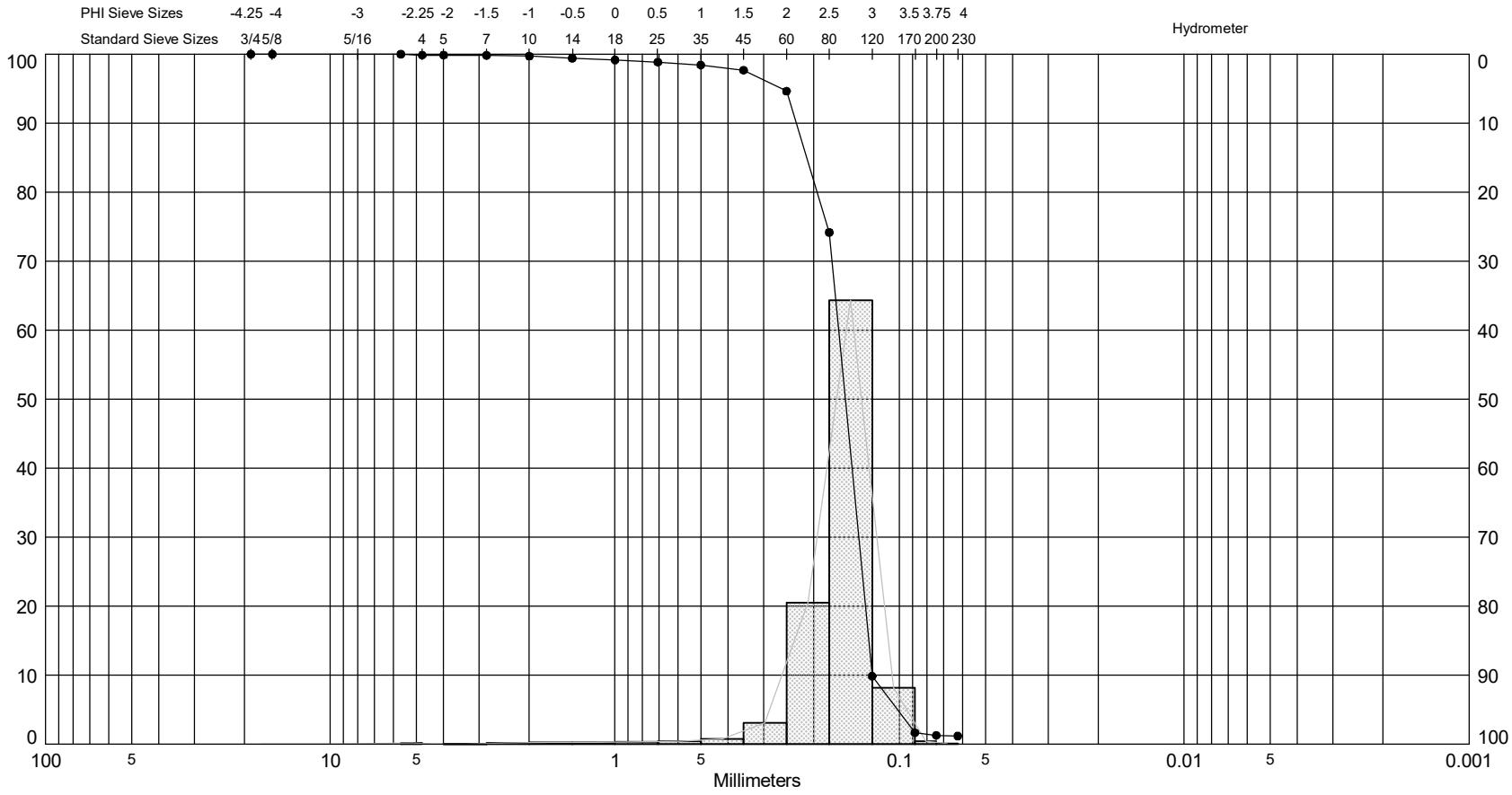
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-34**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.97	
Dry Wt. Before Washing (g):	191.79	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.15	99.89	80	0.12
#10	2.000	0.11	99.82	100	0.11
#14	1.400	0.49	99.47	100	0.49
#18	1.000	0.61	99.04	100	0.61
#25	0.710	0.92	98.39	70	0.64
#35	0.500	1.71	97.19	50	0.86
#45	0.355	2.48	95.44	30	0.74
#60	0.250	4.61	92.19	20	0.92
#80	0.180	22.48	76.34	10	2.25
#120	0.125	86.12	15.61	0	0.00
#170	0.090	17.16	3.51	0	0.00
#200	0.075	0.91	2.87	0	0.00
#230	0.063	0.19	2.74	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-34 #A	—●—	-11.9	SP	#200 - 1.27 #230 - 1.16			2.69	2.6	-3.89	28.97	0.51

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,483
Northing (Y, ft):	2,247,007
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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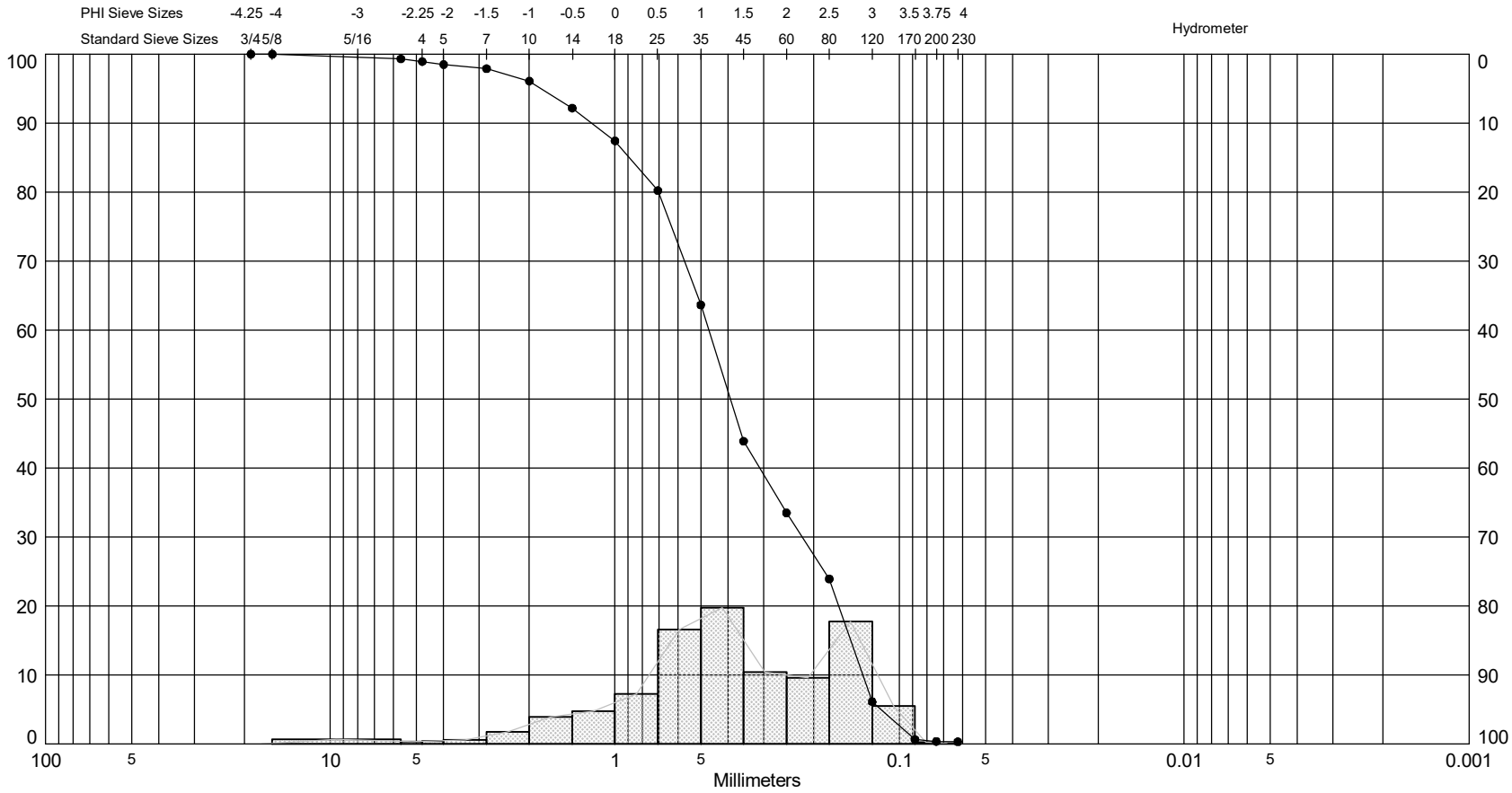
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-34**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.05	
Dry Wt. Before Washing (g):	177.49	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.17	99.87	100	0.17
#5	4.000	0.00	99.87	0	0.00
#7	2.800	0.04	99.84	100	0.04
#10	2.000	0.16	99.71	100	0.16
#14	1.400	0.37	99.42	100	0.37
#18	1.000	0.32	99.17	100	0.32
#25	0.710	0.41	98.85	70	0.29
#35	0.500	0.54	98.42	50	0.27
#45	0.355	0.94	97.69	30	0.28
#60	0.250	3.90	94.62	20	0.78
#80	0.180	26.07	74.17	1	0.26
#120	0.125	81.97	9.85	0	0.00
#170	0.090	10.45	1.65	0	0.00
#200	0.075	0.48	1.27	0	0.00
#230	0.063	0.14	1.16	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-34 #B	—●—	-21.9	SP	#200 - 0.36 #230 - 0.30			1.35	1.36	-0.67	3.66	1.24

Comments: Sample Depth = 11'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,483
Northing (Y, ft):	2,247,007
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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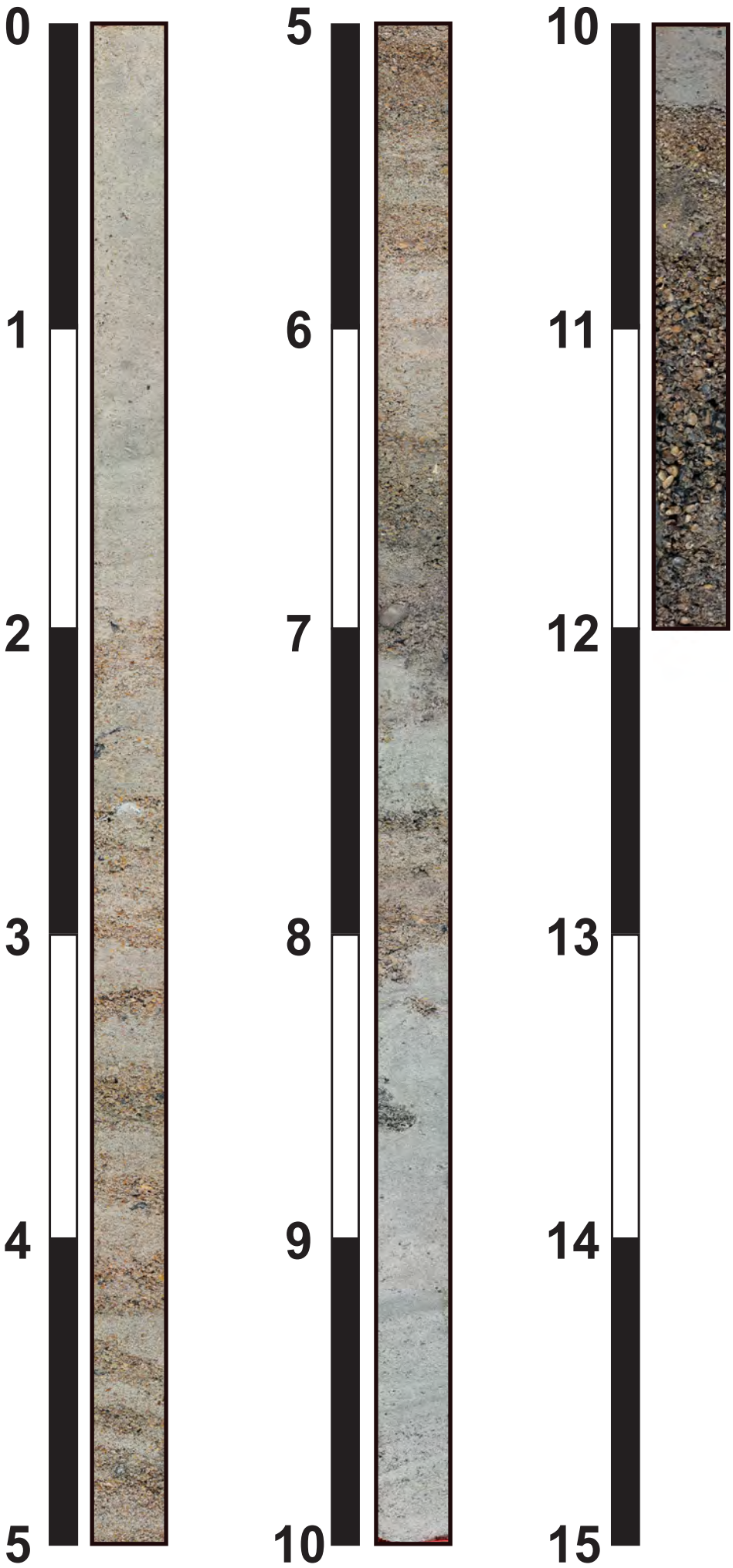
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**11'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-34**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.29	
Dry Wt. Before Washing (g):	199.91	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.03	99.31	100	1.03
#4	4.750	0.55	98.94	100	0.55
#5	4.000	0.67	98.50	100	0.67
#7	2.800	0.90	97.89	100	0.90
#10	2.000	2.68	96.10	100	2.68
#14	1.400	5.87	92.18	100	5.87
#18	1.000	7.11	87.43	90	6.40
#25	0.710	10.79	80.22	70	7.55
#35	0.500	24.81	63.63	50	12.41
#45	0.355	29.56	43.88	20	5.91
#60	0.250	15.53	33.50	5	0.78
#80	0.180	14.35	23.91	1	0.14
#120	0.125	26.61	6.12	0	0.00
#170	0.090	8.19	0.65	0	0.00
#200	0.075	0.44	0.35	0	0.00
#230	0.063	0.09	0.29	0	0.00
Total Shell Content:		**30**		**%**	



Nassau Sound
Florida
2016 - 2017

C-35

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-35

DRILLING LOG

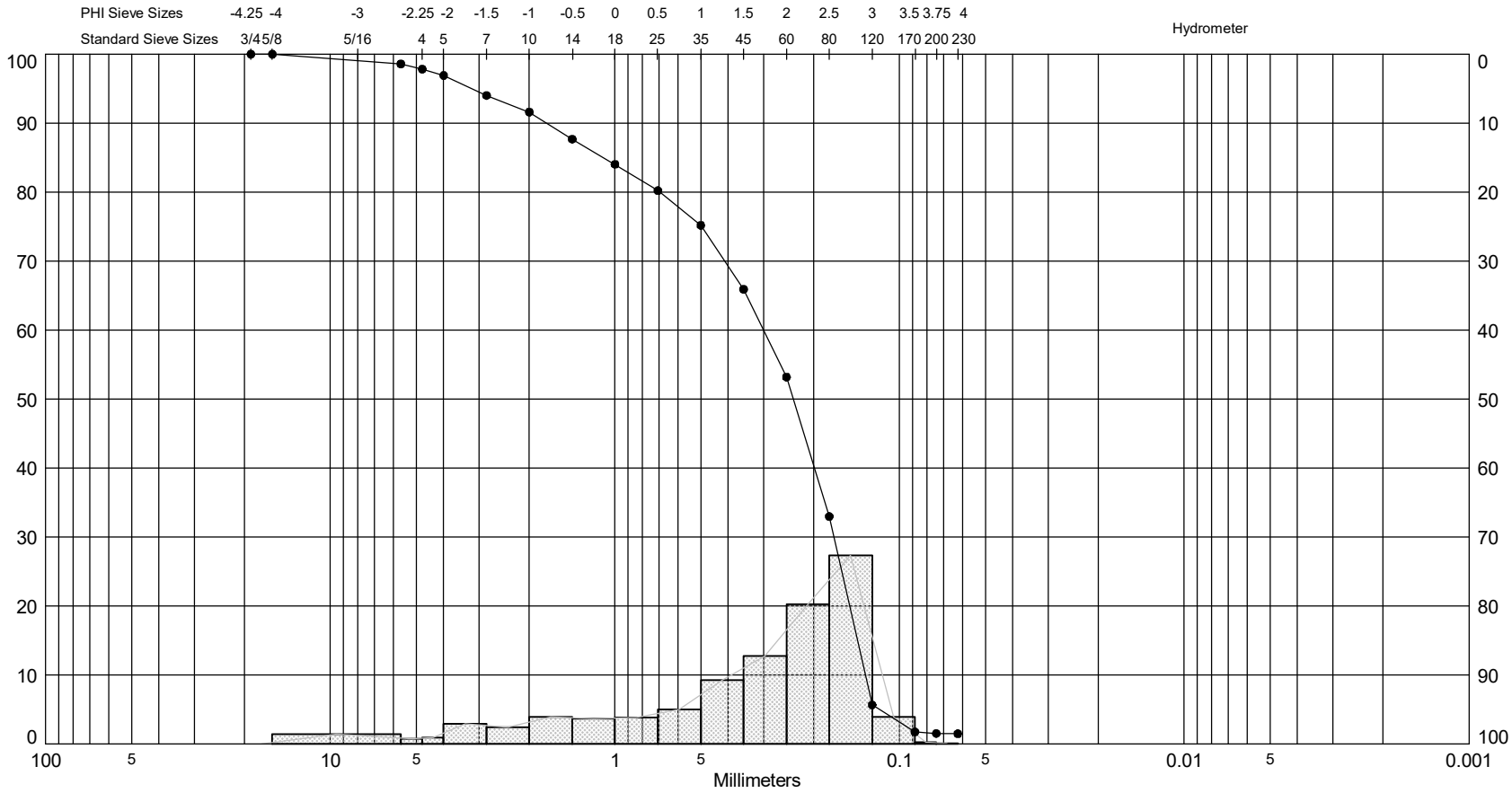
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-35
LOCATION COORDINATES	X = 522,714 Y = 2,247,788
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	15.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	3
DISTURBED	
UNDISTURBED (UD)	
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	7.3 Ft.
15. DATE BORING	
STARTED	03-18-17 10:34
COMPLETED	03-18-17
16. ELEVATION TOP OF BORING	-8.7 Ft.
17. TOTAL RECOVERY FOR BORING	12 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-8.7	0.0					
			Fine quartz SAND, few fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.20, Phi Sorting: 0.77 Shell: 4%, Fines (#200) - 4.66 (SP)
-10.7	2.0					
			Fine to medium quartz SAND, little medium sand to fine gravel-size shell (primarily in layers > 1 thick), poorly graded, loose, subangular, light gray (2.5Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 12.0' Mean (mm): 0.34, Phi Sorting: 1.47 Shell: 27%, Carbonate: 23.3%, Fines (#200) - 1.52 (SP)
-15.1	6.4					
-15.8	7.1		Fine to medium quartz SAND, little medium sand to fine gravel-size shell, few silt, well graded, loose, subangular, light olive gray (5Y-6/2), (SW-SM).			
-16.3	7.6					
-16.8	8.1		Fine quartz SAND, trace fine to coarse sand-size shell, trace silt in burrows, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).			
			Fine to medium quartz SAND, little medium to coarse sand-size shell, trace silt, poorly graded, loose, subangular, light brownish gray (2.5Y-6/2), (SW).			
-19.0	10.3		Fine grading to medium quartz SAND, few fine to coarse sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 10.3' - 10.8' Mean (mm): 0.71, Phi Sorting: 1.75 Shell: 53%, Fines (#200) - 1.74 (SP)
-19.5	10.8					
			Medium quartz SAND, some medium sand to fine gravel-size shell, trace silt, well graded, loose, subangular, grayish brown (2.5Y-5/2), (SW).			
-20.7	12.0		Fine gravel-size SHELL, little medium quartz sand, poorly graded, very loose, subangular, grayish brown (2.5Y-5/2), (GP).			
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-35 #COMP	—●—	-8.7	SP	#200 - 1.52 #230 - 1.47		23.30	2.08	1.55	-1.31	4.04	1.47

Comments: Sample Interval = 0 - 12.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,714
Northing (Y, ft):	2,247,788
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

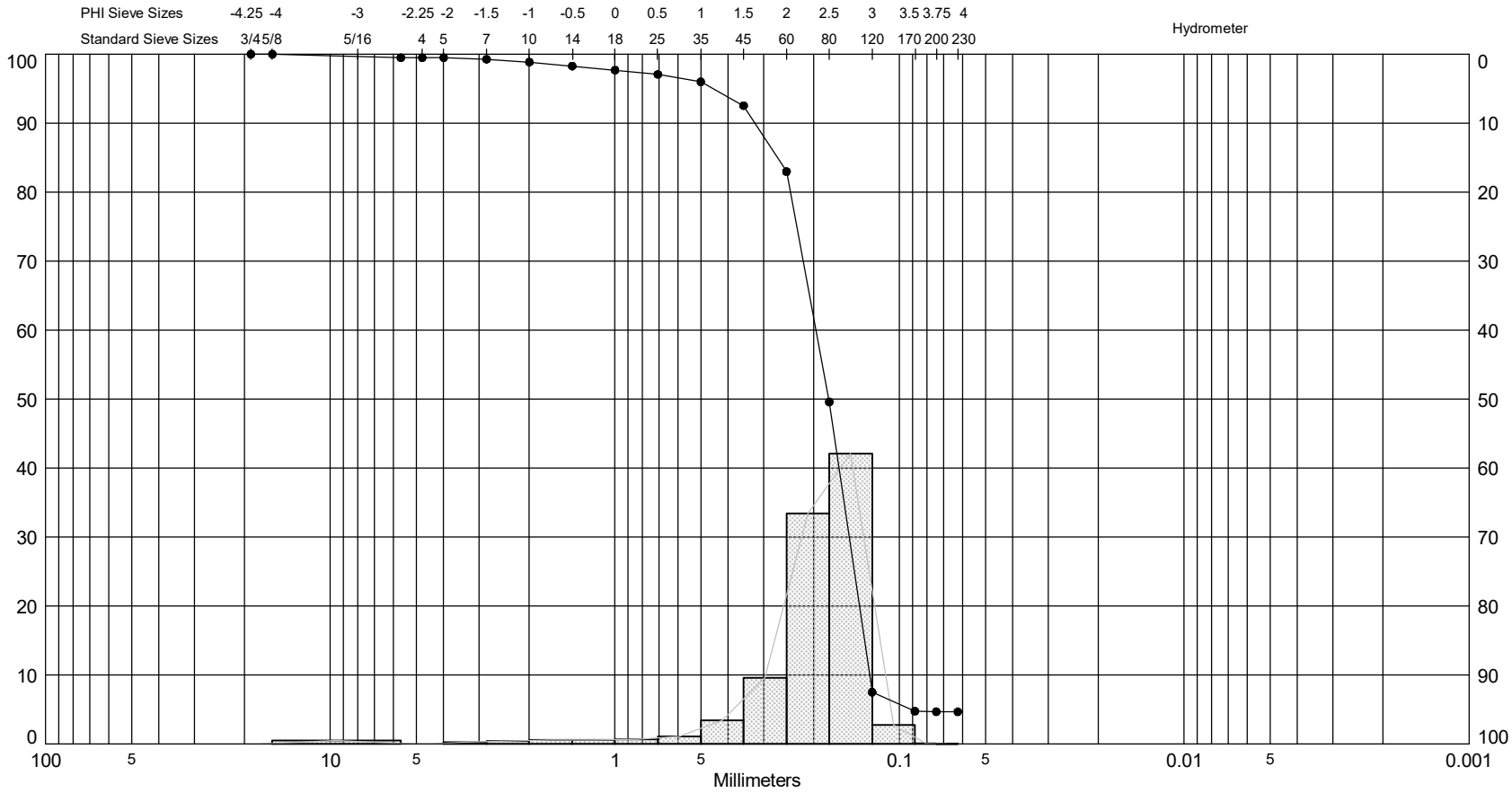
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-35**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	51.77	
Dry Wt. Before Washing (g):	197.49	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.06	98.59	100	2.06
#4	4.750	1.11	97.82	100	1.11
#5	4.000	1.34	96.91	100	1.34
#7	2.800	4.21	94.02	100	4.21
#10	2.000	3.51	91.61	100	3.51
#14	1.400	5.73	87.67	100	5.73
#18	1.000	5.30	84.04	98	5.19
#25	0.710	5.57	80.22	90	5.01
#35	0.500	7.32	75.19	70	5.12
#45	0.355	13.52	65.91	30	4.06
#60	0.250	18.53	53.20	10	1.85
#80	0.180	29.48	32.97	1	0.29
#120	0.125	39.81	5.65	0	0.00
#170	0.090	5.70	1.74	0	0.00
#200	0.075	0.32	1.52	0	0.00
#230	0.063	0.08	1.46	0	0.00
Total Shell Content:		**27**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-35 #A	—●—	-9.5	SP	#200 - 4.66 #230 - 4.65			2.49	2.3	-3.53	21	0.77

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,714
Northing (Y, ft):	2,247,788
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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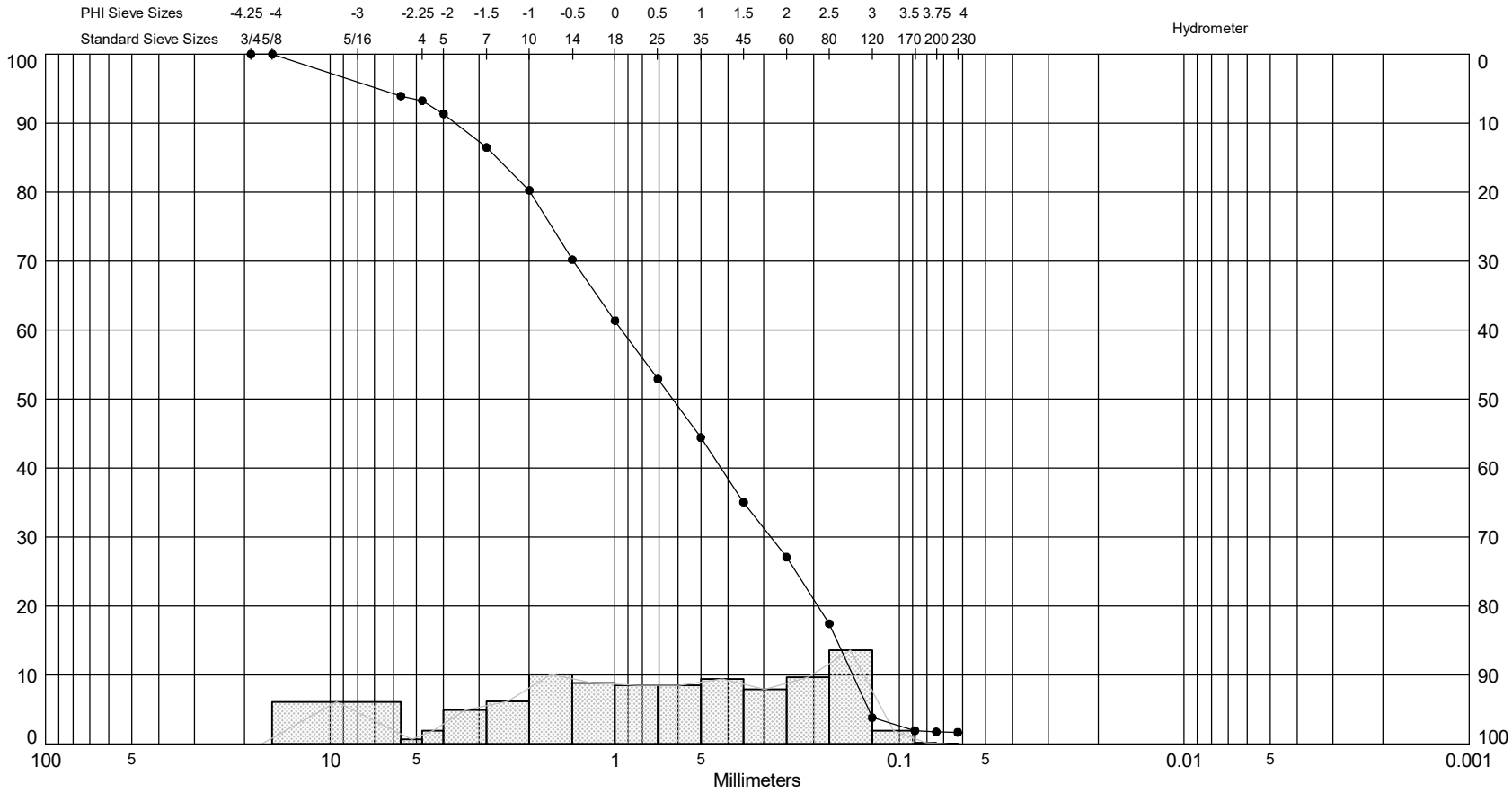
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-35**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.14	
Dry Wt. Before Washing (g):	181.84	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.68	99.48	100	0.68
#4	4.750	0.00	99.48	0	0.00
#5	4.000	0.00	99.48	0	0.00
#7	2.800	0.27	99.28	100	0.27
#10	2.000	0.54	98.87	100	0.54
#14	1.400	0.76	98.29	100	0.76
#18	1.000	0.76	97.71	100	0.76
#25	0.710	0.84	97.08	95	0.80
#35	0.500	1.41	96.01	50	0.71
#45	0.355	4.55	92.55	10	0.46
#60	0.250	12.61	82.98	1	0.13
#80	0.180	43.96	49.60	0	0.00
#120	0.125	55.43	7.51	0	0.00
#170	0.090	3.63	4.75	0	0.00
#200	0.075	0.10	4.68	0	0.00
#230	0.063	0.01	4.67	0	0.00
Total Shell Content:		**4**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-35 #B	—●—	-19.0	SP	#200 - 1.74 #230 - 1.70			0.67	0.5	-0.39	2.3	1.75

Comments: Sample Depth = 10.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,714
Northing (Y, ft):	2,247,788
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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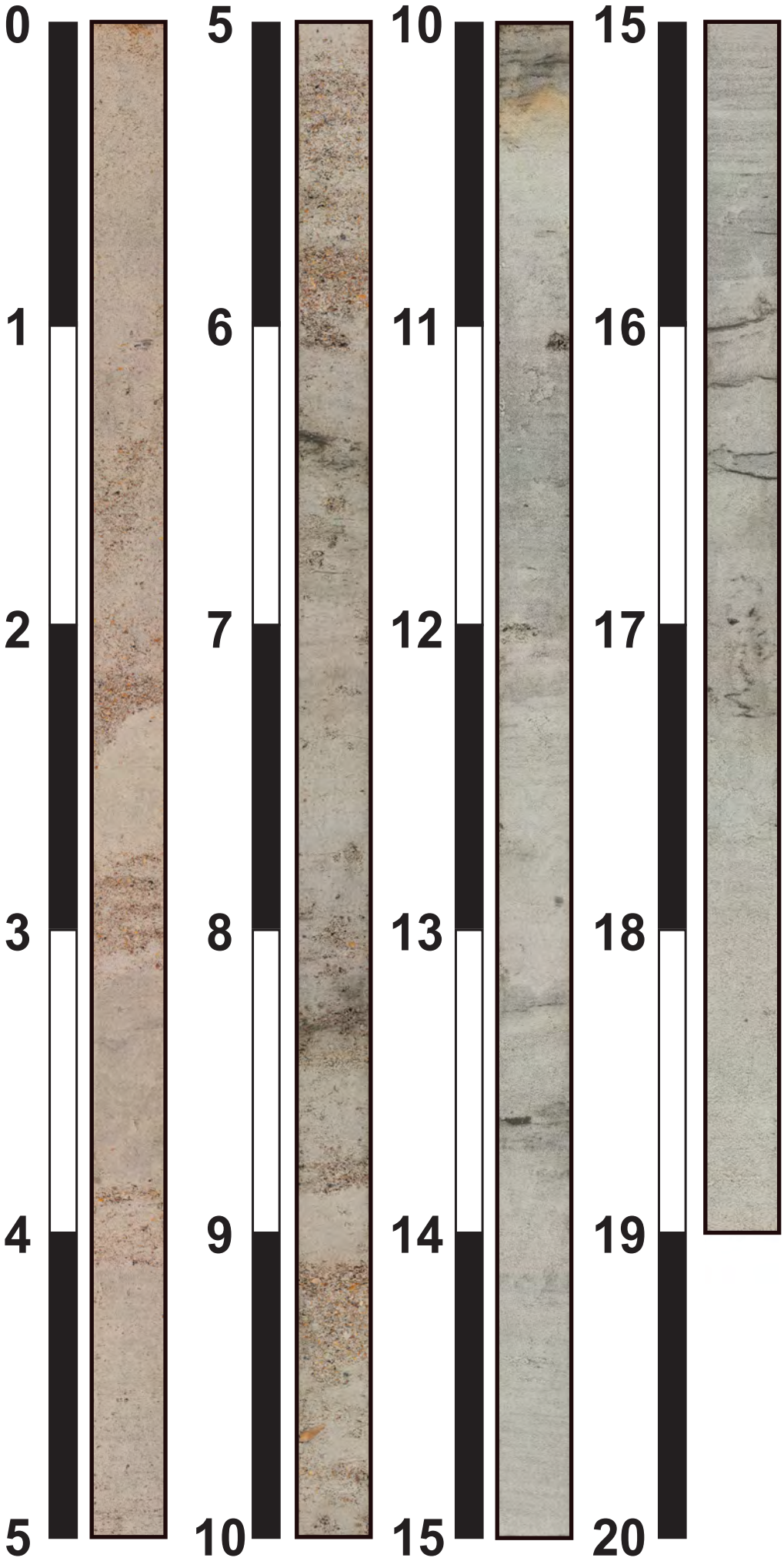
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-35**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 5Y 5/1**		

Tare Weight, (g):	49.02	
Dry Wt. Before Washing (g):	173.54	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.55	93.94	100	7.55
#4	4.750	0.85	93.25	100	0.85
#5	4.000	2.36	91.36	100	2.36
#7	2.800	6.09	86.47	100	6.09
#10	2.000	7.72	80.27	100	7.72
#14	1.400	12.53	70.21	100	12.53
#18	1.000	11.02	61.36	98	10.80
#25	0.710	10.53	52.90	80	8.42
#35	0.500	10.56	44.42	50	5.28
#45	0.355	11.68	35.04	30	3.50
#60	0.250	9.90	27.09	5	0.50
#80	0.180	12.03	17.43	1	0.12
#120	0.125	16.96	3.81	0	0.00
#170	0.090	2.35	1.92	0	0.00
#200	0.075	0.22	1.74	0	0.00
#230	0.063	0.05	1.70	0	0.00
Total Shell Content:		**53**		**%**	



Nassau Sound
Florida
2016 - 2017

C-36

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-36

DRILLING LOG

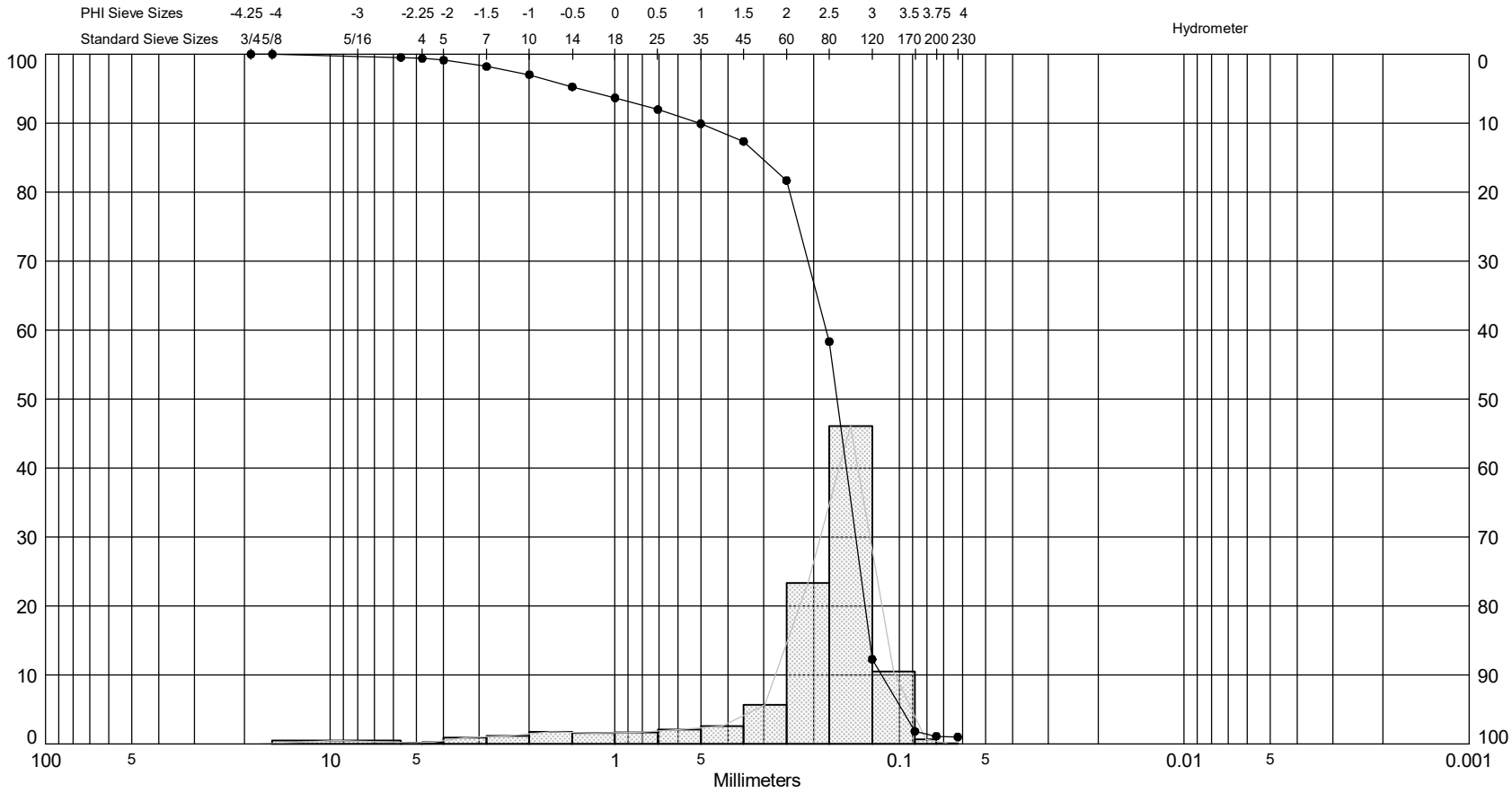
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-36
LOCATION COORDINATES	X = 524,411 Y = 2,246,519
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	11.2 Ft.
15. DATE BORING	STARTED: 08-22-16 11:23 / COMPLETED: 08-22-16
16. ELEVATION TOP OF BORING*	-7.1 Ft.
17. TOTAL RECOVERY FOR BORING	19 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-7.1	0.0					
			Fine SAND, trace shell fragments in layers, white (2.5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.19, Phi Sorting: 0.62 Shell: 4%, Fines (#200) - 0.74 (SP)
-12.9	5.8					
			Fine SAND, trace silt in lenses, trace shell fragments, light greenish gray (10Y-8/1), (SP).		B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.16, Phi Sorting: 1.15 Shell: 9%, Fines (#200) - 1.51 (SP)
-15.4	8.3					
			Fine SAND, few shell fragments <3.0cm, shell layer 9.1-9.4', white (2.5Y-8/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 19.0' Mean (mm): 0.21, Phi Sorting: 1.08 Shell: 9%, Carbonate: 9.4%, Fines (#200) - 1.12 (SP)
-17.1	10.0					
			Fine SAND, trace silt in lenses, bedding present, light greenish gray (10Y-8/1), (SP).		C	Sample #C, Depth = 17.8' - 18.3' Mean (mm): 0.18, Phi Sorting: 0.38 Shell: 2%, Fines (#200) - 0.76 (SP)
-26.1	19.0					
			End of Boring			* = Top of boring elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

0 5 10 15 20 25

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-36 #COMP	—●—	-7.1	SP	#200 - 1.12 #230 - 1.01		9.40	2.59	2.26	-2.43	9.39	1.08

Comments: Sample Interval = 0 - 19.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,411
Northing (Y, ft):	2,246,519
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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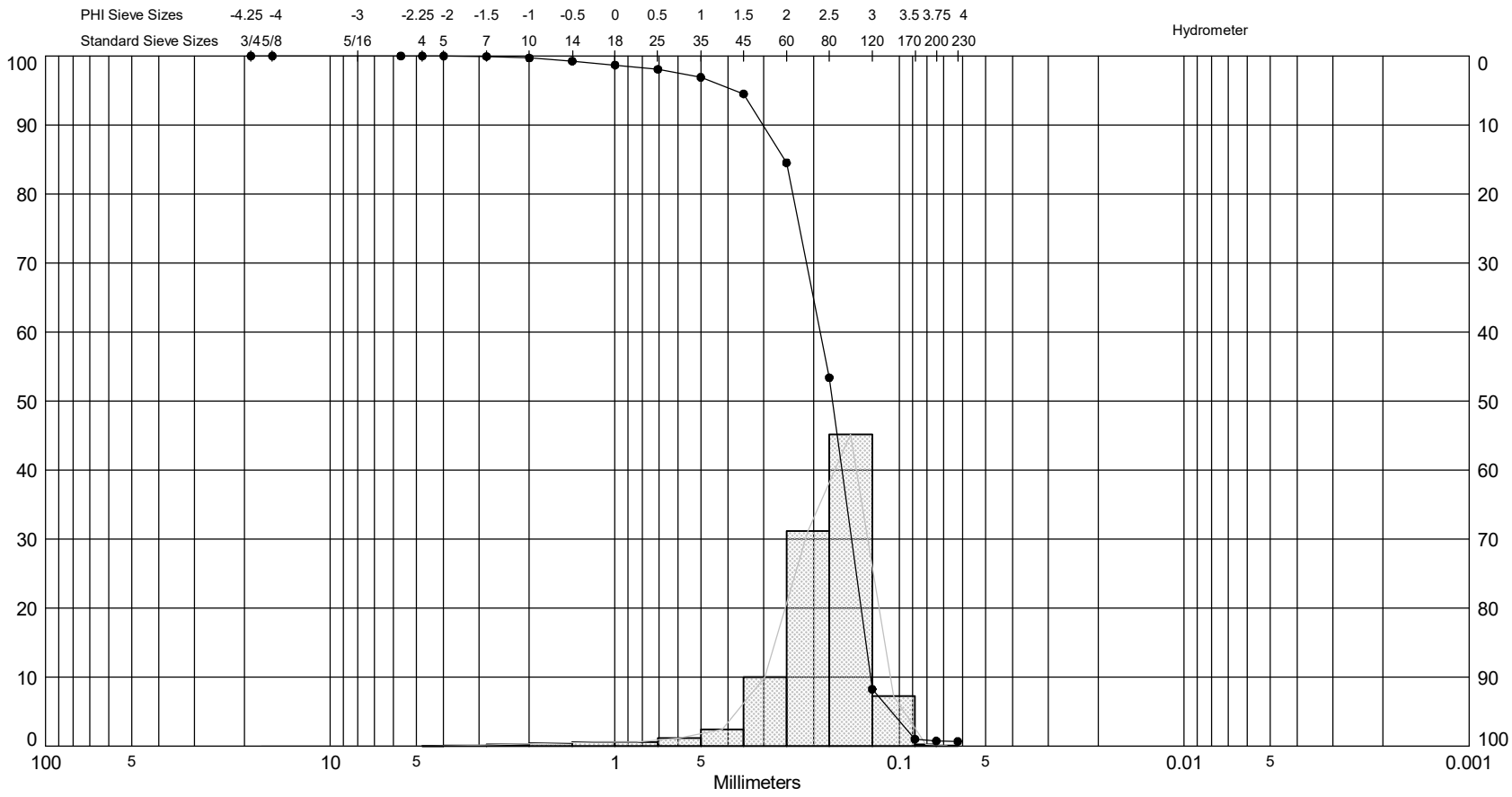
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-19'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-36**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.27	
Dry Wt. Before Washing (g):	207.38	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.73	99.53	100	0.73
#4	4.750	0.23	99.39	100	0.23
#5	4.000	0.39	99.14	100	0.39
#7	2.800	1.44	98.21	100	1.44
#10	2.000	1.82	97.05	100	1.82
#14	1.400	2.76	95.28	100	2.76
#18	1.000	2.50	93.68	80	2.00
#25	0.710	2.66	91.97	60	1.60
#35	0.500	3.20	89.92	50	1.60
#45	0.355	3.99	87.37	30	1.20
#60	0.250	8.84	81.71	10	0.88
#80	0.180	36.46	58.35	0	0.00
#120	0.125	71.90	12.29	0	0.00
#170	0.090	16.35	1.82	0	0.00
#200	0.075	1.07	1.13	0	0.00
#230	0.063	0.17	1.02	0	0.00
Total Shell Content:		**9**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-36 #A	—●—	-7.9	SP	#200 - 0.74 #230 - 0.68			2.54	2.41	-2.24	11.63	0.62

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,411
Northing (Y, ft):	2,246,519
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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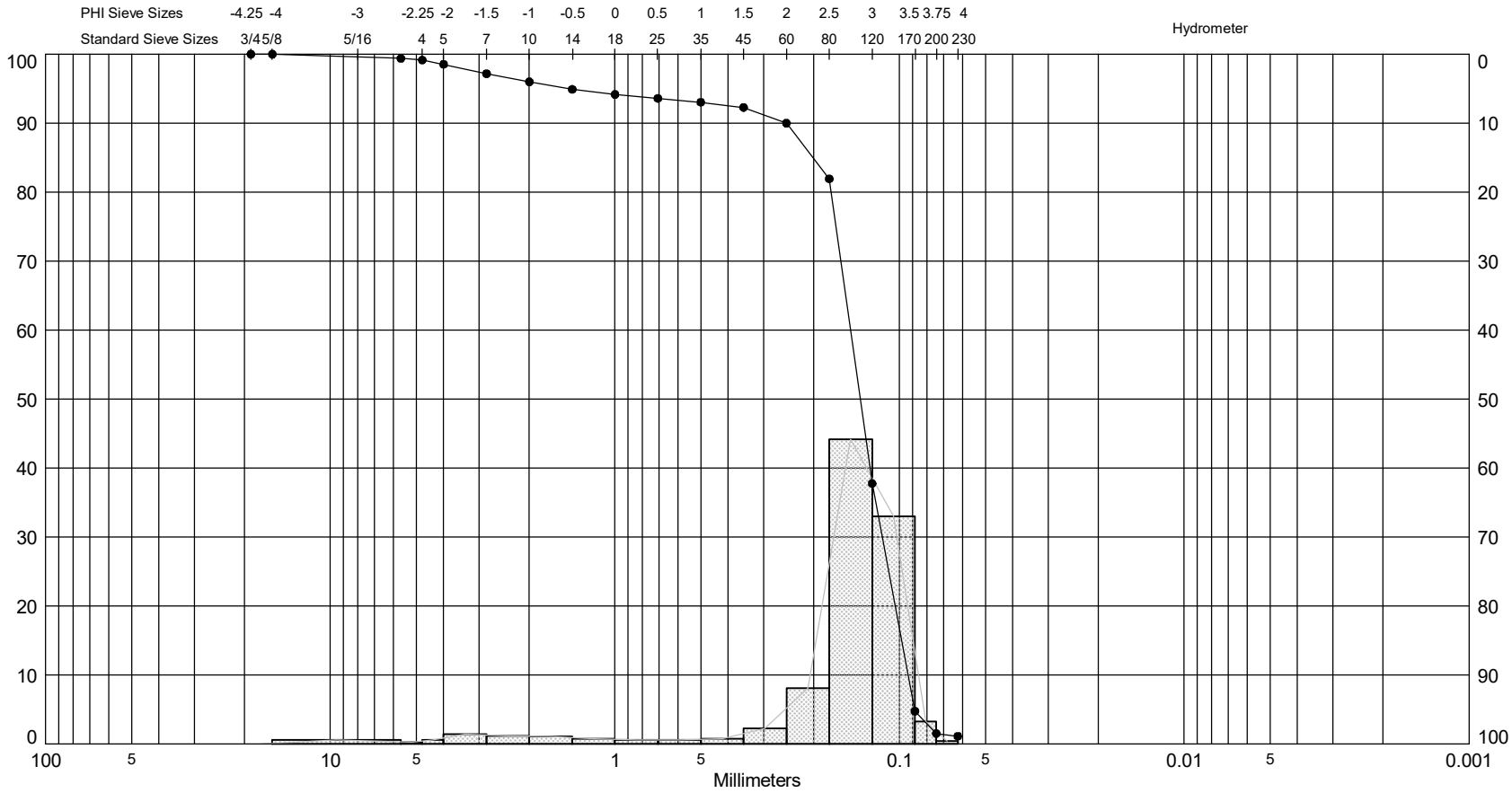
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-36**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.26	
Dry Wt. Before Washing (g):	188.41	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.02	99.99	100	0.02
#7	2.800	0.07	99.94	100	0.07
#10	2.000	0.32	99.71	100	0.32
#14	1.400	0.62	99.26	100	0.62
#18	1.000	0.79	98.69	100	0.79
#25	0.710	0.86	98.07	70	0.60
#35	0.500	1.62	96.91	50	0.81
#45	0.355	3.33	94.52	30	1.00
#60	0.250	13.90	84.53	10	1.39
#80	0.180	43.34	53.38	0	0.00
#120	0.125	62.82	8.24	0	0.00
#170	0.090	10.04	1.02	0	0.00
#200	0.075	0.37	0.75	0	0.00
#230	0.063	0.09	0.69	0	0.00
Total Shell Content:		**4**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-36 #B	—●—	-13.9	SP	#200 - 1.51 #230 - 1.12			2.86	2.6	-3.05	12.48	1.15

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,411
Northing (Y, ft):	2,246,519
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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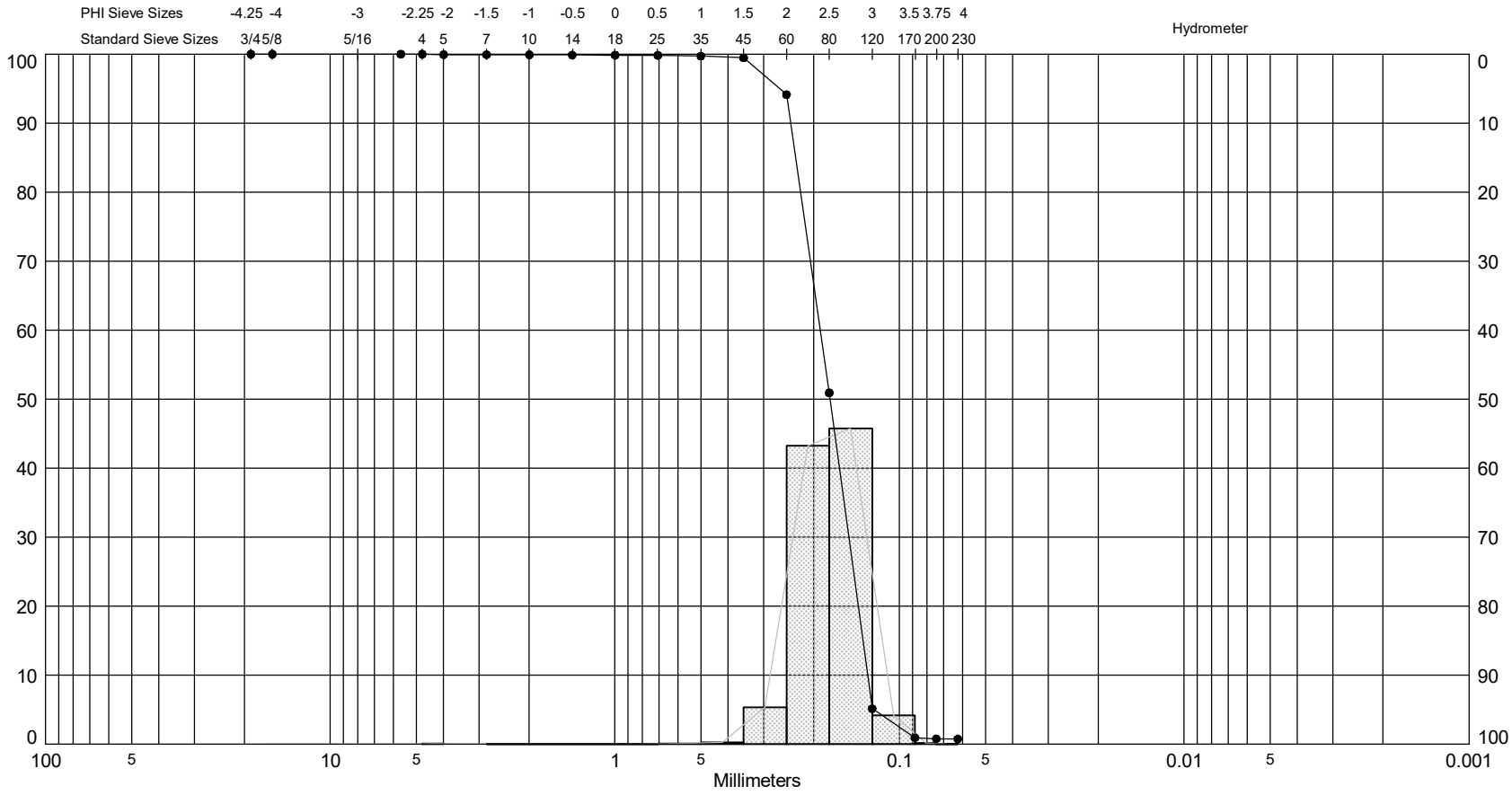
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-36**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.69	
Dry Wt. Before Washing (g):	200.35	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.94	99.38	100	0.94
#4	4.750	0.35	99.14	100	0.35
#5	4.000	0.92	98.53	100	0.92
#7	2.800	2.08	97.15	100	2.08
#10	2.000	1.77	95.98	100	1.77
#14	1.400	1.64	94.89	100	1.64
#18	1.000	1.10	94.16	100	1.10
#25	0.710	0.86	93.59	80	0.69
#35	0.500	0.85	93.02	70	0.60
#45	0.355	1.15	92.26	50	0.58
#60	0.250	3.43	89.98	30	1.03
#80	0.180	12.15	81.92	10	1.22
#120	0.125	66.55	37.75	1	0.67
#170	0.090	49.74	4.73	0	0.00
#200	0.075	4.90	1.48	0	0.00
#230	0.063	0.59	1.09	0	0.00
Total Shell Content:		**9**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-36 #C	—●—	-24.9	SP	#200 - 0.76 #230 - 0.73			2.51	2.49	-1.83	20.96	0.38

Comments: Sample Depth = 18'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,411
Northing (Y, ft):	2,246,519
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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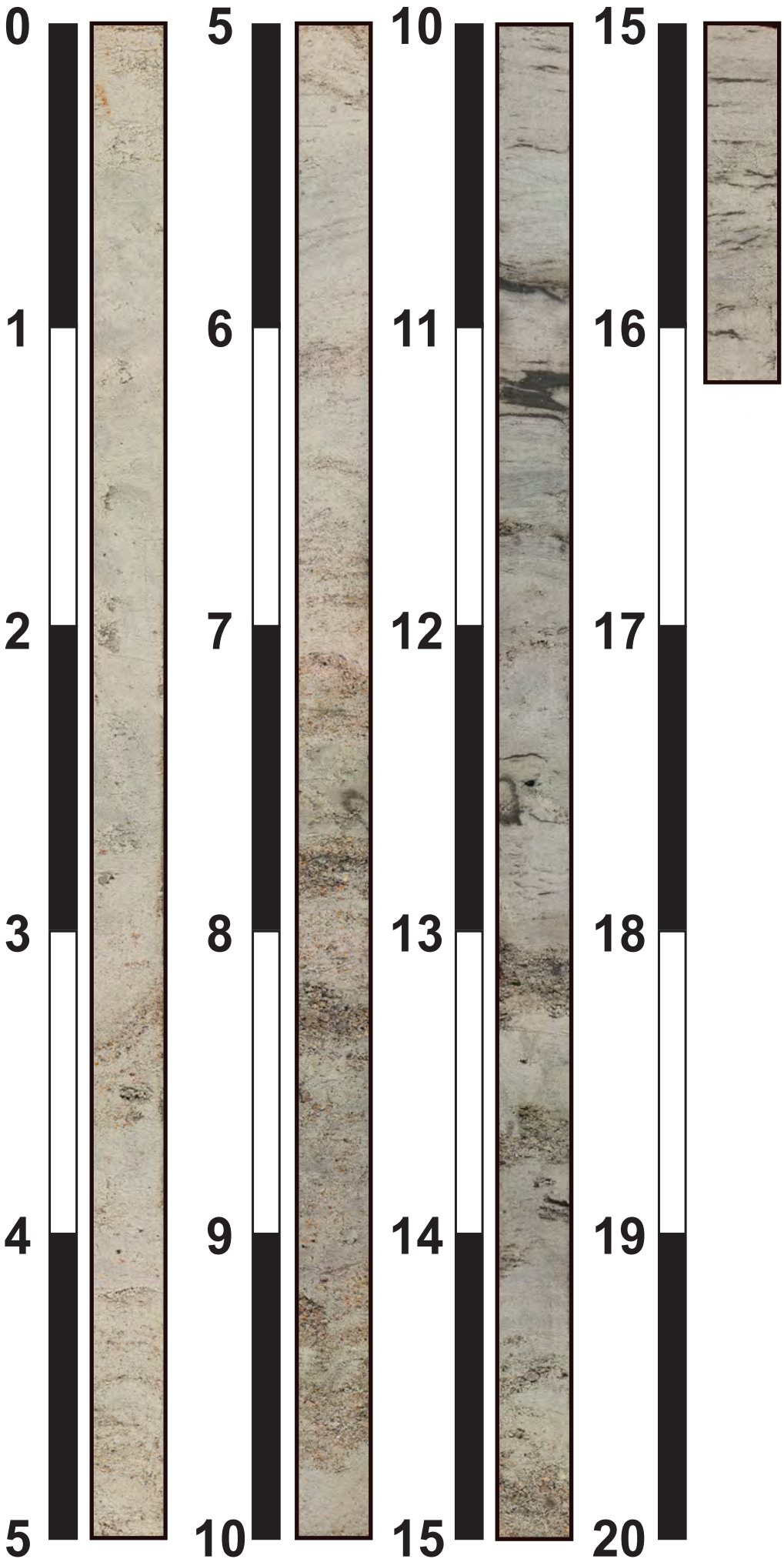
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**18'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-36**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.68	
Dry Wt. Before Washing (g):	179.46	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.08	99.94	0	0.00
#7	2.800	0.00	99.94	0	0.00
#10	2.000	0.02	99.92	0	0.00
#14	1.400	0.05	99.88	0	0.00
#18	1.000	0.03	99.86	10	0.00
#25	0.710	0.04	99.83	20	0.01
#35	0.500	0.16	99.71	30	0.05
#45	0.355	0.32	99.46	50	0.16
#60	0.250	6.92	94.13	30	2.08
#80	0.180	56.08	50.92	1	0.56
#120	0.125	59.43	5.12	0	0.00
#170	0.090	5.44	0.93	0	0.00
#200	0.075	0.23	0.76	0	0.00
#230	0.063	0.04	0.72	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-37

Notes:
Scale in Feet
Photo Mosaic Image

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(843) 887-3800

Boring Designation C-37

DRILLING LOG

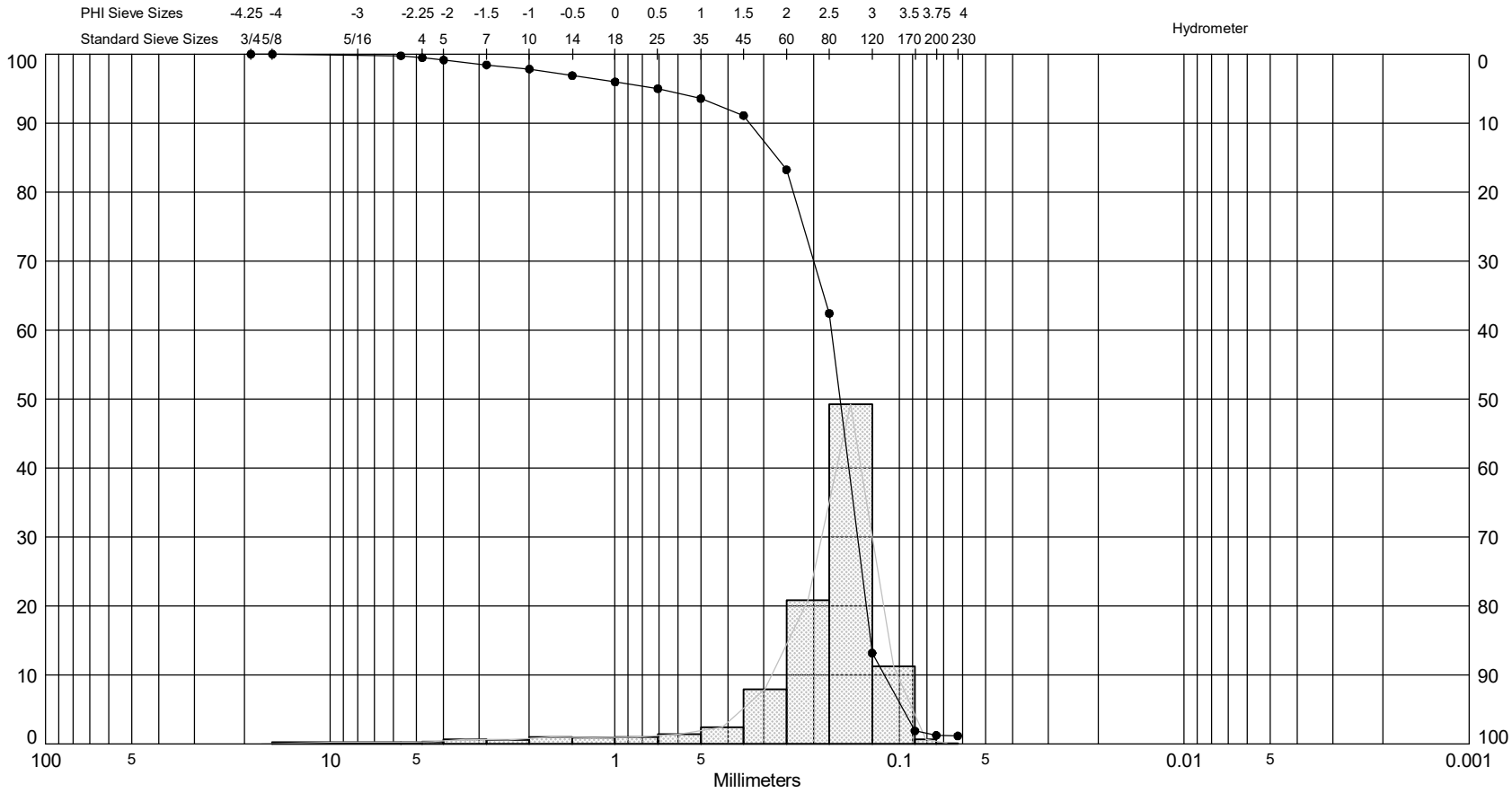
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-37
LOCATION COORDINATES	X = 524,261 Y = 2,247,032
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 4 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	6.2 Ft.
15. DATE BORING	STARTED 07-27-16 13:09 / COMPLETED 07-27-16
16. ELEVATION TOP OF BORING	-5.1 Ft.
17. TOTAL RECOVERY FOR BORING	16.2 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-5.1	0.0					
			Fine SAND, trace shell fragments in layers increasing downcore, bedding present, white (5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.40 Shell: 2%, Fines (#200) - 0.87 (SP)
					B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.35, Phi Sorting: 1.67 Shell: 27%, Fines (#200) - 1.90 (SP)
-15.1	10.0				COMP	Sample #COMP, Depth = 0.0' - 16.2' Mean (mm): 0.19, Phi Sorting: 0.94 Shell: 6%, Carbonate: 7.2%, Fines (#200) - 1.24 (SP)
			Fine SAND, trace shell fragments in layers ~2, trace silt in thin lenses & burrows, bedding present, light greenish gray (10Y-7/1), (SP).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 0.15, Phi Sorting: 0.32 Shell: 0%, Fines (#200) - 1.98 (SP)
-21.3	16.2					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-37 #COMP	—●—	-5.1	SP	#200 - 1.24 #230 - 1.15		7.20	2.63	2.37	-2.85	12.91	0.94

Comments: Sample Interval = 0 - 16.2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,261
Northing (Y, ft):	2,247,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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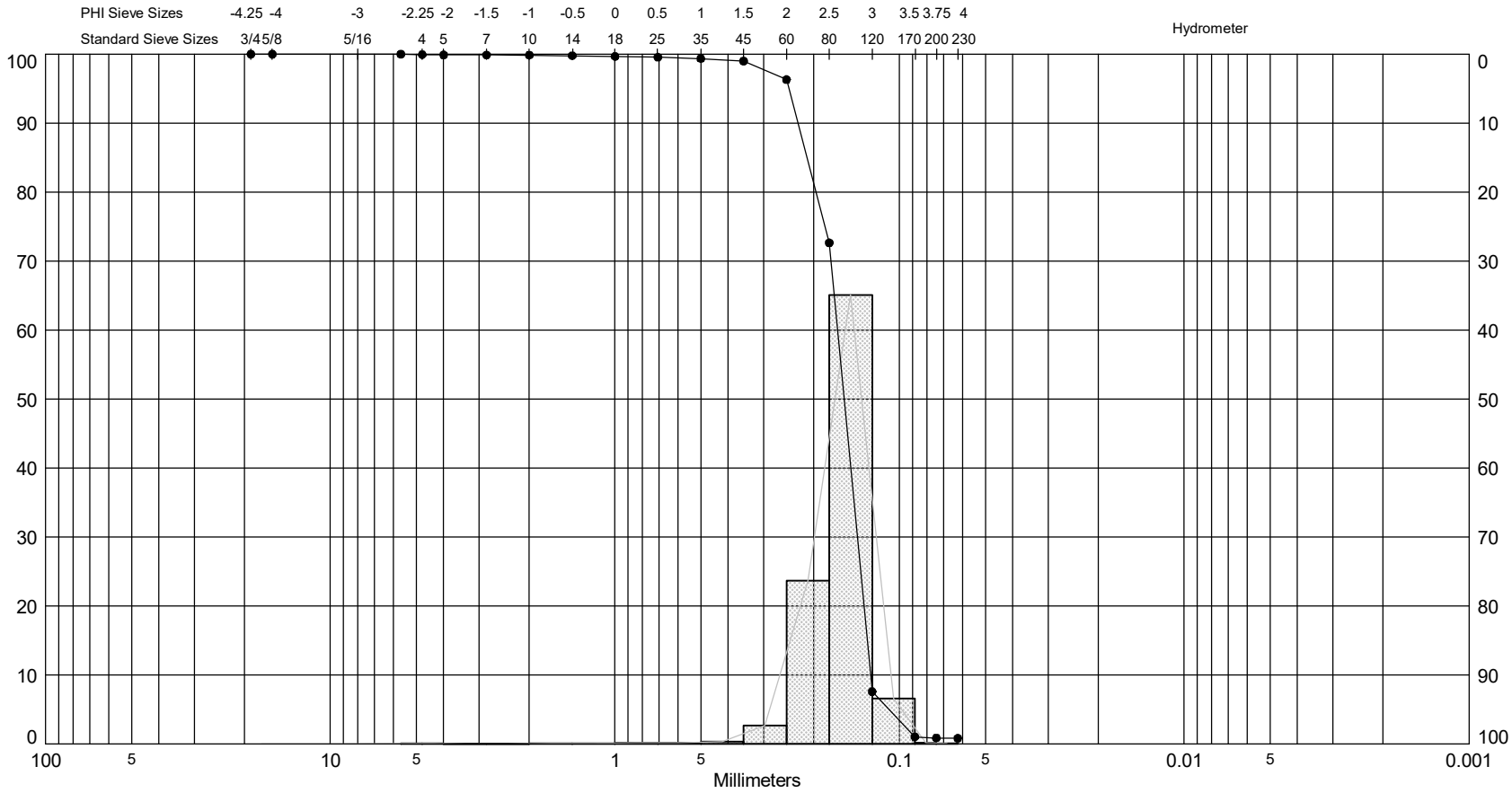
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-16.2'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-37**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.82	
Dry Wt. Before Washing (g):	214.36	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.38	99.77	100	0.38
#4	4.750	0.47	99.48	100	0.47
#5	4.000	0.54	99.15	100	0.54
#7	2.800	1.14	98.45	100	1.14
#10	2.000	0.98	97.85	100	0.98
#14	1.400	1.57	96.89	100	1.57
#18	1.000	1.51	95.97	80	1.21
#25	0.710	1.59	95.00	70	1.11
#35	0.500	2.36	93.56	40	0.94
#45	0.355	4.01	91.10	20	0.80
#60	0.250	12.89	83.22	5	0.64
#80	0.180	34.04	62.41	0	0.00
#120	0.125	80.54	13.16	0	0.00
#170	0.090	18.47	1.86	0	0.00
#200	0.075	1.04	1.23	0	0.00
#230	0.063	0.14	1.14	0	0.00
Total Shell Content:		**6**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-37 #A	—●—	-5.9	SP	#200 - 0.87 #230 - 0.81			2.67	2.61	-3.76	36.78	0.4

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,261
Northing (Y, ft):	2,247,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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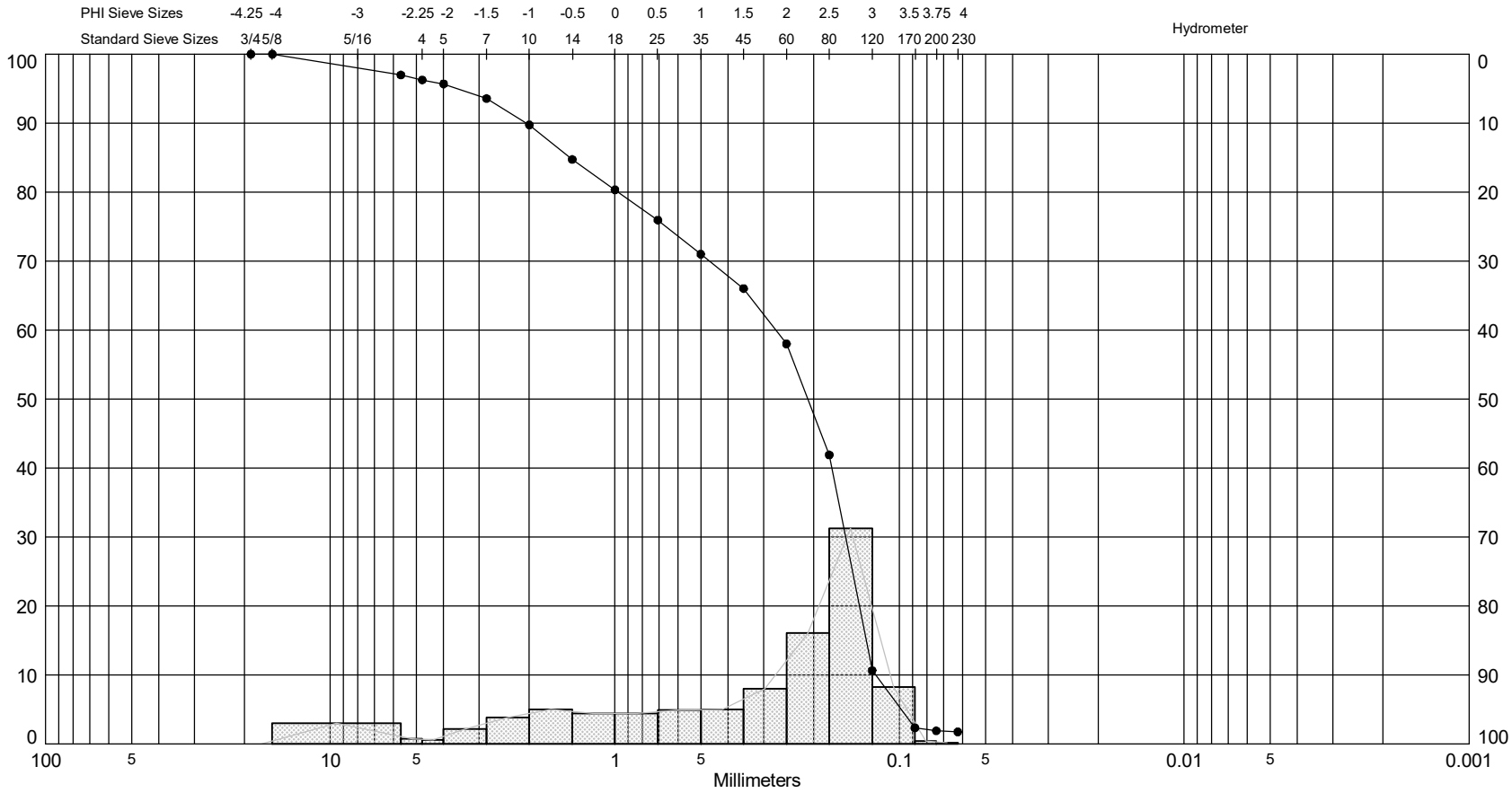
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-37**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.00	
Dry Wt. Before Washing (g):	207.65	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.08	99.95	100	0.08
#5	4.000	0.09	99.89	100	0.09
#7	2.800	0.02	99.88	100	0.02
#10	2.000	0.02	99.87	100	0.02
#14	1.400	0.13	99.78	100	0.13
#18	1.000	0.17	99.68	100	0.17
#25	0.710	0.21	99.54	80	0.17
#35	0.500	0.29	99.36	70	0.20
#45	0.355	0.58	98.99	50	0.29
#60	0.250	4.25	96.30	30	1.28
#80	0.180	37.30	72.64	0	0.00
#120	0.125	102.56	7.58	0	0.00
#170	0.090	10.32	1.03	0	0.00
#200	0.075	0.25	0.88	0	0.00
#230	0.063	0.10	0.81	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-37 #B	—●—	-12.9	SP	#200 - 1.90 #230 - 1.74			2.25	1.53	-1.19	3.52	1.67

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,261
Northing (Y, ft):	2,247,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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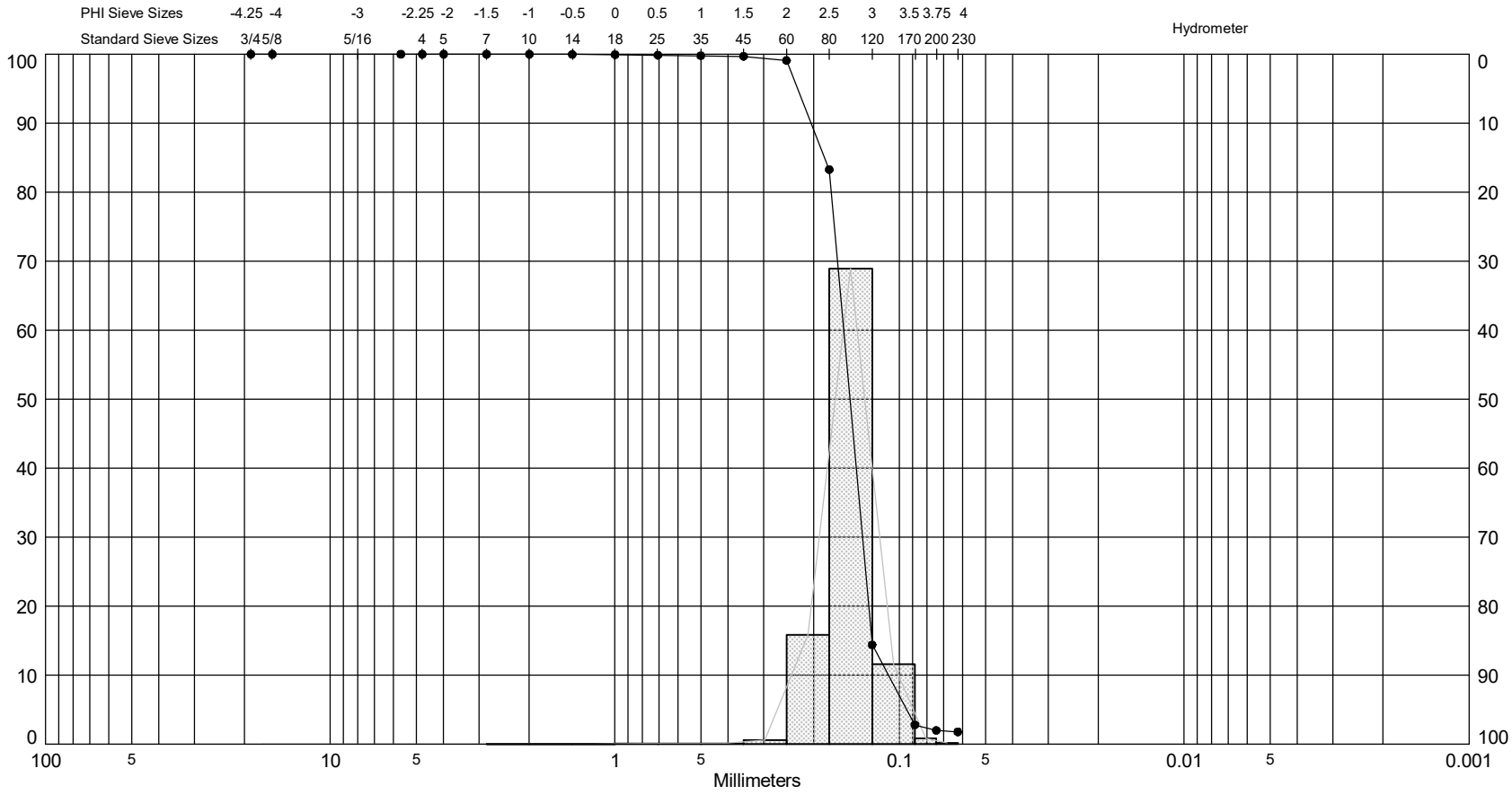
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-37**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.37	
Dry Wt. Before Washing (g):	208.11	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	4.79	96.98	100	4.79
#4	4.750	1.12	96.28	100	1.12
#5	4.000	0.91	95.70	100	0.91
#7	2.800	3.40	93.56	100	3.40
#10	2.000	6.06	89.74	100	6.06
#14	1.400	7.95	84.74	100	7.95
#18	1.000	6.99	80.33	80	5.59
#25	0.710	6.96	75.95	70	4.87
#35	0.500	7.84	71.01	50	3.92
#45	0.355	7.91	66.03	30	2.37
#60	0.250	12.77	57.98	10	1.28
#80	0.180	25.56	41.88	0	0.00
#120	0.125	49.62	10.62	0	0.00
#170	0.090	13.16	2.33	0	0.00
#200	0.075	0.70	1.89	0	0.00
#230	0.063	0.25	1.73	0	0.00
Total Shell Content:		**27**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-37 #C	—●—	-18.9	SP	#200 - 1.98 #230 - 1.78			2.74	2.72	-1.24	15.06	0.32

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,261
Northing (Y, ft):	2,247,032
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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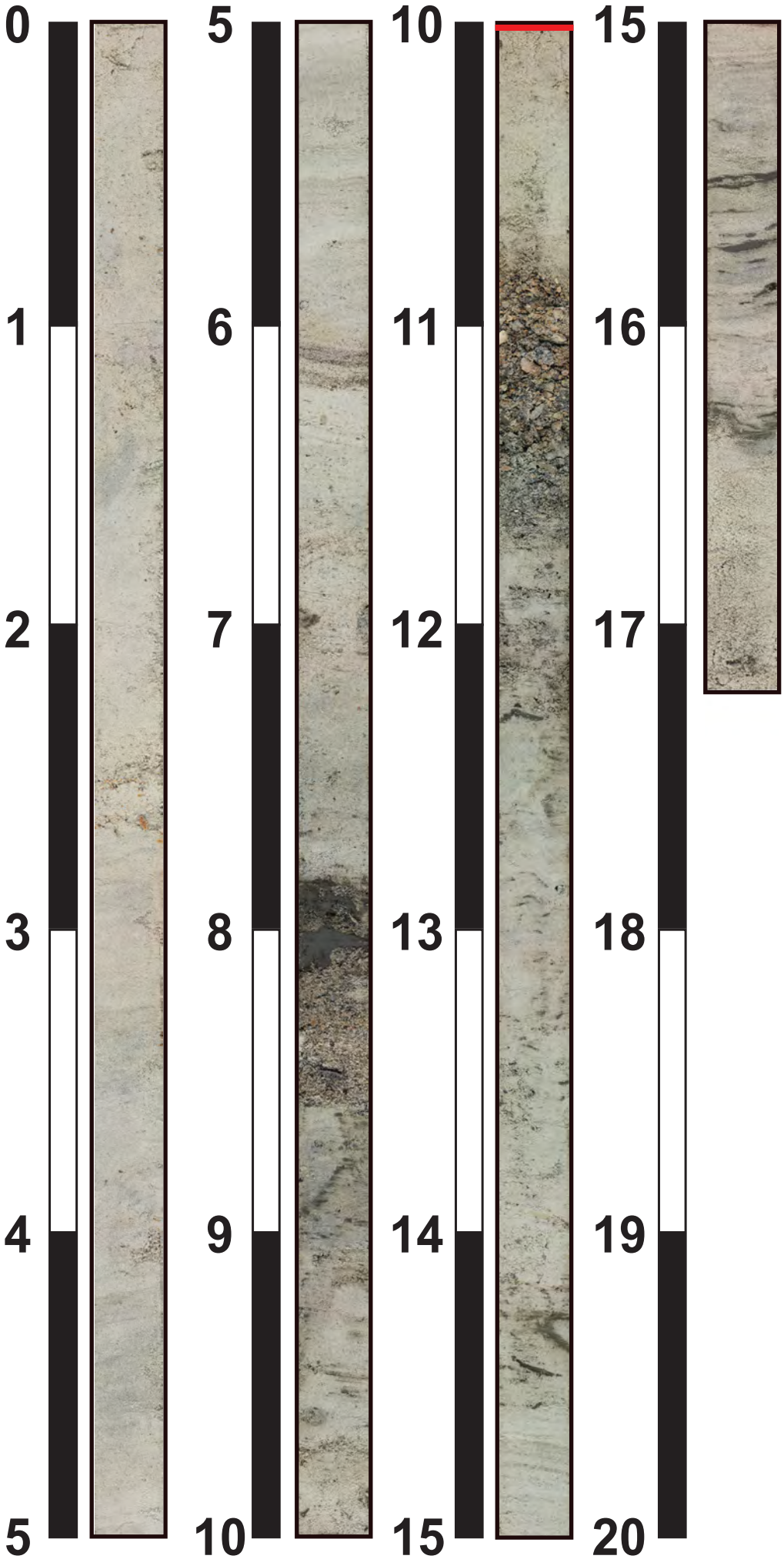
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-37**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 8/1**		

Tare Weight, (g):	50.08	
Dry Wt. Before Washing (g):	180.50	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.01	99.99	0	0.00
#14	1.400	0.03	99.97	50	0.02
#18	1.000	0.04	99.94	50	0.02
#25	0.710	0.09	99.87	30	0.03
#35	0.500	0.11	99.79	50	0.06
#45	0.355	0.12	99.69	30	0.04
#60	0.250	0.78	99.10	20	0.16
#80	0.180	20.63	83.28	1	0.21
#120	0.125	89.86	14.38	0	0.00
#170	0.090	15.12	2.78	0	0.00
#200	0.075	1.06	1.97	0	0.00
#230	0.063	0.26	1.77	0	0.00
Total Shell Content:		**0**		**%**	



Nassau Sound
Florida
2016 - 2017

C-38

Notes:
Scale in Feet
Photo Mosaic Image
= Jet Depth

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-38

DRILLING LOG

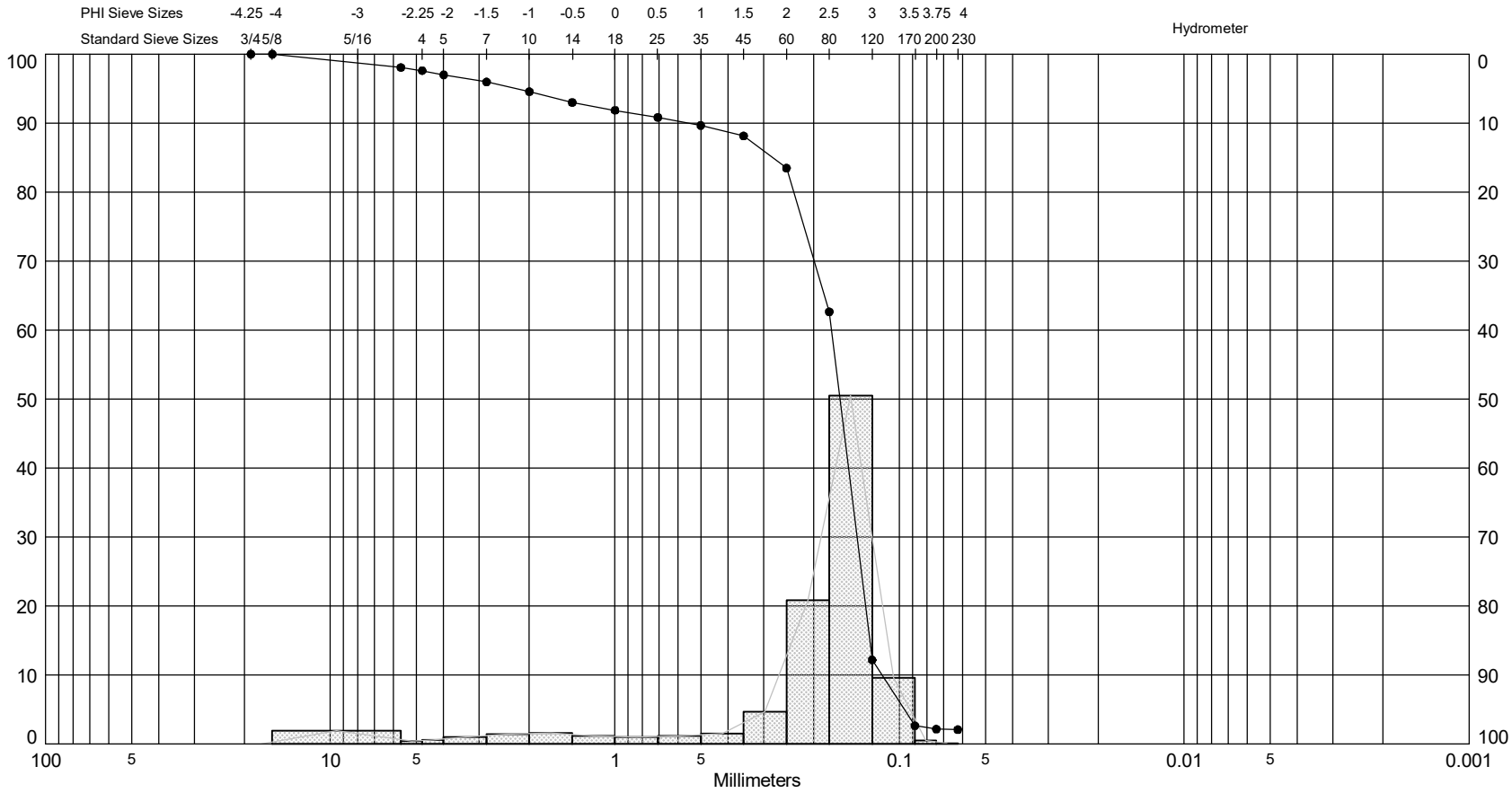
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-38
LOCATION COORDINATES	X = 524,310 Y = 2,247,925
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL: / BEARING:
14. WATER DEPTH	8.3 Ft.
15. DATE BORING	STARTED: 07-26-16 13:15 / COMPLETED: 07-26-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-10.8 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	17.2 Ft.
8. TOTAL DEPTH OF BORING	19.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-10.8	0.0					
			Fine SAND, trace shell fragments, bedding present, light greenish gray (10Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.60 Shell: 4%, Fines (#200) - 0.91 (SP)
-18.6	7.8					
-18.9	8.1		Medium stiff CLAY, little shell fragments, black (5Y-2.5/1), (CH).			
-19.4	8.6		Fine to medium SAND, few shell fragments <3.0cm, light greenish gray (10Y-7/1), (SP).		B	Sample #B, Depth = 8.3' - 8.8' Mean (mm): 0.49, Phi Sorting: 1.98 Shell: 26%, Fines (#200) - 1.18 (SP)
			Fine SAND, trace silt in thin lenses, light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 17.2' Mean (mm): 0.22, Phi Sorting: 1.31 Shell: 10%, Carbonate: 10.4%, Fines (#200) - 2.14 (SP)
-21.7	10.9					
-22.5	11.7		Fine to medium SAND, some shell fragments <2.0cm, light gray (2.5Y-7/1), (SW).			
			Fine SAND, trace silt in thin lenses and burrows, light greenish gray (10Y-7/1), (SP).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 0.19, Phi Sorting: 0.74 Shell: 3%, Fines (#200) - 2.53 (SP)
-28.0	17.2					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-38 #COMP	—●—	-10.8	SP	#200 - 2.14 #230 - 2.05		10.40	2.63	2.21	-2.65	9.75	1.31

Comments: Sample Interval = 0 - 17.2'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,310
Northing (Y, ft):	2,247,925
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

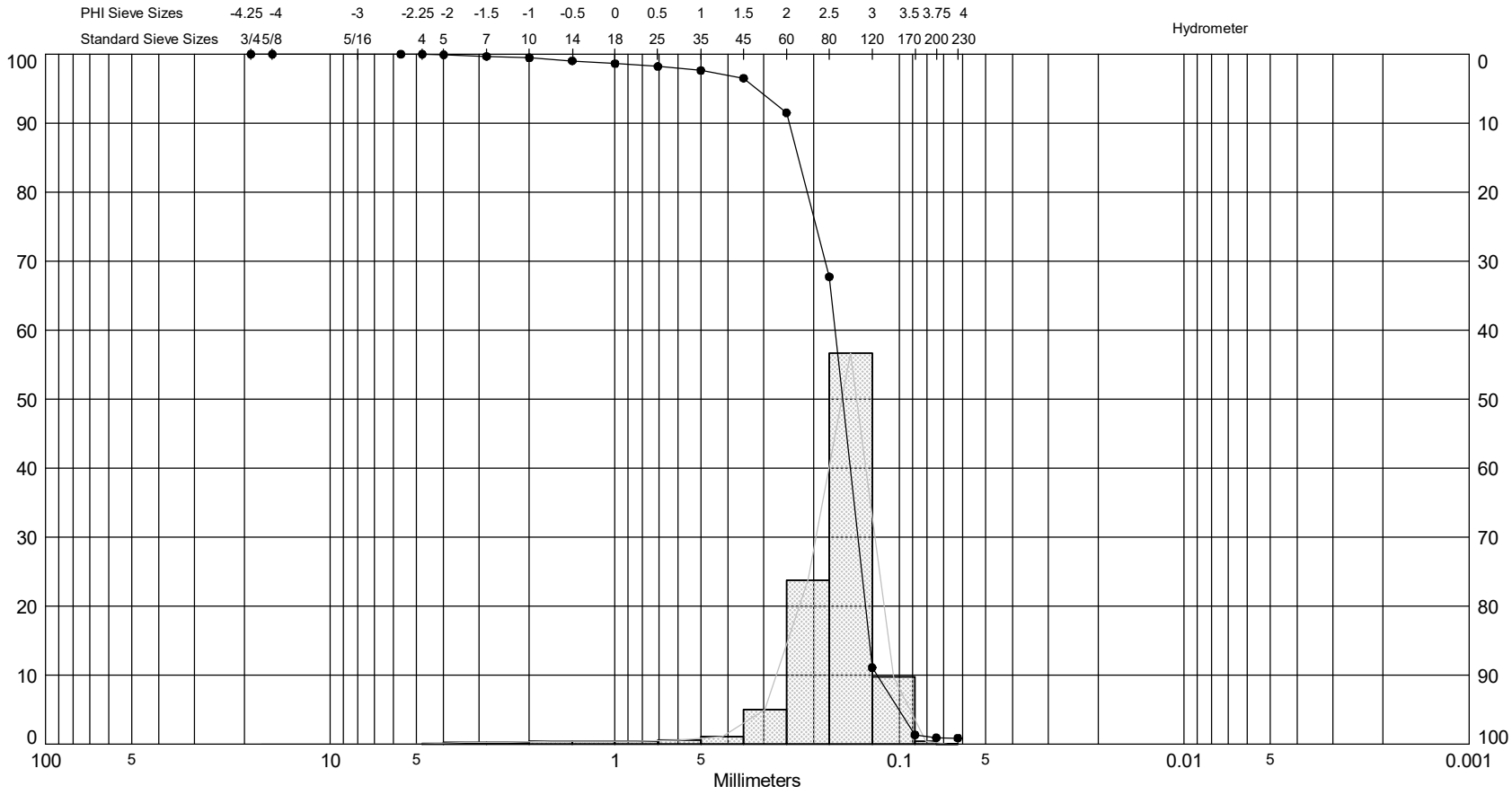
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-17.2'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-38**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	51.74	
Dry Wt. Before Washing (g):	221.53	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.27	98.07	100	3.27
#4	4.750	0.76	97.63	100	0.76
#5	4.000	1.05	97.01	100	1.05
#7	2.800	1.75	95.98	100	1.75
#10	2.000	2.39	94.57	100	2.39
#14	1.400	2.65	93.01	100	2.65
#18	1.000	1.92	91.88	100	1.92
#25	0.710	1.76	90.84	70	1.23
#35	0.500	1.97	89.68	50	0.99
#45	0.355	2.60	88.15	30	0.78
#60	0.250	7.93	83.48	10	0.79
#80	0.180	35.37	62.65	0	0.00
#120	0.125	85.67	12.19	0	0.00
#170	0.090	16.22	2.64	0	0.00
#200	0.075	0.83	2.15	0	0.00
#230	0.063	0.15	2.06	0	0.00
Total Shell Content:		**10**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-38 #A	—●—	-11.6	SP	#200 - 0.91 #230 - 0.87			2.66	2.54	-3.32	20.19	0.6

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,310
Northing (Y, ft):	2,247,925
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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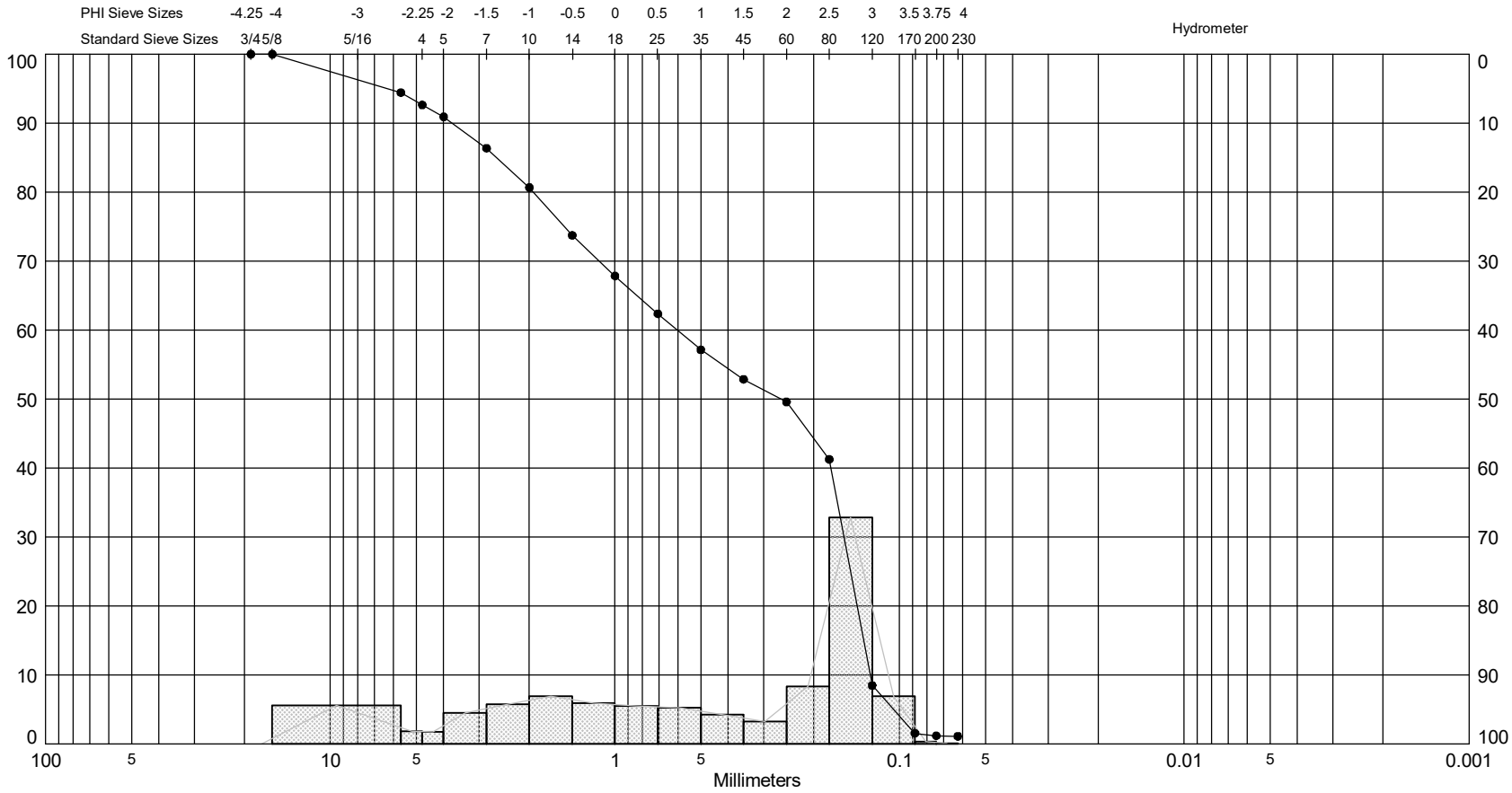
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-38**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	48.01	
Dry Wt. Before Washing (g):	195.87	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.12	99.92	100	0.12
#7	2.800	0.34	99.69	100	0.34
#10	2.000	0.33	99.47	100	0.33
#14	1.400	0.63	99.04	100	0.63
#18	1.000	0.61	98.63	100	0.61
#25	0.710	0.60	98.22	90	0.54
#35	0.500	0.87	97.63	70	0.61
#45	0.355	1.64	96.52	40	0.66
#60	0.250	7.41	91.51	20	1.48
#80	0.180	35.16	67.73	1	0.35
#120	0.125	83.75	11.09	0	0.00
#170	0.090	14.43	1.33	0	0.00
#200	0.075	0.62	0.91	0	0.00
#230	0.063	0.06	0.87	0	0.00
Total Shell Content:		**4**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-38 #B	—●—	-19.1	SP	#200 - 1.18 #230 - 1.11			1.94	1.03	-0.66	2.15	1.98

Comments: Sample Depth = 8.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,310
Northing (Y, ft):	2,247,925
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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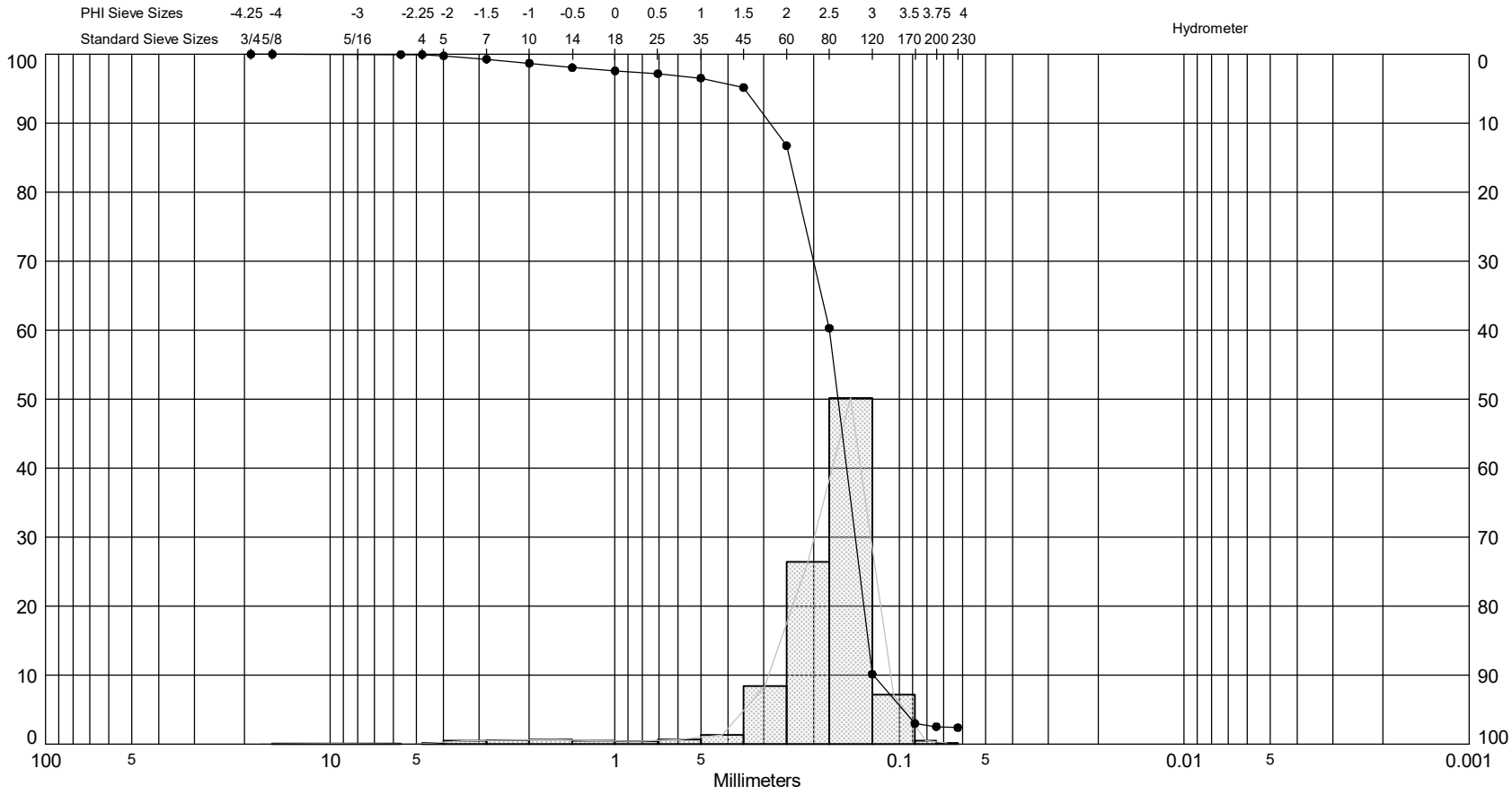
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8.5'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-38**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.47	
Dry Wt. Before Washing (g):	190.21	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.83	94.44	100	7.83
#4	4.750	2.53	92.64	100	2.53
#5	4.000	2.43	90.91	90	2.19
#7	2.800	6.39	86.37	80	5.11
#10	2.000	8.04	80.66	70	5.63
#14	1.400	9.76	73.72	60	5.86
#18	1.000	8.28	67.84	40	3.31
#25	0.710	7.71	62.36	30	2.31
#35	0.500	7.38	57.12	15	1.11
#45	0.355	5.99	52.86	5	0.30
#60	0.250	4.61	49.59	1	0.05
#80	0.180	11.73	41.25	0	0.00
#120	0.125	46.16	8.46	0	0.00
#170	0.090	9.74	1.53	0	0.00
#200	0.075	0.51	1.17	0	0.00
#230	0.063	0.10	1.10	0	0.00
Total Shell Content:		**26**		**%**	



SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-38 #C	—●—	-24.6	SP	#200 - 2.53 #230 - 2.38			2.6	2.43	-3.24	17.49	0.74

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,310
Northing (Y, ft):	2,247,925
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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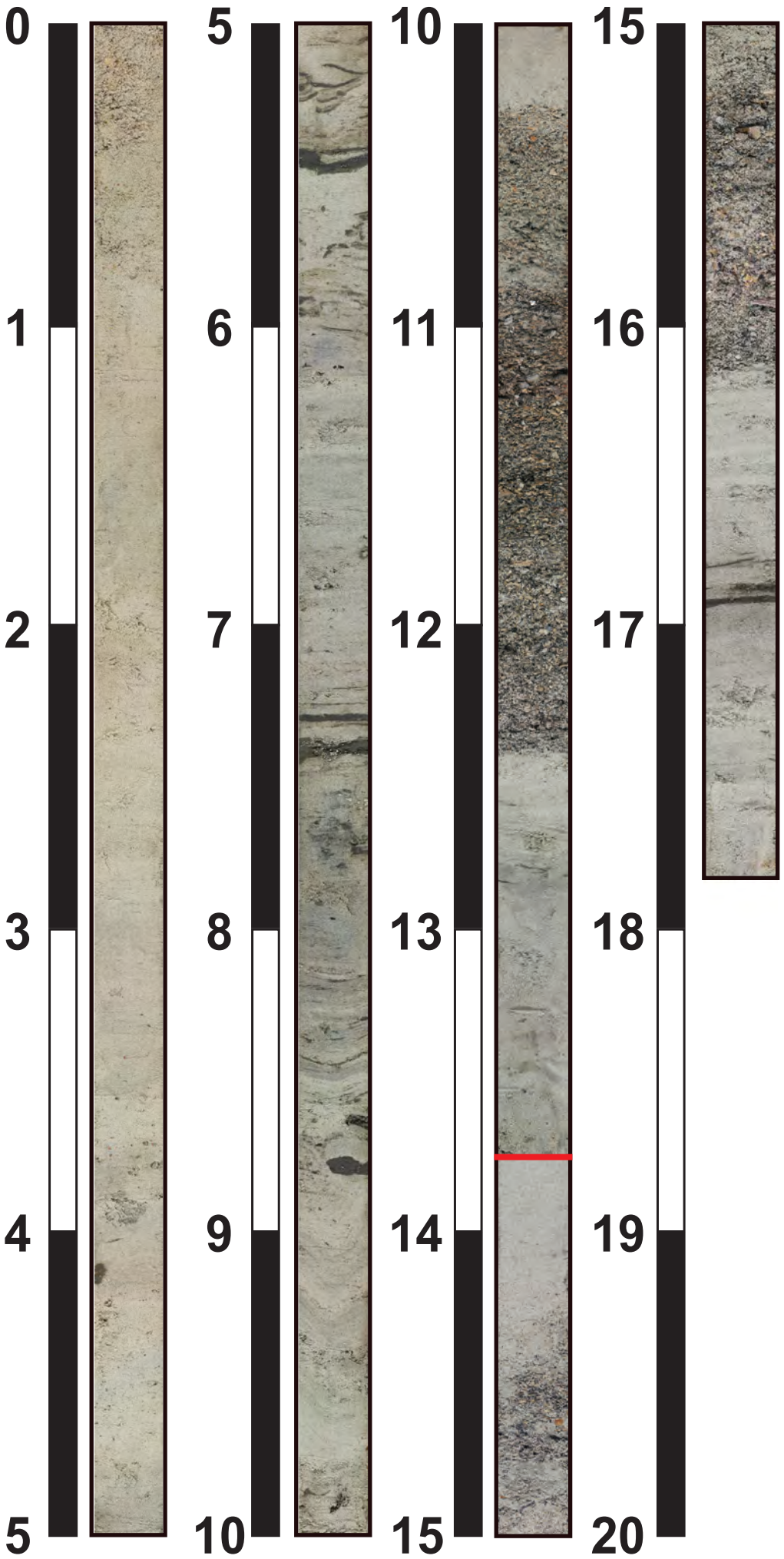
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-38**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.29	
Dry Wt. Before Washing (g):	180.61	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.07	99.95	100	0.07
#4	4.750	0.00	99.95	0	0.00
#5	4.000	0.24	99.76	100	0.24
#7	2.800	0.64	99.28	98	0.63
#10	2.000	0.76	98.70	70	0.53
#14	1.400	0.85	98.05	60	0.51
#18	1.000	0.60	97.59	50	0.30
#25	0.710	0.52	97.20	40	0.21
#35	0.500	0.85	96.55	30	0.26
#45	0.355	1.80	95.18	25	0.45
#60	0.250	11.08	86.74	1	0.11
#80	0.180	34.72	60.30	0	0.00
#120	0.125	65.87	10.14	0	0.00
#170	0.090	9.38	3.00	0	0.00
#200	0.075	0.61	2.54	0	0.00
#230	0.063	0.20	2.38	0	0.00
Total Shell Content:		**3**		**%**	



Nassau Sound
Florida
2016 - 2017

C-39

Notes:
Scale in Feet
Photo Mosaic Image
= Jet Depth

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McClellanville, SC 29458
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Boring Designation C-39

DRILLING LOG

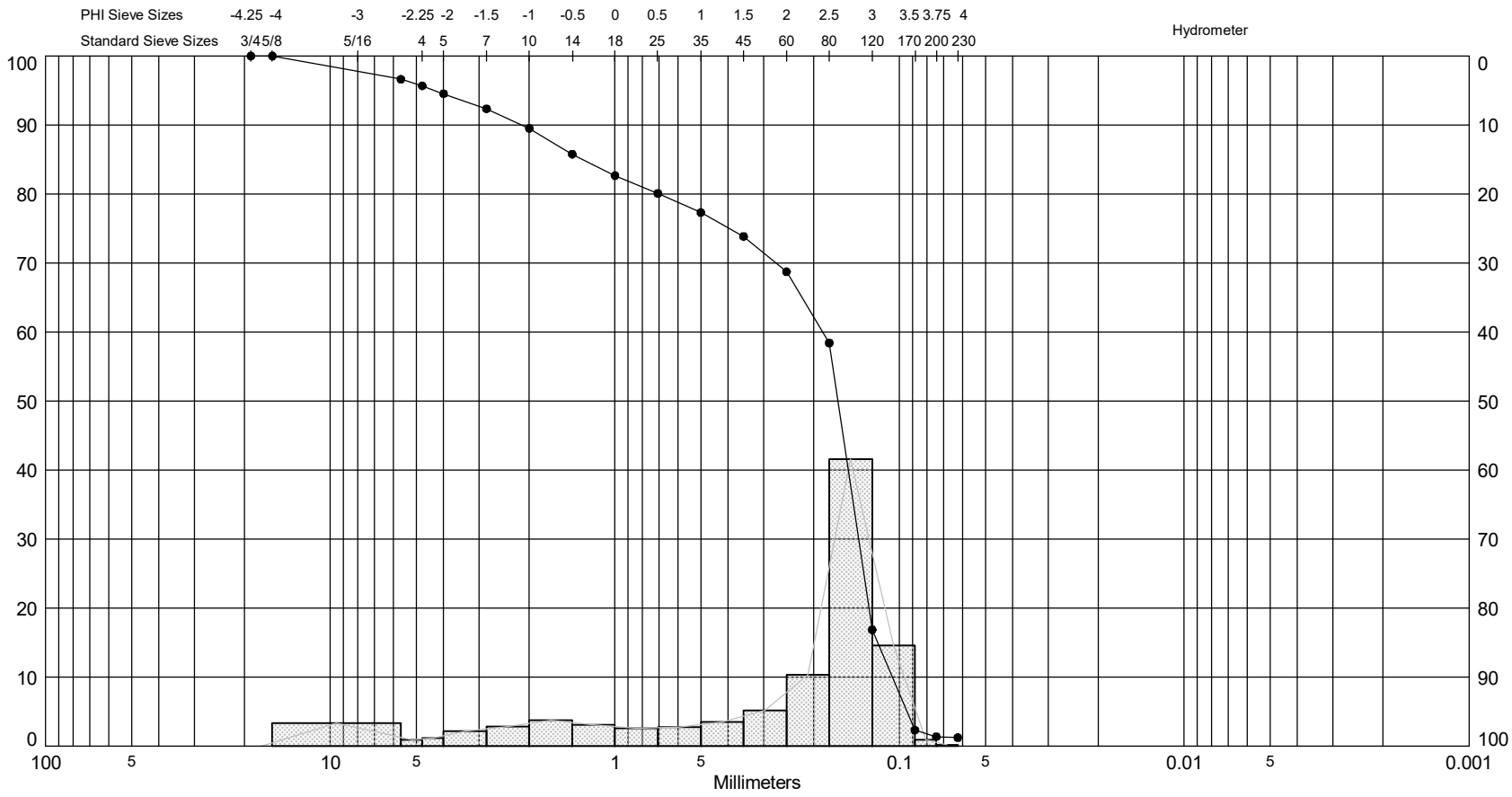
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	C-39
LOCATION COORDINATES	X = 524,250 Y = 2,248,633
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	14.8 Ft.
15. DATE BORING	STARTED: 07-25-16 08:10 / COMPLETED: 07-25-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-15.9 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	17.8 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-15.9	0.0					
			Fine SAND, trace shell fragments, clay rip up at 4.2', white (2.5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.80 Shell: 5%, Fines (#200) - 1.15 (SP)
-20.8	4.9					
			Fine SAND, trace silt in thin lenses, bedding present, greenish gray (10Y-6/1), (SP).		B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.12, Phi Sorting: 0.37 Shell: 0%, Fines (#200) - 2.87 (SP)
-26.2	10.3				COMP	Sample #COMP, Depth = 0.0' - 17.8' Mean (mm): 0.29, Phi Sorting: 1.73 Shell: 20%, Carbonate: 21.3%, Fines (#200) - 1.37 (SP)
			Fine to medium SAND, some shell fragments <1.0cm, light greenish gray (10Y-7/1), (SW).			
-28.3	12.4					
			Fine SAND, clean, bedding present, light greenish gray (10Y-7/1), (SP).			
-30.4	14.5					
			Fine SAND, little shell fragments <3.0cm, light greenish gray (10Y-7/1), (SW).		C	Sample #C, Depth = 15.8' - 16.3' Mean (mm): 0.16, Phi Sorting: 0.48 Shell: 2%, Fines (#200) - 1.37 (SP)
-32.1	16.2					
			Fine SAND, trace silt in lenses, light greenish gray (10Y-7/1), (SP).			
-33.7	17.8					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-39 #COMP	—●—	-15.9	SP	#200 - 1.37 #230 - 1.22		21.30	2.6	1.8	-1.5	4.18	1.73

Comments: Sample Interval = 0 - 17.8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,250
Northing (Y, ft):	2,248,633
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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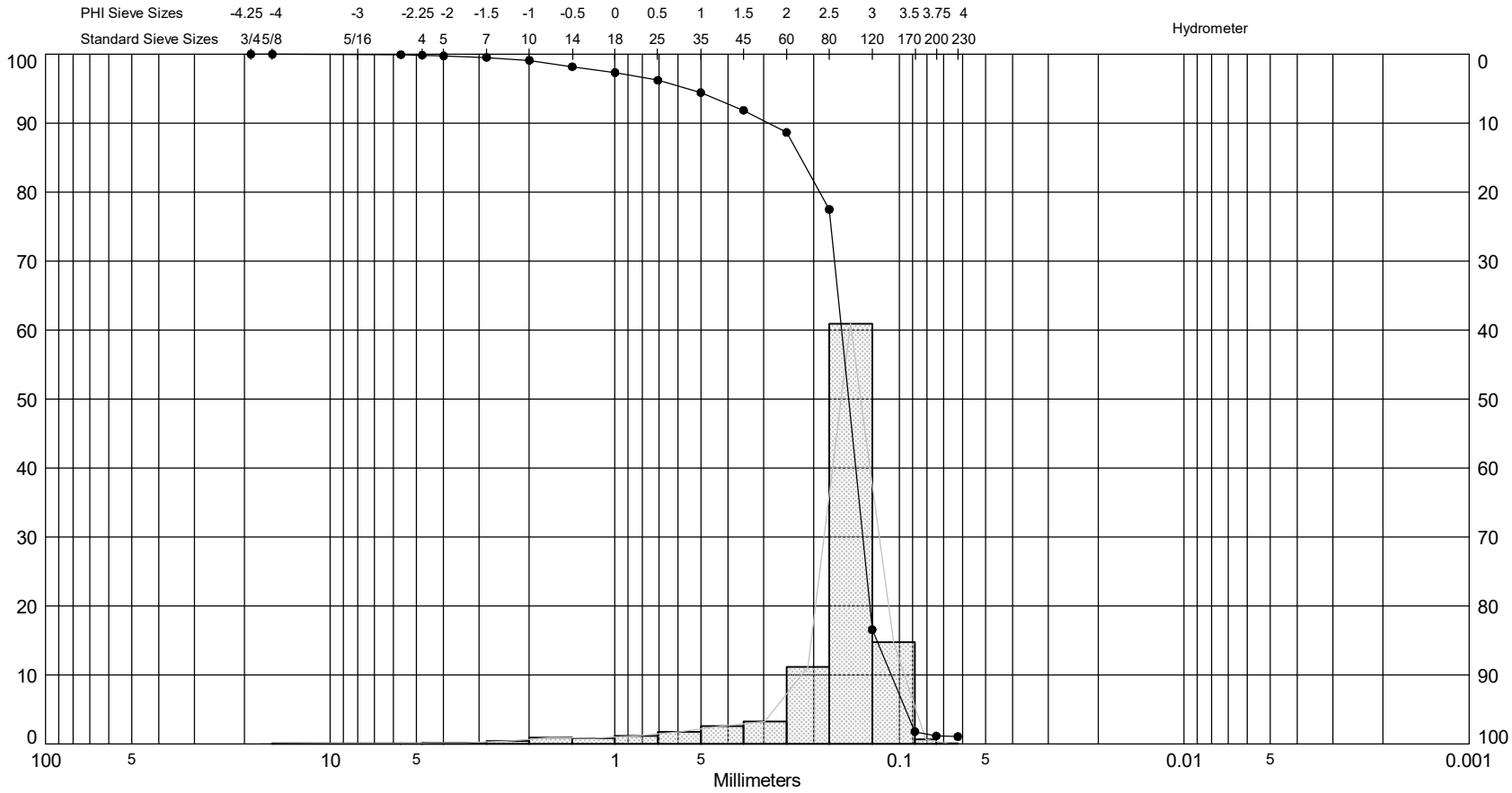
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-17.8**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-39**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.06	
Dry Wt. Before Washing (g):	182.26	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	4.45	96.63	100	4.45
#4	4.750	1.24	95.70	100	1.24
#5	4.000	1.52	94.55	100	1.52
#7	2.800	2.89	92.36	100	2.89
#10	2.000	3.74	89.53	100	3.74
#14	1.400	4.95	85.79	80	3.96
#18	1.000	4.12	82.67	75	3.09
#25	0.710	3.40	80.10	60	2.04
#35	0.500	3.66	77.33	40	1.46
#45	0.355	4.57	73.87	30	1.37
#60	0.250	6.78	68.74	15	1.02
#80	0.180	13.63	58.43	1	0.14
#120	0.125	54.94	16.88	0	0.00
#170	0.090	19.23	2.33	0	0.00
#200	0.075	1.24	1.39	0	0.00
#230	0.063	0.20	1.24	0	0.00
Total Shell Content:		**20**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-39 #A	—●—	-16.7	SP	#200 - 1.15 #230 - 1.06			2.73	2.54	-2.96	13.84	0.8

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,250
Northing (Y, ft):	2,248,633
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

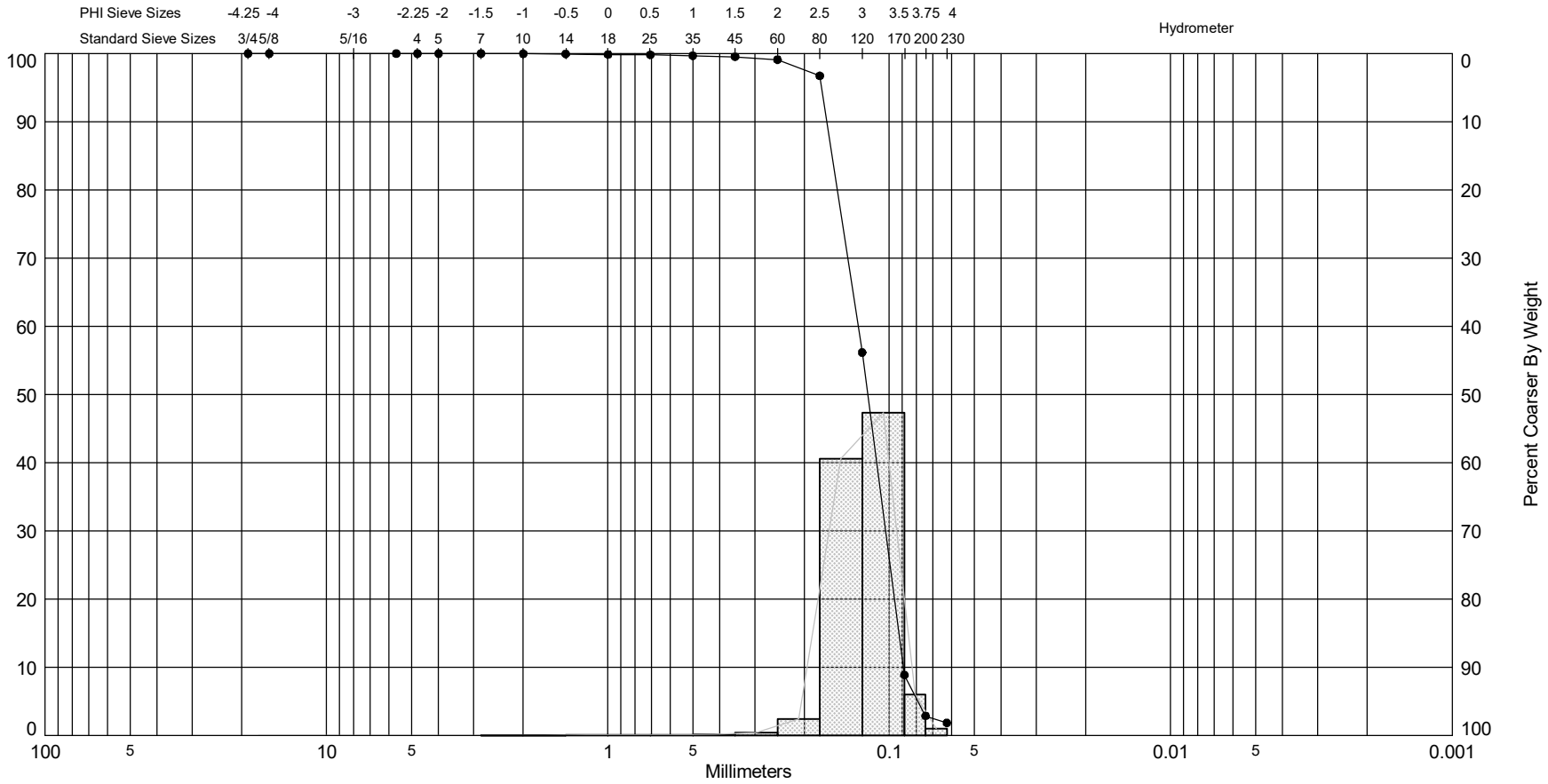
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-39**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	49.51	
Dry Wt. Before Washing (g):	180.69	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.09	99.93	100	0.09
#4	4.750	0.08	99.87	100	0.08
#5	4.000	0.17	99.74	100	0.17
#7	2.800	0.26	99.54	100	0.26
#10	2.000	0.56	99.12	95	0.53
#14	1.400	1.21	98.19	100	1.21
#18	1.000	1.11	97.35	80	0.89
#25	0.710	1.48	96.22	60	0.89
#35	0.500	2.33	94.44	30	0.70
#45	0.355	3.36	91.88	20	0.67
#60	0.250	4.23	88.66	10	0.42
#80	0.180	14.63	77.50	1	0.15
#120	0.125	79.95	16.56	0	0.00
#170	0.090	19.37	1.79	0	0.00
#200	0.075	0.82	1.17	0	0.00
#230	0.063	0.12	1.07	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-39 #B	—●—	-23.7	SP	#200 - 2.87 #230 - 1.85			3.07	3.03	-1.93	17.56	0.37

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,250
Northing (Y, ft):	2,248,633
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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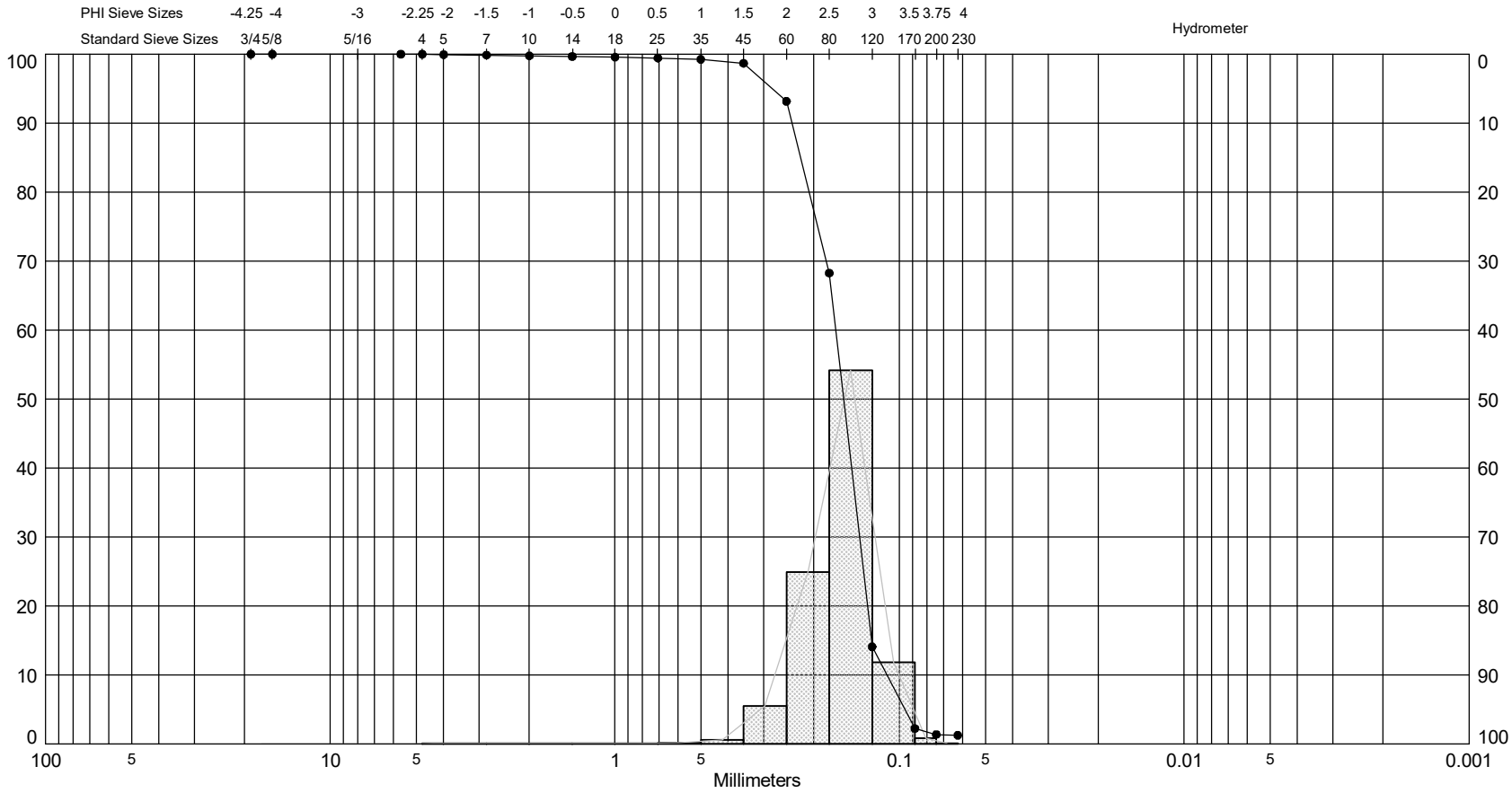
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-39**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 7/1**		

Tare Weight, (g):	50.07	
Dry Wt. Before Washing (g):	166.70	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.03	99.97	100	0.03
#14	1.400	0.02	99.96	90	0.02
#18	1.000	0.09	99.88	70	0.06
#25	0.710	0.07	99.82	50	0.04
#35	0.500	0.14	99.70	30	0.04
#45	0.355	0.18	99.55	20	0.04
#60	0.250	0.50	99.12	10	0.05
#80	0.180	2.78	96.73	5	0.14
#120	0.125	47.30	56.18	0	0.00
#170	0.090	55.17	8.87	0	0.00
#200	0.075	7.00	2.87	0	0.00
#230	0.063	1.19	1.85	0	0.00
Total Shell Content:		**0**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-39 #C	—●—	-31.7	SP	#200 - 1.37 #230 - 1.26			2.67	2.6	-2.58	21.13	0.48

Comments: Sample Depth = 16'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,250
Northing (Y, ft):	2,248,633
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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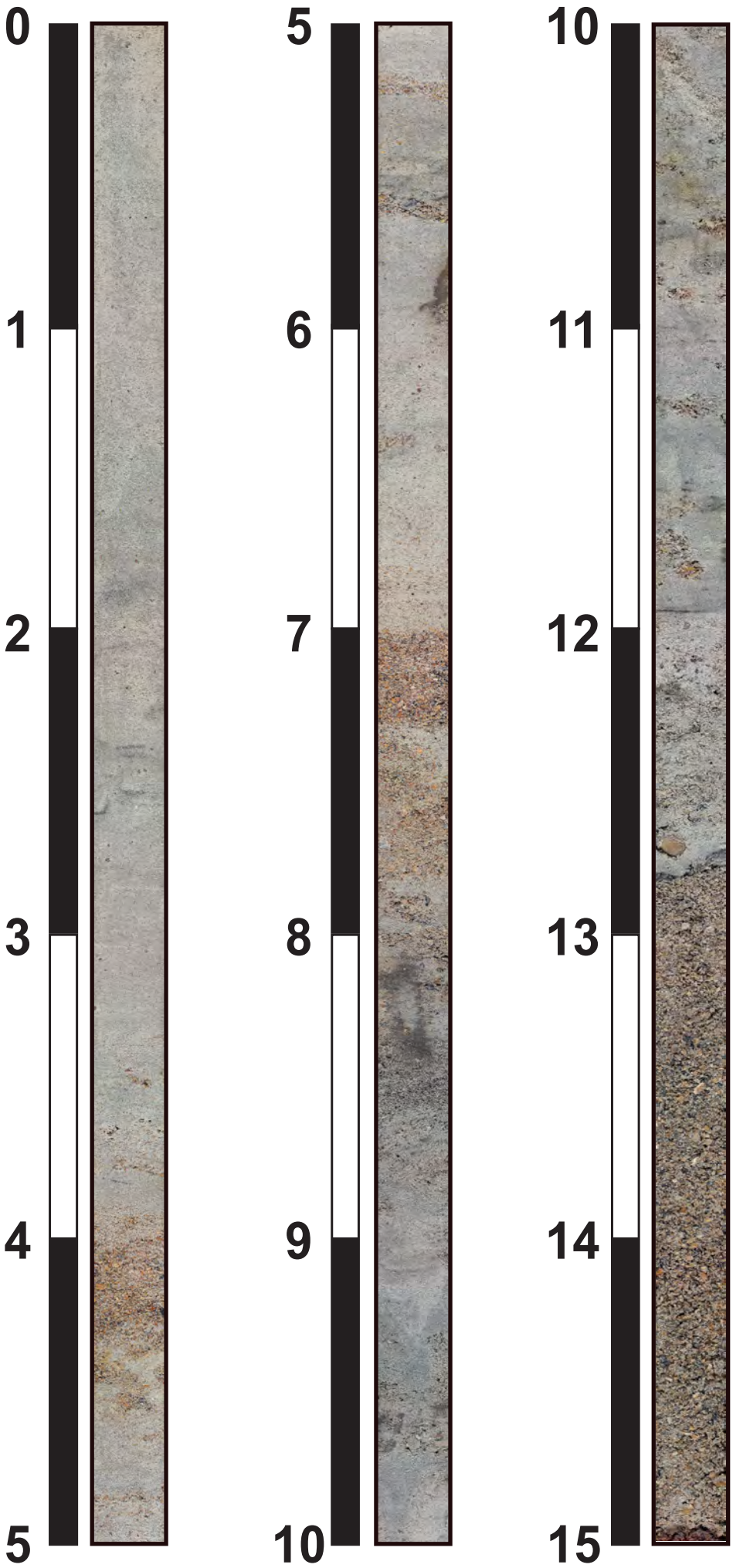
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**16'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-39**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	49.61	
Dry Wt. Before Washing (g):	194.59	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.08	99.94	100	0.08
#7	2.800	0.11	99.87	100	0.11
#10	2.000	0.14	99.77	90	0.13
#14	1.400	0.15	99.67	70	0.11
#18	1.000	0.15	99.57	70	0.11
#25	0.710	0.17	99.45	50	0.09
#35	0.500	0.28	99.26	40	0.11
#45	0.355	0.82	98.69	30	0.25
#60	0.250	8.01	93.16	20	1.60
#80	0.180	36.09	68.27	0	0.00
#120	0.125	78.56	14.08	0	0.00
#170	0.090	17.18	2.23	0	0.00
#200	0.075	1.26	1.37	0	0.00
#230	0.063	0.16	1.26	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-40

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-40

DRILLING LOG

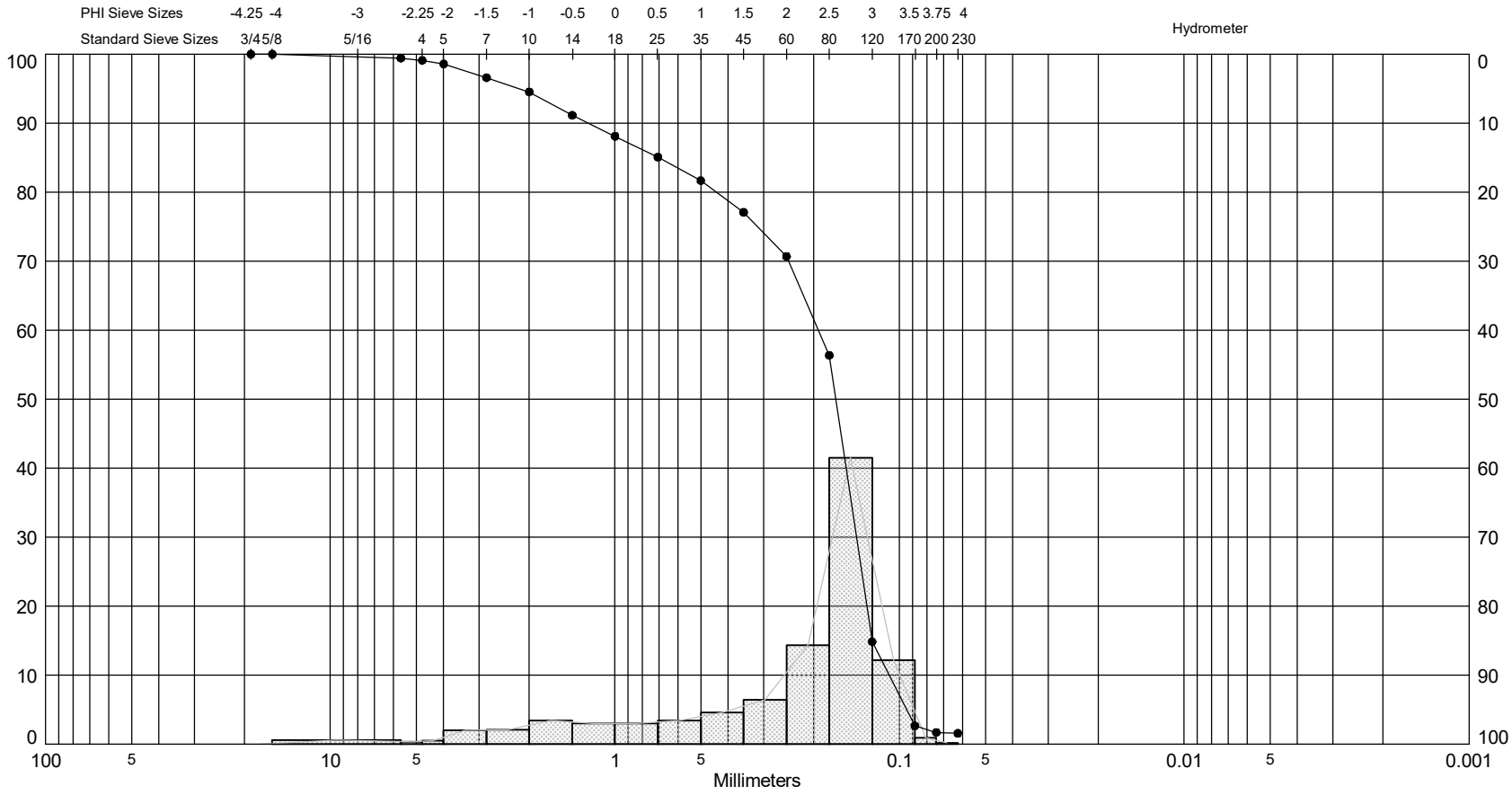
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-40
LOCATION COORDINATES	X = 523,203 Y = 2,248,171
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	9.7 Ft.
15. DATE BORING	STARTED: 03-17-17 11:33 / COMPLETED: 03-17-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-9.1 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	15 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-9.1	0.0					
			Fine quartz SAND, few fine to coarse sand-size shell, trace silt in occasional burrow, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.65 Shell: 3%, Fines (#200) - 1.15 (SP)
-13.1	4.0					
-13.5	4.4		Medium quartz SAND, some medium to coarse sand-size shell, poorly graded, loose, subangular, light yellowish brown (2.5Y-6/3), (SP).			
			Fine quartz SAND, few fine to coarse sand-size shell, trace silt in occasional burrow, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		COMP	Sample #COMP, Depth = 0.0' - 15.0' Mean (mm): 0.25, Phi Sorting: 1.37 Shell: 18%, Carbonate: 17.0%, Fines (#200) - 1.70 (SP)
-16.1	7.0					
-17.1	8.0		Medium quartz SAND, some (grading to little) medium to coarse sand-size shell, poorly graded, loose, subangular, light yellowish brown (2.5Y-6/3), (SP).			Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.19, Phi Sorting: 1.20 Shell: 8%, Fines (#200) - 1.69 (SP)
			Fine quartz SAND, few fine to coarse sand-size shell, trace silt in burrows, well graded, loose, subangular, 12.0-12.8' = sand grain size and shell percentage increases, 8.3' = silt-lined Callianassa major burrow, gray (5Y-6/1), (SW).		B	
-21.9	12.8				C	Sample #C, Depth = 12.3' - 12.8' Mean (mm): 0.35, Phi Sorting: 1.82 Shell: 27%, Fines (#200) - 1.20 (SP)
			Medium quartz SAND, some coarse sand to fine gravel-size shell, poorly graded, very loose, subangular, olive gray (5Y-5/2), (SP).			
-24.1	15.0					
-25.1	16.0		Loss of recovery during core barrel retrieval.			
			End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-40 #COMP	—●—	-9.1	SP	#200 - 1.70 #230 - 1.55		17.00	2.58	2	-1.6	4.84	1.37

Comments: Sample Interval = 0 - 15.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,203
Northing (Y, ft):	2,248,171
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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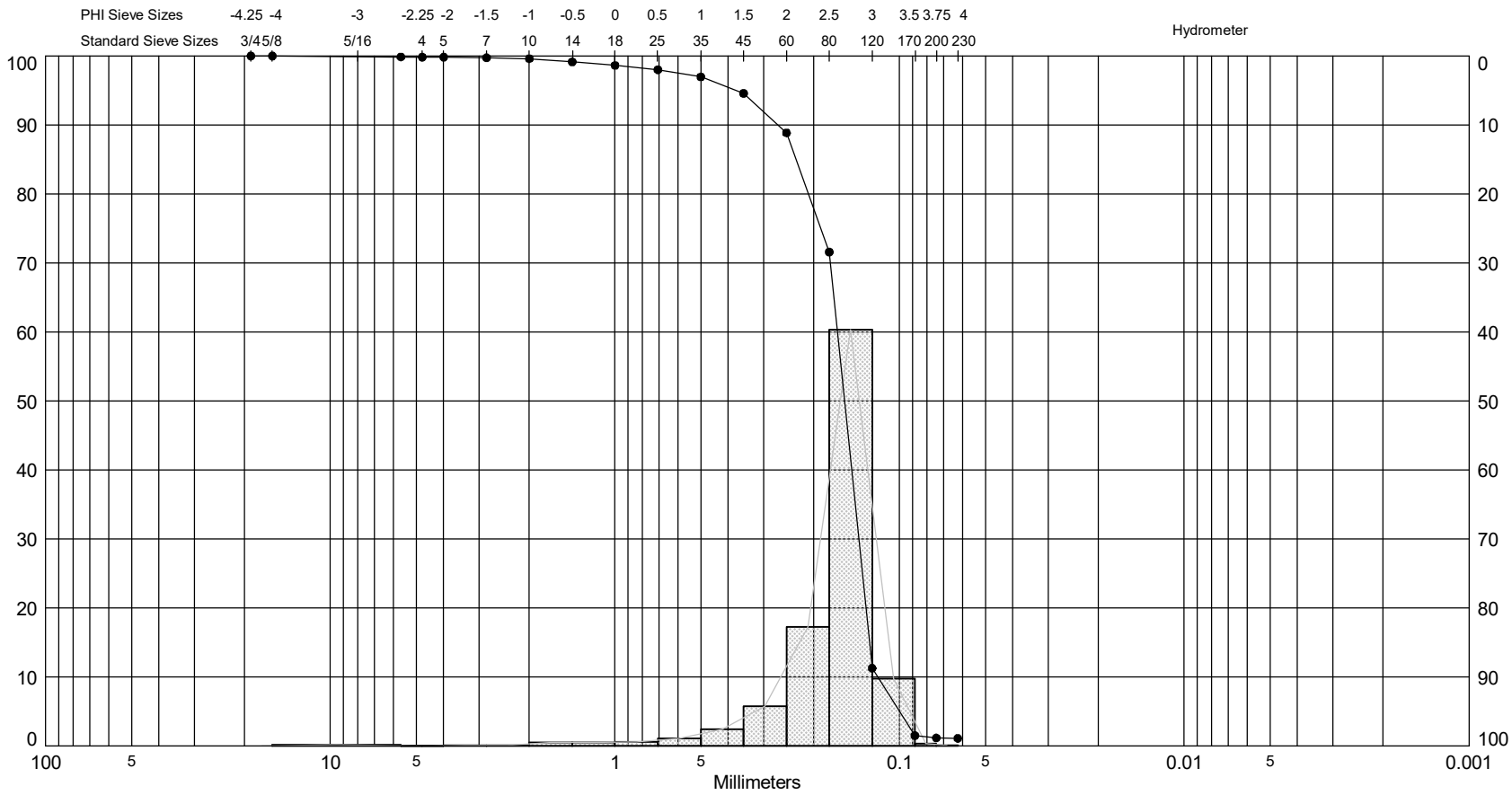
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-15'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-40**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.86	
Dry Wt. Before Washing (g):	175.72	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.71	99.44	100	0.71
#4	4.750	0.41	99.11	100	0.41
#5	4.000	0.65	98.59	100	0.65
#7	2.800	2.50	96.61	100	2.50
#10	2.000	2.59	94.55	100	2.59
#14	1.400	4.27	91.16	100	4.27
#18	1.000	3.82	88.12	98	3.74
#25	0.710	3.81	85.09	80	3.05
#35	0.500	4.28	81.69	50	2.14
#45	0.355	5.79	77.09	30	1.74
#60	0.250	8.03	70.71	5	0.40
#80	0.180	18.05	56.37	1	0.18
#120	0.125	52.24	14.87	0	0.00
#170	0.090	15.35	2.67	0	0.00
#200	0.075	1.20	1.72	0	0.00
#230	0.063	0.19	1.57	0	0.00
Total Shell Content:		**18**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-40 #A	—●—	-9.9	SP	#200 - 1.15 #230 - 1.10			2.68	2.53	-3.28	20.05	0.65

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,203
Northing (Y, ft):	2,248,171
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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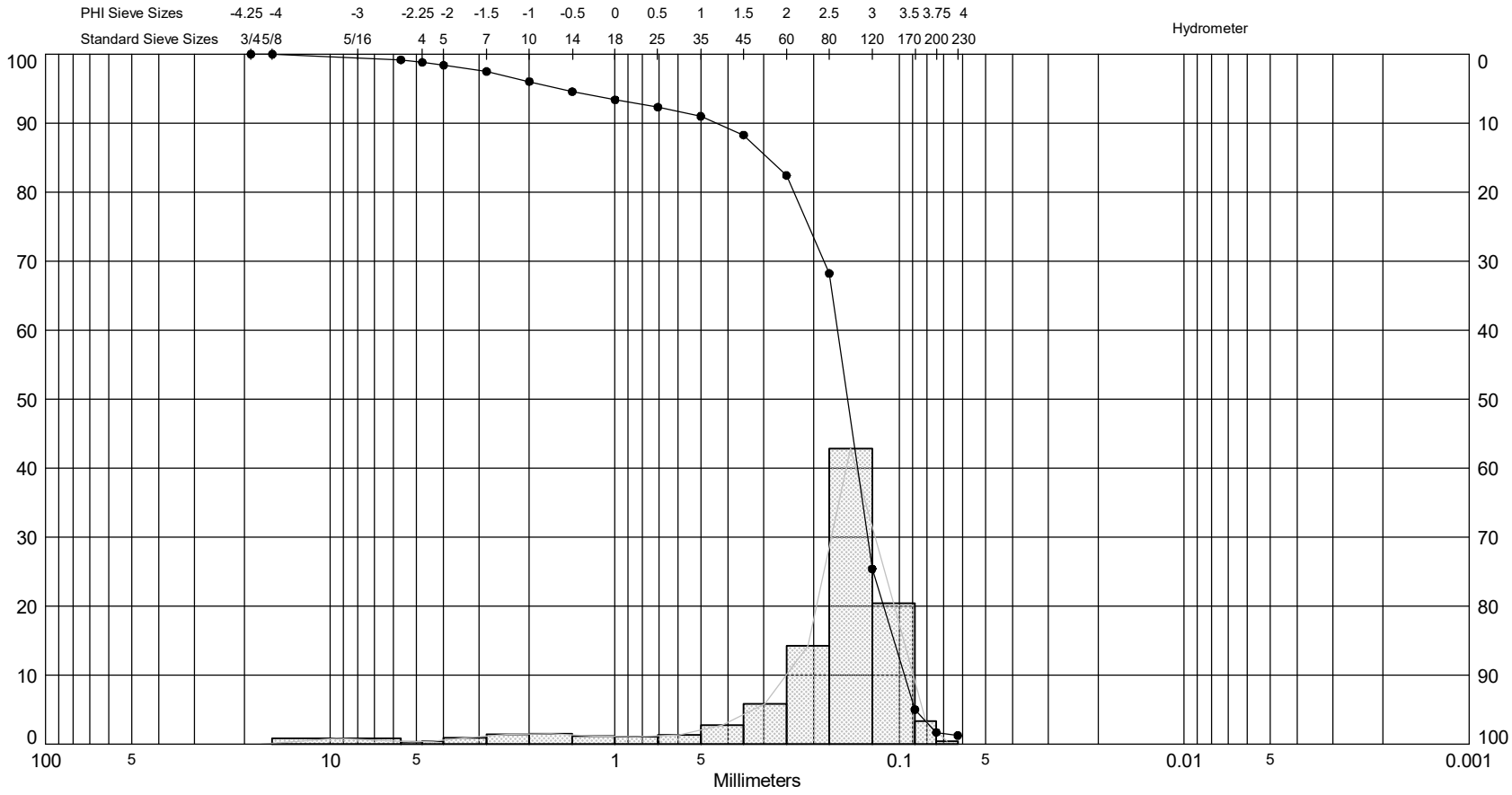
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-40**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.60	
Dry Wt. Before Washing (g):	162.07	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.15	99.87	100	0.15
#4	4.750	0.03	99.84	100	0.03
#5	4.000	0.01	99.83	100	0.01
#7	2.800	0.10	99.74	100	0.10
#10	2.000	0.14	99.62	100	0.14
#14	1.400	0.54	99.14	100	0.54
#18	1.000	0.57	98.63	100	0.57
#25	0.710	0.70	98.01	90	0.63
#35	0.500	1.18	96.96	50	0.59
#45	0.355	2.68	94.58	10	0.27
#60	0.250	6.42	88.87	1	0.06
#80	0.180	19.45	71.57	0	0.00
#120	0.125	67.83	11.27	0	0.00
#170	0.090	11.00	1.48	0	0.00
#200	0.075	0.38	1.15	0	0.00
#230	0.063	0.06	1.09	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-40 #B	—●—	-17.9	SP	#200 - 1.69 #230 - 1.24			2.71	2.38	-2.49	9.65	1.2

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,203
Northing (Y, ft):	2,248,171
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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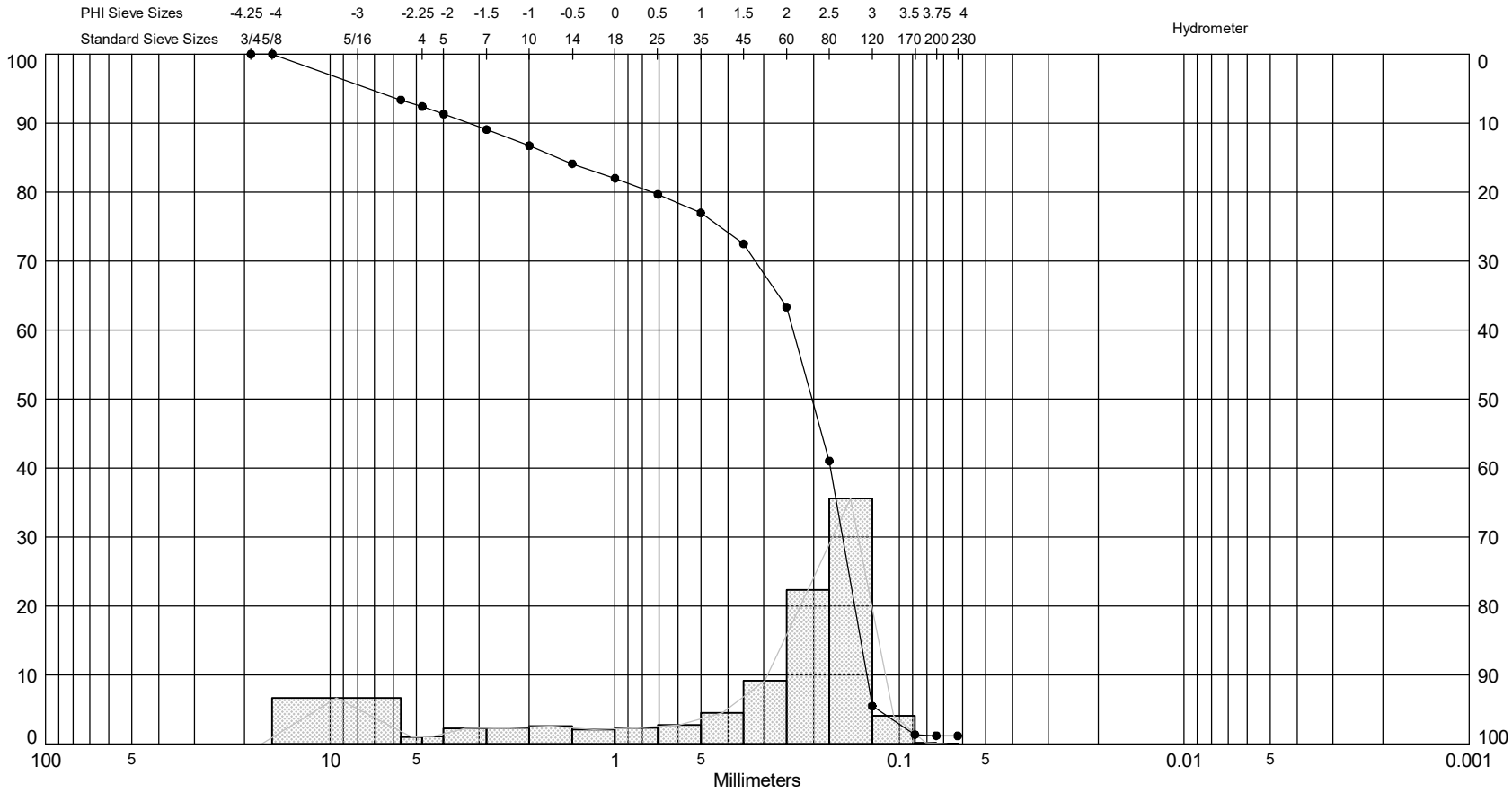
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-40**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	48.89	
Dry Wt. Before Washing (g):	193.47	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.18	99.18	100	1.18
#4	4.750	0.54	98.81	100	0.54
#5	4.000	0.59	98.40	100	0.59
#7	2.800	1.31	97.50	100	1.31
#10	2.000	2.09	96.05	100	2.09
#14	1.400	2.14	94.57	100	2.14
#18	1.000	1.71	93.39	98	1.68
#25	0.710	1.55	92.32	80	1.24
#35	0.500	1.89	91.01	50	0.95
#45	0.355	3.92	88.30	10	0.39
#60	0.250	8.47	82.44	1	0.08
#80	0.180	20.55	68.23	0	0.00
#120	0.125	61.94	25.38	0	0.00
#170	0.090	29.46	5.01	0	0.00
#200	0.075	4.78	1.70	0	0.00
#230	0.063	0.65	1.25	0	0.00
Total Shell Content:		**8**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-40 #C	—●—	-21.4	SP	#200 - 1.20 #230 - 1.17			2.3	1.53	-1.54	4.15	1.82

Comments: Sample Depth = 12.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,203
Northing (Y, ft):	2,248,171
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
fax

SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

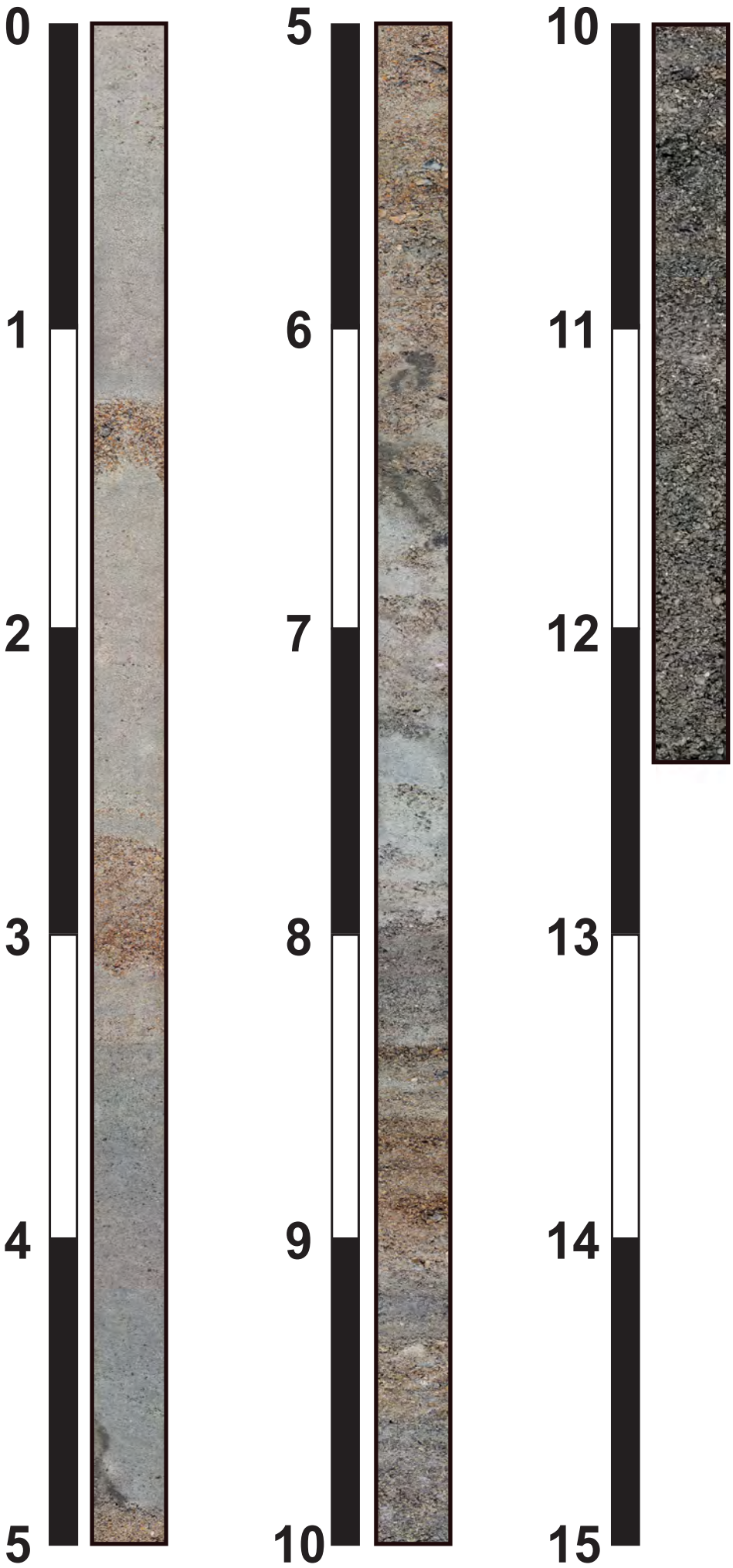
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**12.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-40**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.37	
Dry Wt. Before Washing (g):	166.72	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.78	93.37	100	7.78
#4	4.750	1.13	92.41	100	1.13
#5	4.000	1.29	91.31	100	1.29
#7	2.800	2.63	89.07	100	2.63
#10	2.000	2.76	86.71	100	2.76
#14	1.400	3.05	84.12	100	3.05
#18	1.000	2.46	82.02	100	2.46
#25	0.710	2.75	79.68	90	2.48
#35	0.500	3.18	76.97	70	2.23
#45	0.355	5.27	72.48	50	2.64
#60	0.250	10.74	63.32	30	3.22
#80	0.180	26.17	41.02	1	0.26
#120	0.125	41.73	5.46	0	0.00
#170	0.090	4.84	1.34	0	0.00
#200	0.075	0.18	1.18	0	0.00
#230	0.063	0.03	1.16	0	0.00
Total Shell Content:		**27**		**%**	



Nassau Sound
Florida
2016 - 2017

C-41

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-41

DRILLING LOG

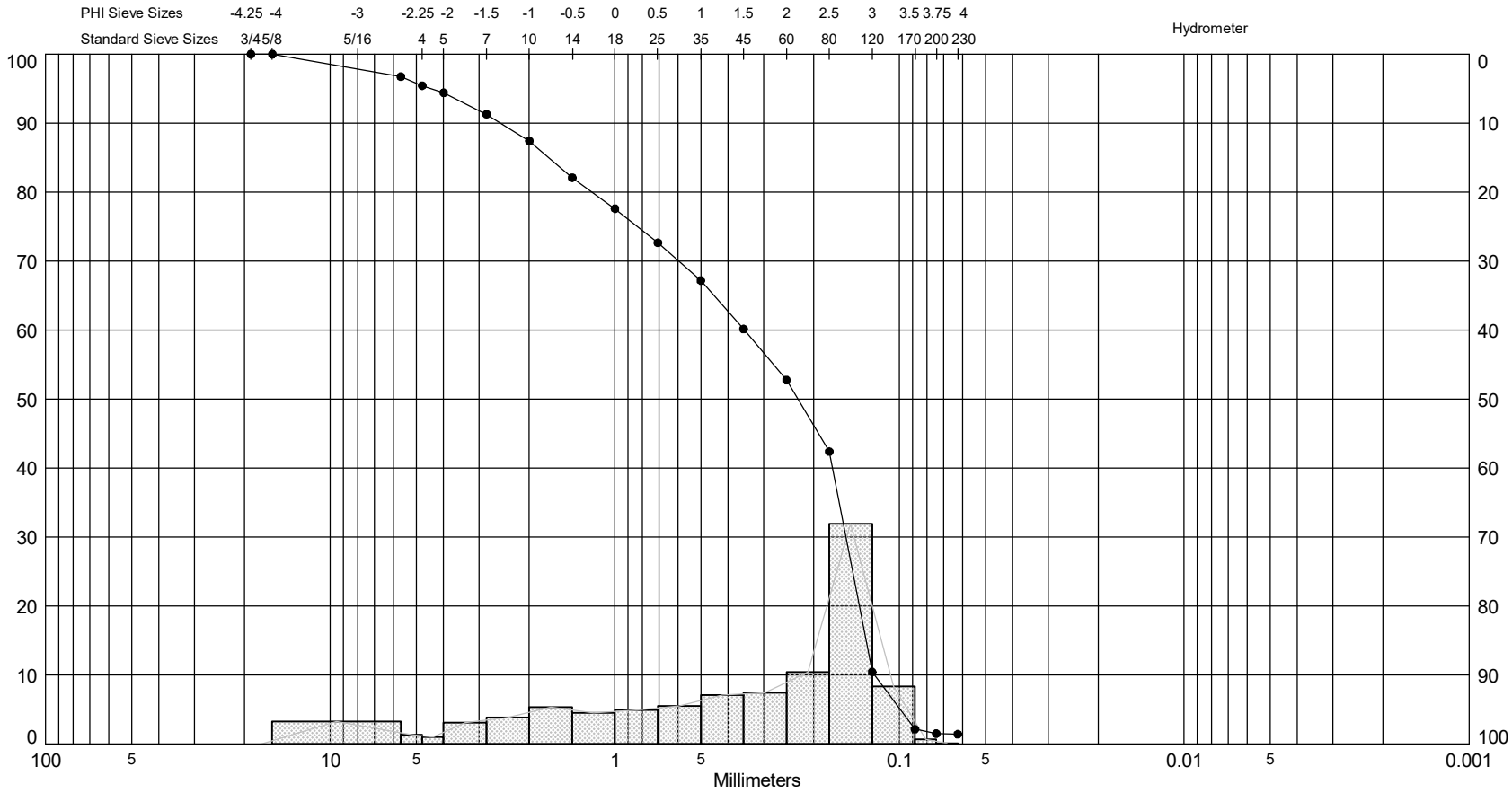
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-41
LOCATION COORDINATES	X = 522,513 Y = 2,248,825
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 3 — UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	11.1 Ft.
15. DATE BORING	STARTED: 03-17-17 10:10 — COMPLETED: 03-17-17
16. ELEVATION TOP OF BORING	-11.4 Ft.
17. TOTAL RECOVERY FOR BORING	12.4 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-11.4	0.0					
			Fine quartz SAND, trace fine to coarse sand-size shell, pooly graded, loose, subangular, 1.3-1.5' and 2.7-3.1' = shell percentage increases to ~40%, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.68 Shell: 4%, Fines (#200) - 1.00 (SP)
-14.7	3.3					
			Fine quartz SAND, few fine to coarse sand-size shell, trace silt in burrow at 4.7', poorly graded, loose, subangular, gray (5Y-6/1), (SP).			
-16.3	4.9				COMP	Sample #COMP, Depth = 0.0' - 12.5' Mean (mm): 0.38, Phi Sorting: 1.76 Shell: 33%, Carbonate: 30.0%, Fines (#200) - 1.49 (SP)
			Fine to medium quartz SAND, some medium sand to fine gravel-size shell, poorly graded, loose, subangular, light brownish gray (2.5Y-6/2), (SP).			
-17.5	6.1					
			Fine to medium quartz SAND, little medium sand to fine gravel-size shell, trace silt in burrows, well graded, loose, subangular, 6.2' and 6.5' = silt-lined Callianassa major burrows, gray (5Y-6/1), (SW).			
-19.4	8.0				B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.74, Phi Sorting: 1.69 Shell: 55%, Fines (#200) - 1.21 (SP)
			Medium quartz SAND, little medium sand to fine gravel-size shell, trace silt, well graded, loose, subangular, color alternates between gray (5Y 5/1) and, light brownish gray (2.5Y-6/2), (SW).			
-21.4	10.0					
			Fine gravel-size SHELL, some medium quartz sand, poorly graded, very loose, subangular, olive gray (5Y-5/2), (GP).			
-23.8	12.4					
			End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-41 #COMP	—●—	-11.4	SP	#200 - 1.49 #230 - 1.40		30.00	2.13	1.39	-1	2.98	1.76

Comments: Sample Interval = 0 - 12.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,513
Northing (Y, ft):	2,248,825
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

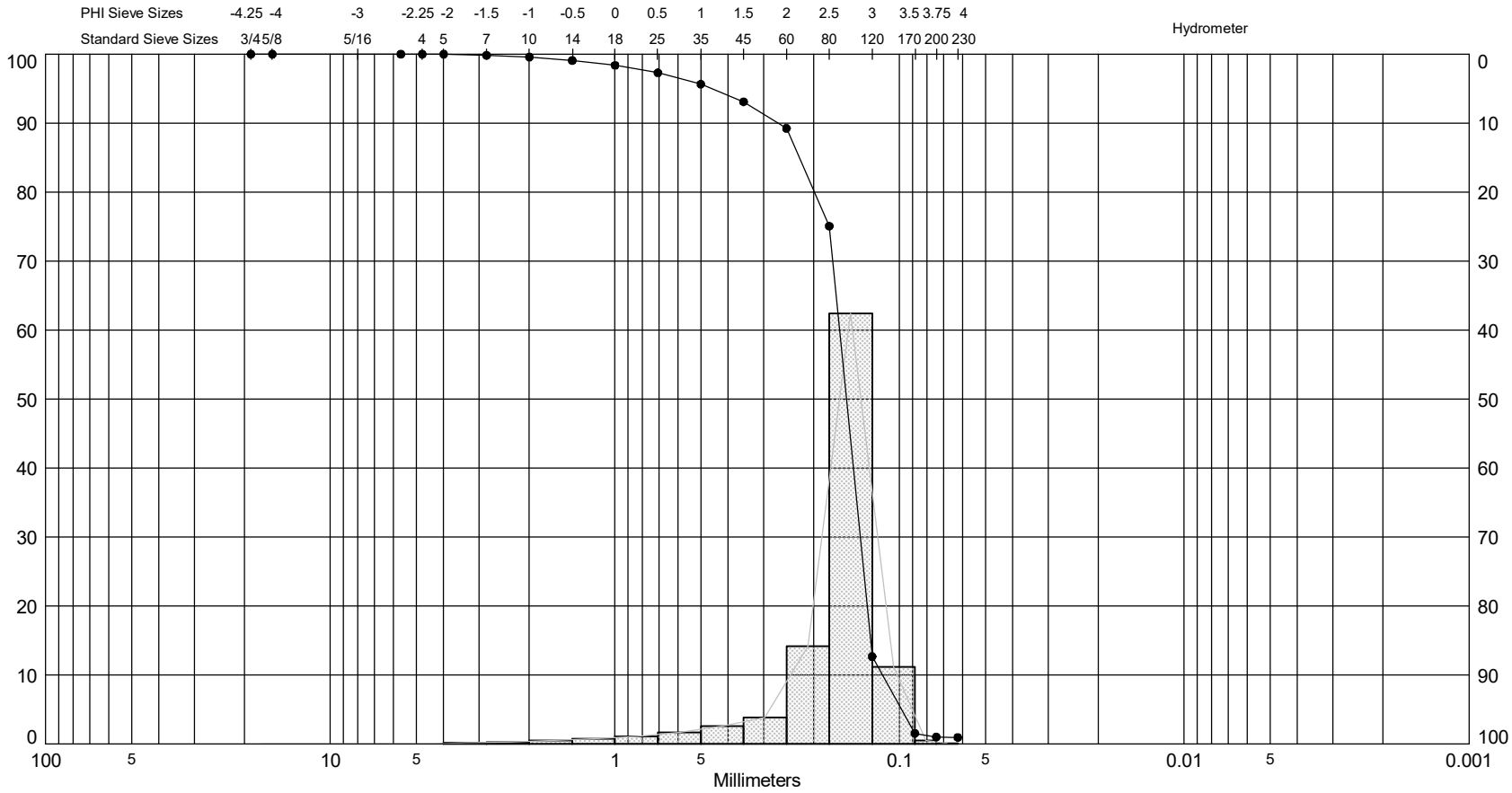
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-41**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	49.05	
Dry Wt. Before Washing (g):	188.16	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	4.53	96.74	100	4.53
#4	4.750	1.81	95.44	100	1.81
#5	4.000	1.45	94.40	100	1.45
#7	2.800	4.32	91.29	100	4.32
#10	2.000	5.39	87.42	100	5.39
#14	1.400	7.40	82.10	100	7.40
#18	1.000	6.26	77.60	100	6.26
#25	0.710	6.89	72.65	90	6.20
#35	0.500	7.59	67.19	70	5.31
#45	0.355	9.81	60.14	30	2.94
#60	0.250	10.27	52.76	5	0.51
#80	0.180	14.44	42.38	1	0.14
#120	0.125	44.45	10.42	0	0.00
#170	0.090	11.55	2.12	0	0.00
#200	0.075	0.89	1.48	0	0.00
#230	0.063	0.13	1.39	0	0.00
Total Shell Content:		**33**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-41 #A	—●—	-12.2	SP	#200 - 1.00 #230 - 0.94			2.7	2.54	-2.78	12.97	0.68

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,513
Northing (Y, ft):	2,248,825
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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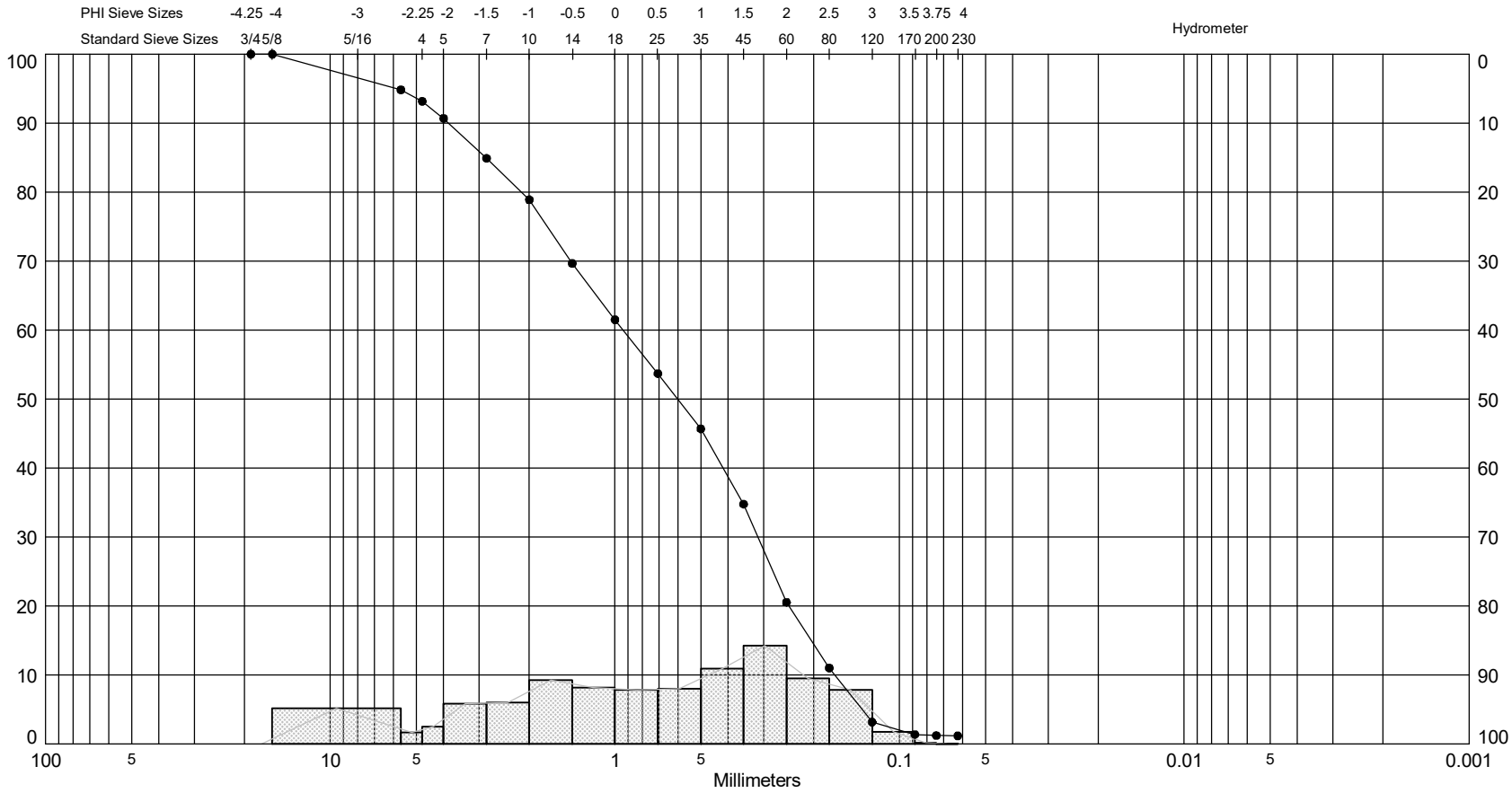
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-41**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.93	
Dry Wt. Before Washing (g):	190.28	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.23	99.84	100	0.23
#10	2.000	0.37	99.57	100	0.37
#14	1.400	0.69	99.08	100	0.69
#18	1.000	1.00	98.37	98	0.98
#25	0.710	1.51	97.29	70	1.06
#35	0.500	2.32	95.64	50	1.16
#45	0.355	3.58	93.09	30	1.07
#60	0.250	5.41	89.23	5	0.27
#80	0.180	19.92	75.04	1	0.20
#120	0.125	87.56	12.65	0	0.00
#170	0.090	15.63	1.52	0	0.00
#200	0.075	0.74	0.99	0	0.00
#230	0.063	0.08	0.93	0	0.00
Total Shell Content:		**4**		**%**	



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-41 #B	—●—	-20.2	SP	#200 - 1.21 #230 - 1.17			0.73	0.44	-0.43	2.31	1.69

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	522,513
Northing (Y, ft):	2,248,825
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
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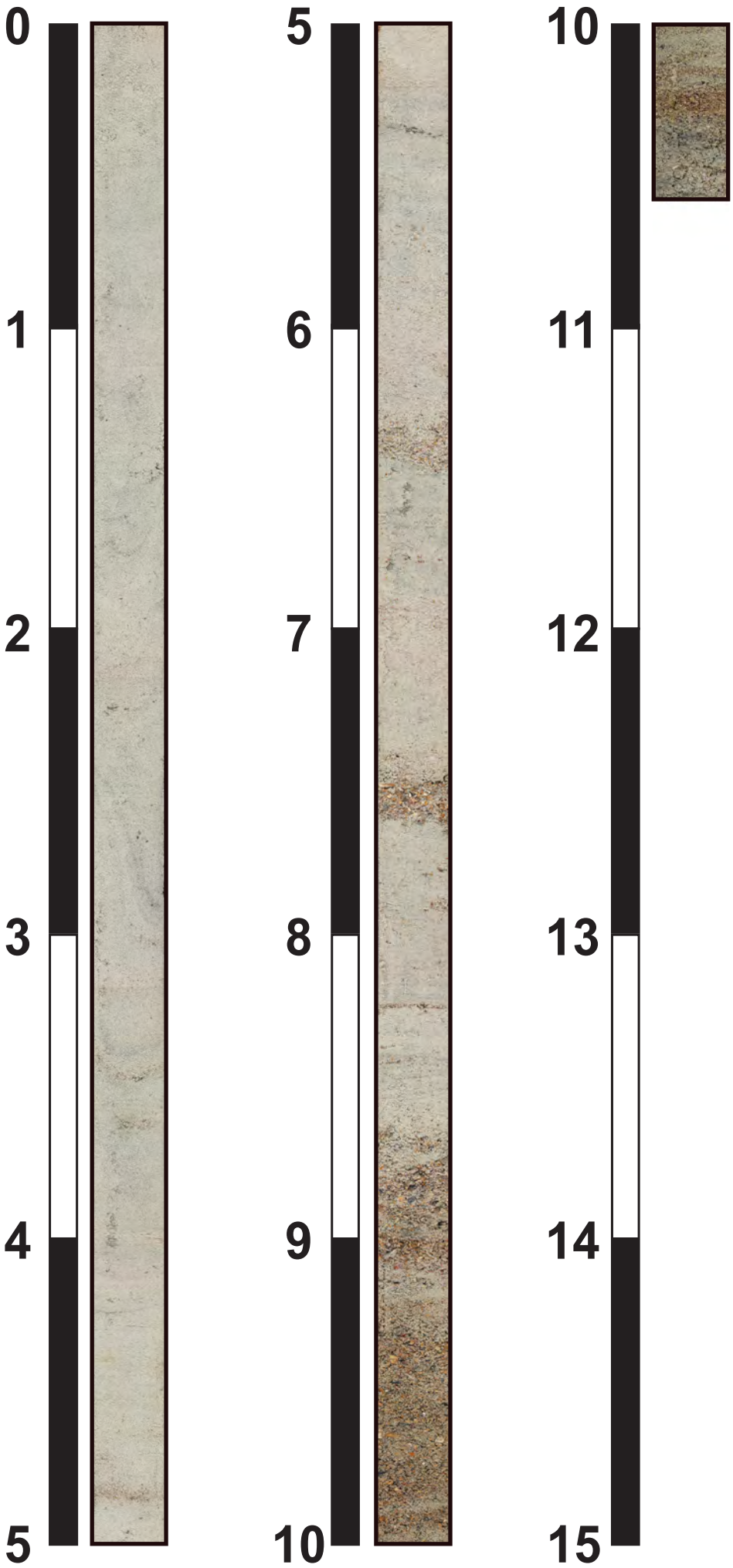
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-41**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, some fine-grained quartz sand (SP) 5Y 5/1**		

Tare Weight, (g):	50.03	
Dry Wt. Before Washing (g):	189.35	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	7.19	94.84	100	7.19
#4	4.750	2.32	93.17	100	2.32
#5	4.000	3.44	90.70	100	3.44
#7	2.800	8.08	84.91	100	8.08
#10	2.000	8.37	78.90	100	8.37
#14	1.400	12.84	69.68	100	12.84
#18	1.000	11.38	61.51	100	11.38
#25	0.710	10.86	53.72	90	9.77
#35	0.500	11.16	45.71	70	7.81
#45	0.355	15.21	34.79	30	4.56
#60	0.250	19.82	20.56	5	0.99
#80	0.180	13.28	11.03	1	0.13
#120	0.125	10.93	3.19	0	0.00
#170	0.090	2.49	1.40	0	0.00
#200	0.075	0.22	1.24	0	0.00
#230	0.063	0.06	1.20	0	0.00
Total Shell Content:		**55**		**%**	



Nassau Sound
Florida
2016 - 2017

C-42

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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Boring Designation C-42

DRILLING LOG

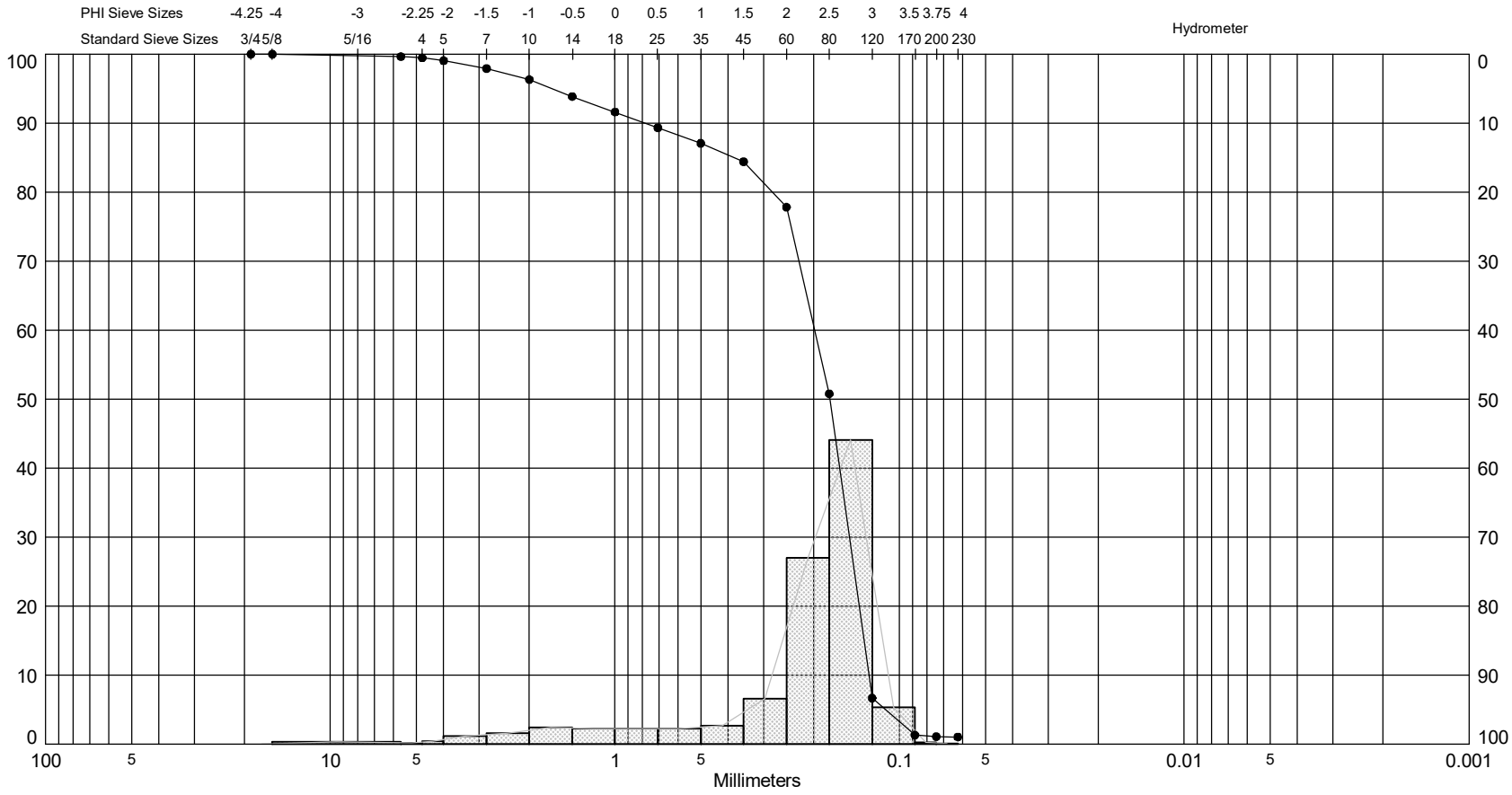
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
2. BORING DESIGNATION	C-42
LOCATION COORDINATES	X = 525,116 Y = 2,246,572
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	3.5 Ft.
15. DATE BORING	STARTED 08-22-16 07:31 / COMPLETED 08-22-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING*	-7.1 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	10.6 Ft.
8. TOTAL DEPTH OF BORING	13.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-7.1	0.0					
			Fine SAND, trace shell fragments in 1-2 lenses at 6.3' & 7.6', bedding present, light greenish gray (10Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.35 Shell: 1%, Fines (#200) - 0.47 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 10.5' Mean (mm): 0.23, Phi Sorting: 1.15 Shell: 12%, Carbonate: 10.9%, Fines (#200) - 1.09 (SP)
-15.9	8.8				B	Sample #B, Depth = 8.8' - 9.3' Mean (mm): 0.62, Phi Sorting: 2.00 Shell: 46%, Fines (#200) - 1.82 (SP)
-17.7	10.6		Fine SAND, few shell fragments <5.0cm, trace silt, light olive gray (5Y-6/2), (SP).			
			End of Boring			

* = Top of boring elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-42 #COMP	—●—	-7.1	SP	#200 - 1.09 #230 - 1.04		10.90	2.51	2.11	-2.13	7.29	1.15

Comments: Sample Interval = 0 - 10.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,116
Northing (Y, ft):	2,246,572
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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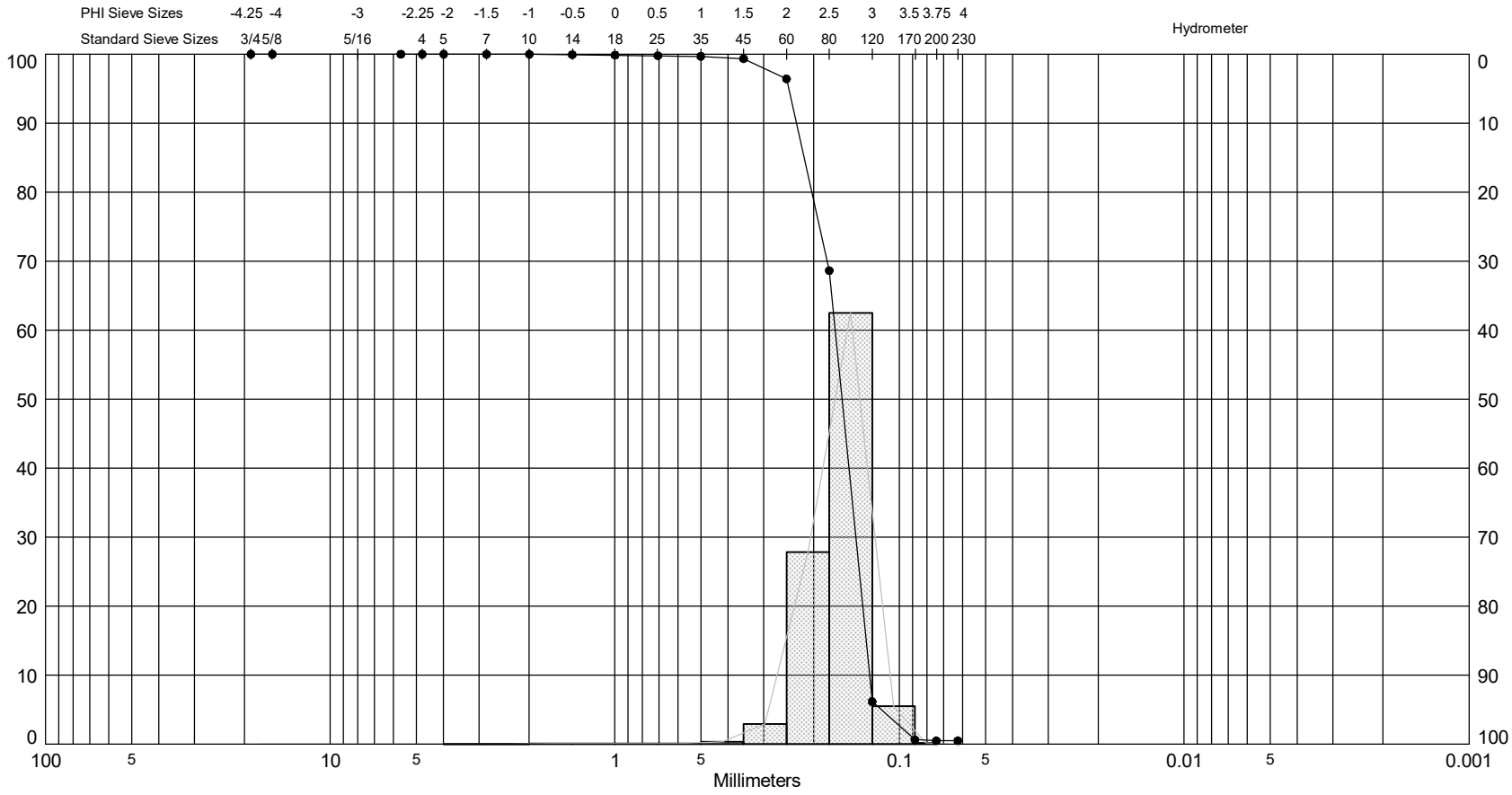
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-10.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-42**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.15	
Dry Wt. Before Washing (g):	199.84	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.52	99.65	100	0.52
#4	4.750	0.29	99.46	100	0.29
#5	4.000	0.61	99.05	100	0.61
#7	2.800	1.71	97.91	100	1.71
#10	2.000	2.38	96.32	100	2.38
#14	1.400	3.66	93.87	98	3.59
#18	1.000	3.37	91.62	90	3.03
#25	0.710	3.42	89.34	70	2.39
#35	0.500	3.37	87.09	50	1.69
#45	0.355	4.01	84.41	30	1.20
#60	0.250	9.86	77.82	5	0.49
#80	0.180	40.48	50.78	1	0.40
#120	0.125	66.04	6.66	0	0.00
#170	0.090	8.03	1.30	0	0.00
#200	0.075	0.32	1.08	0	0.00
#230	0.063	0.07	1.04	0	0.00
Total Shell Content:		**12**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-42 #A	—●—	-7.9	SP	#200 - 0.47 #230 - 0.47			2.65	2.6	-1.86	15.47	0.35

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,116
Northing (Y, ft):	2,246,572
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
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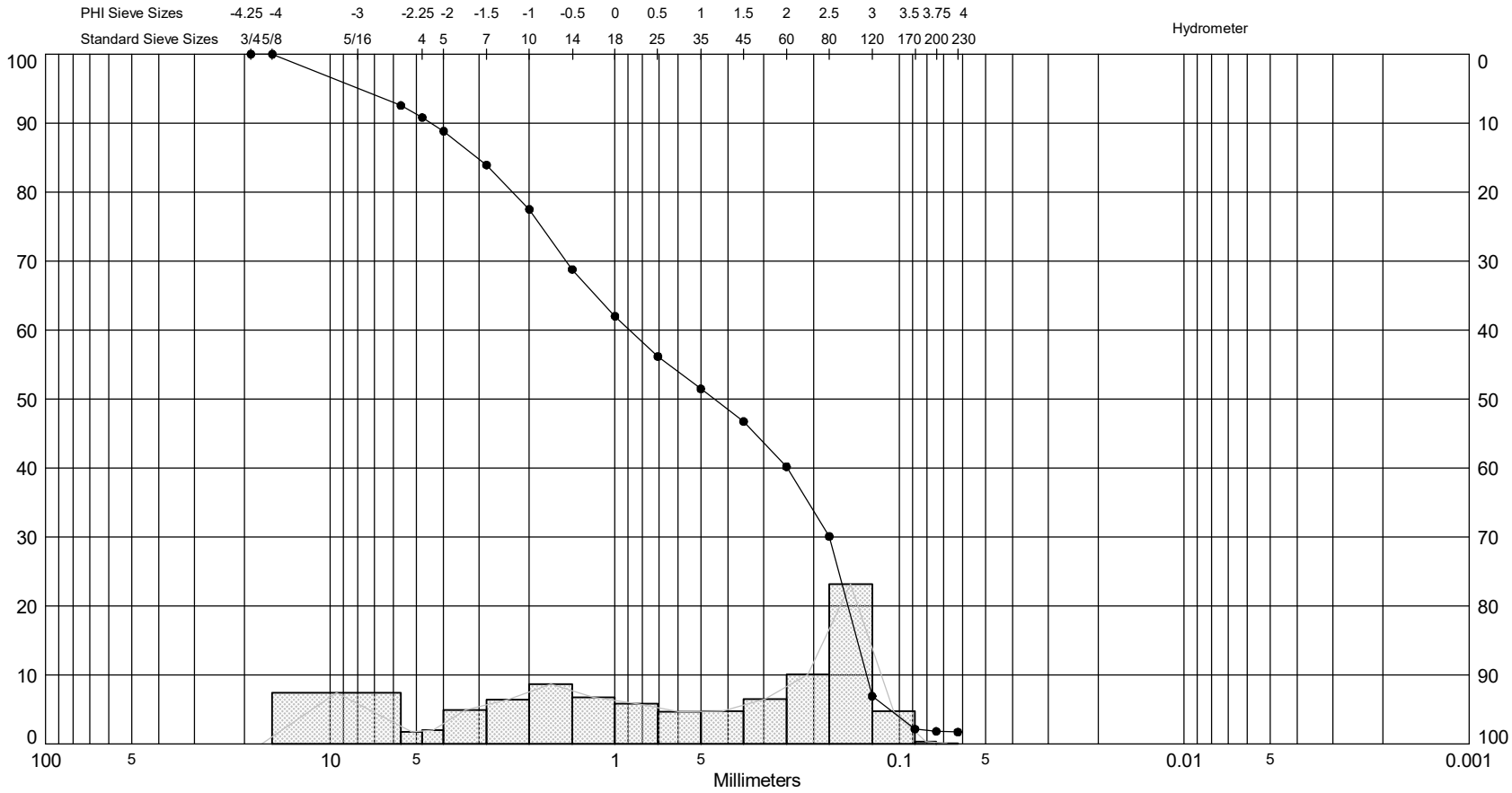
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-42**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.30	
Dry Wt. Before Washing (g):	167.15	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.01	99.99	100	0.01
#10	2.000	0.01	99.98	100	0.01
#14	1.400	0.06	99.93	100	0.06
#18	1.000	0.07	99.87	100	0.07
#25	0.710	0.09	99.79	100	0.09
#35	0.500	0.11	99.70	90	0.10
#45	0.355	0.41	99.35	50	0.21
#60	0.250	3.41	96.43	10	0.34
#80	0.180	32.49	68.63	1	0.32
#120	0.125	72.98	6.17	0	0.00
#170	0.090	6.47	0.63	0	0.00
#200	0.075	0.19	0.47	0	0.00
#230	0.063	0.00	0.47	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-42 #B	—●—	-15.9	SP	#200 - 1.82 #230 - 1.71			1.16	0.7	-0.47	1.98	2

Comments: Sample Depth = 9'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,116
Northing (Y, ft):	2,246,572
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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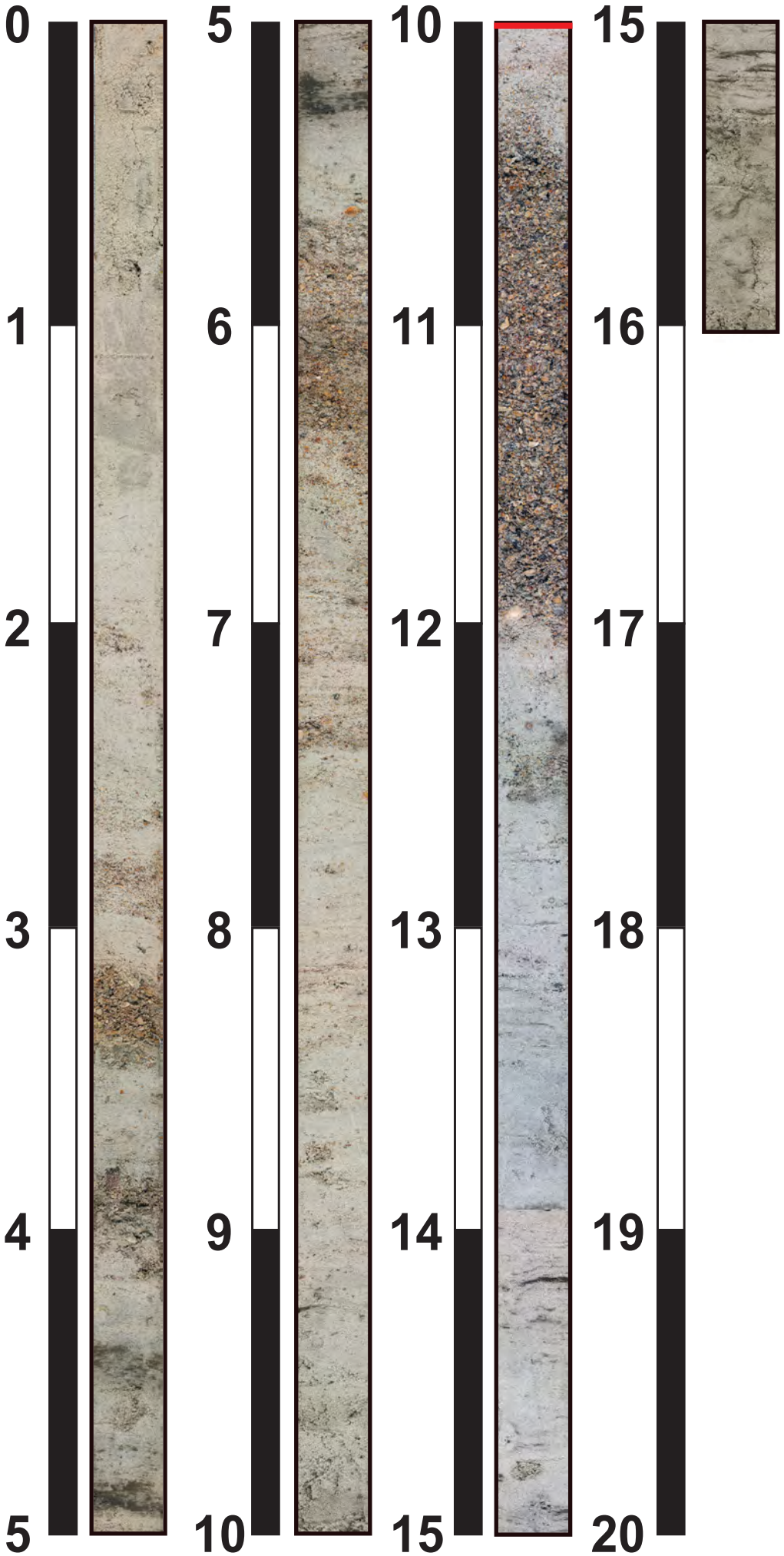
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**9'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-42**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.56	
Dry Wt. Before Washing (g):	203.75	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	11.48	92.55	100	11.48
#4	4.750	2.68	90.82	100	2.68
#5	4.000	3.03	88.85	100	3.03
#7	2.800	7.55	83.95	100	7.55
#10	2.000	9.95	77.50	100	9.95
#14	1.400	13.42	68.80	98	13.15
#18	1.000	10.46	62.01	90	9.41
#25	0.710	9.02	56.16	70	6.31
#35	0.500	7.23	51.48	50	3.62
#45	0.355	7.29	46.75	30	2.19
#60	0.250	10.09	40.20	10	1.01
#80	0.180	15.61	30.08	1	0.16
#120	0.125	35.71	6.92	0	0.00
#170	0.090	7.36	2.15	0	0.00
#200	0.075	0.51	1.82	0	0.00
#230	0.063	0.17	1.71	0	0.00
Total Shell Content:		**46**		**%**	



Nassau Sound
Florida
2016 - 2017

C-43

Notes:
Scale in Feet
Photo Mosaic Image
= Jet Depth

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Boring Designation C-43

DRILLING LOG	CLIENT	PROJECT OWNER	SHEET 1 OF 1 SHEETS
	Olsen Associates, Inc.		

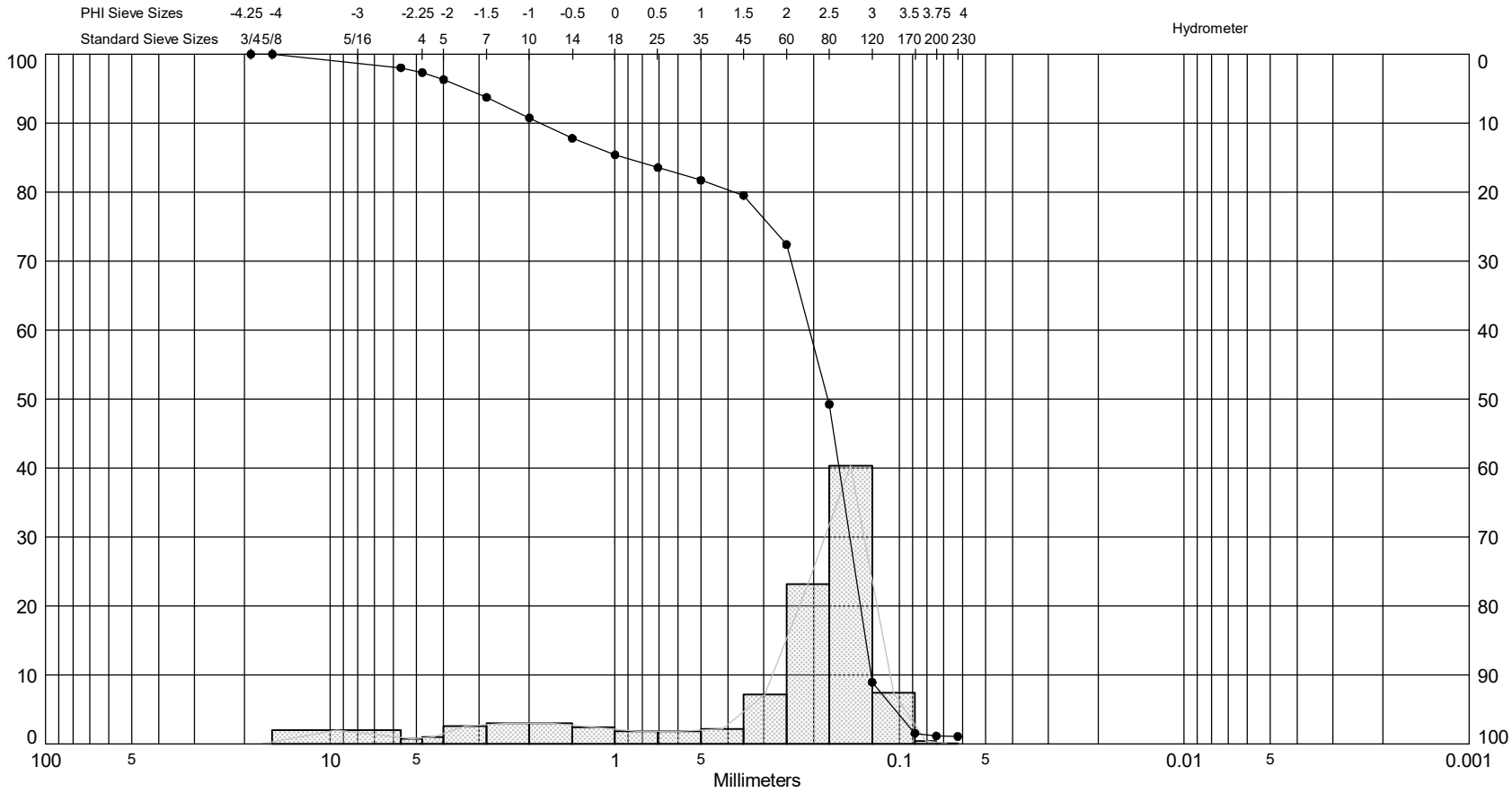
1. PROJECT: Geotechnical Evaluation; Nassau Sound (Amelia Island), Florida		9. SIZE AND TYPE OF BIT: 3.0 In.	
		10. COORDINATE SYSTEM/DATUM: Florida State Plane East	HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION: C-43	LOCATION COORDINATES: X = 525,069 Y = 2,247,278	11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY: Athena Technologies, Inc.	CONTRACTOR FILE NO.	12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER: McClellan		13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING: ☒ VERTICAL ☐ INCLINED	DEG. FROM VERTICAL:	BEARING:	14. WATER DEPTH: 12.9 Ft.
		15. DATE BORING	STARTED: 07-24-16 11:10 / COMPLETED: 07-24-16
6. THICKNESS OF OVERBURDEN: 0.0 Ft.		16. ELEVATION TOP OF BORING*: -10.7 Ft.	
7. DEPTH DRILLED INTO ROCK: 0.0 Ft.		17. TOTAL RECOVERY FOR BORING: 16 Ft.	
8. TOTAL DEPTH OF BORING: 17.2 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR: SEXTON	

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-10.7	0.0					
			Fine SAND, trace shell fragments <1.0cm, 3 shell layers at 3.1' & 3.9', light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.16, Phi Sorting: 0.50 Shell: 1%, Fines (#200) - 0.96 (SP)
-14.8	4.1					
			Fine SAND, trace silt in lenses & burrows, light greenish gray (10Y-7/1), (SP).			
-16.3	5.6					
-17.1	6.4		Fine to medium SAND, few shell fragments <2.0cm, light gray (10YR-7/1), (SW).		COMP	Sample #COMP, Depth = 0.0' - 16.0' Mean (mm): 0.28, Phi Sorting: 1.53 Shell: 18%, Carbonate: 17.0%, Fines (#200) - 1.15 (SP)
			Fine SAND, trace shell fragments <1.0cm decreasing downcore, bedding present, white (5Y-8/1), (SP).		B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.23, Phi Sorting: 0.70 Shell: 4%, Fines (#200) - 0.66 (SP)
-21.0	10.3					
			Fine to medium SAND, some shell fragments <2.0cm increasing downcore, light gray (10YR-7/1), (SW).			
-22.8	12.1					
			Fine SAND, trace silt in lenses increasing downcore, white (5Y-8/1), (SP).		C	Sample #C, Depth = 13.8' - 14.3' Mean (mm): 0.15, Phi Sorting: 0.51 Shell: 0%, Fines (#200) - 1.18 (SP)
-26.7	16.0					
			End of Boring			* = Top of boring elevation is estimated based on hydrographic survey data collected on 17 June 2016 by Arc Surveying & Mapping, Inc.

0 5 10 15 20 25

FLORIDA DEP ROSS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-43 #COMP	—●—	-10.7	SP	#200 - 1.15 #230 - 1.09		17.00	2.48	1.86	-1.76	5.14	1.53

Comments: Sample Interval = 0 - 16.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,069
Northing (Y, ft):	2,247,278
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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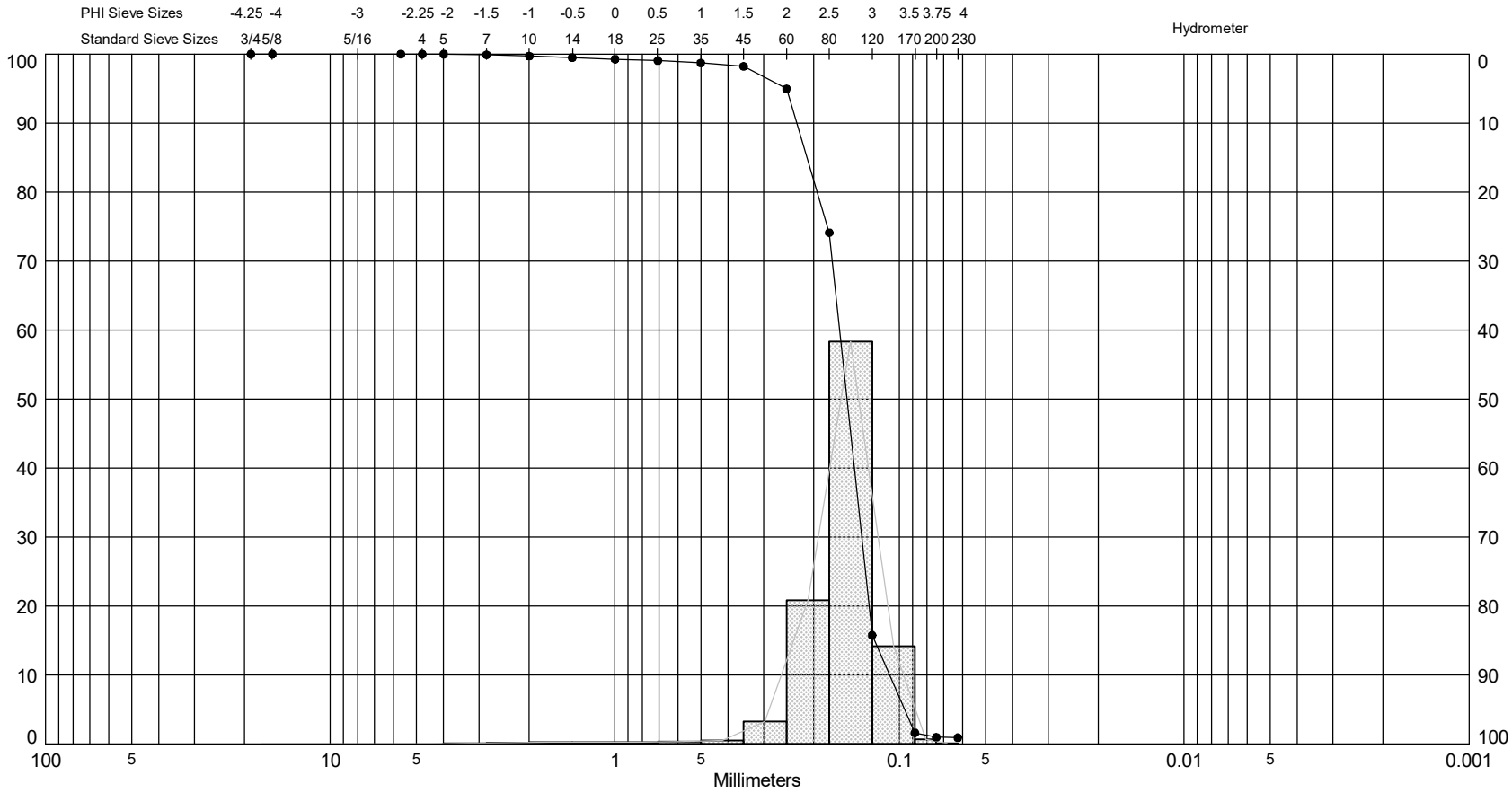
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-16'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-43**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.52	
Dry Wt. Before Washing (g):	212.55	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.17	98.04	100	3.17
#4	4.750	1.15	97.33	100	1.15
#5	4.000	1.67	96.30	100	1.67
#7	2.800	4.17	93.73	95	3.96
#10	2.000	4.79	90.77	100	4.79
#14	1.400	4.82	87.80	100	4.82
#18	1.000	3.89	85.40	80	3.11
#25	0.710	2.99	83.55	70	2.09
#35	0.500	2.98	81.71	50	1.49
#45	0.355	3.53	79.53	30	1.06
#60	0.250	11.57	72.39	15	1.74
#80	0.180	37.50	49.25	1	0.38
#120	0.125	65.32	8.94	0	0.00
#170	0.090	12.00	1.53	0	0.00
#200	0.075	0.62	1.15	0	0.00
#230	0.063	0.09	1.09	0	0.00
Total Shell Content:		**18**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-43 #A	—●—	-11.5	SP	#200 - 0.96 #230 - 0.89			2.71	2.64	-3.18	22.86	0.5

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,069
Northing (Y, ft):	2,247,278
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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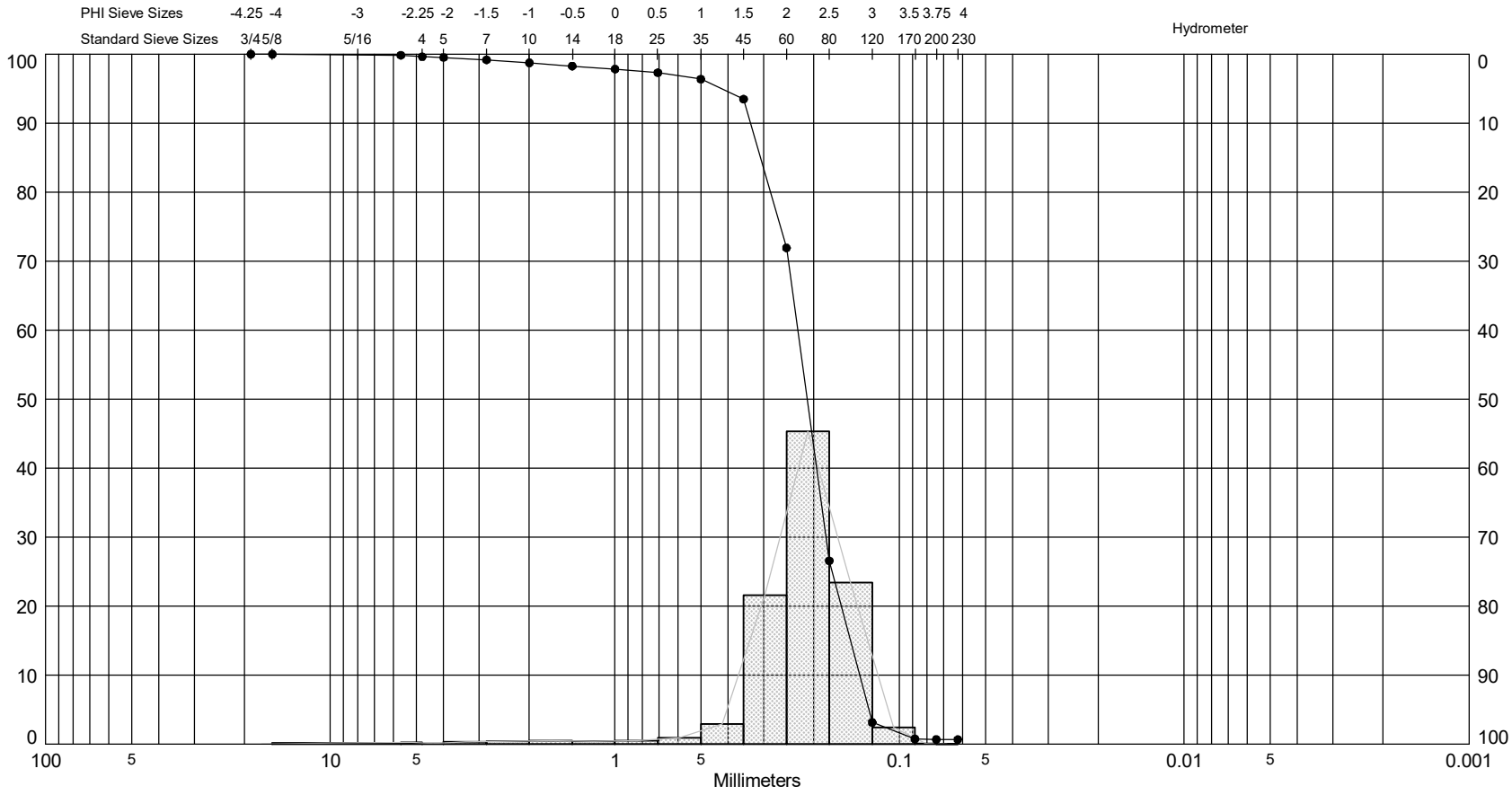
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-43**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	50.02	
Dry Wt. Before Washing (g):	195.10	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.15	99.90	100	0.15
#10	2.000	0.28	99.70	100	0.28
#14	1.400	0.32	99.48	100	0.32
#18	1.000	0.31	99.27	80	0.25
#25	0.710	0.34	99.04	60	0.20
#35	0.500	0.49	98.70	30	0.15
#45	0.355	0.70	98.21	20	0.14
#60	0.250	4.75	94.94	2	0.10
#80	0.180	30.23	74.10	0	0.00
#120	0.125	84.68	15.74	0	0.00
#170	0.090	20.51	1.60	0	0.00
#200	0.075	0.94	0.95	0	0.00
#230	0.063	0.10	0.88	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-43 #B	—●—	-18.5	SP	#200 - 0.66 #230 - 0.65			2.24	2.15	-3.16	19.08	0.7

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,069
Northing (Y, ft):	2,247,278
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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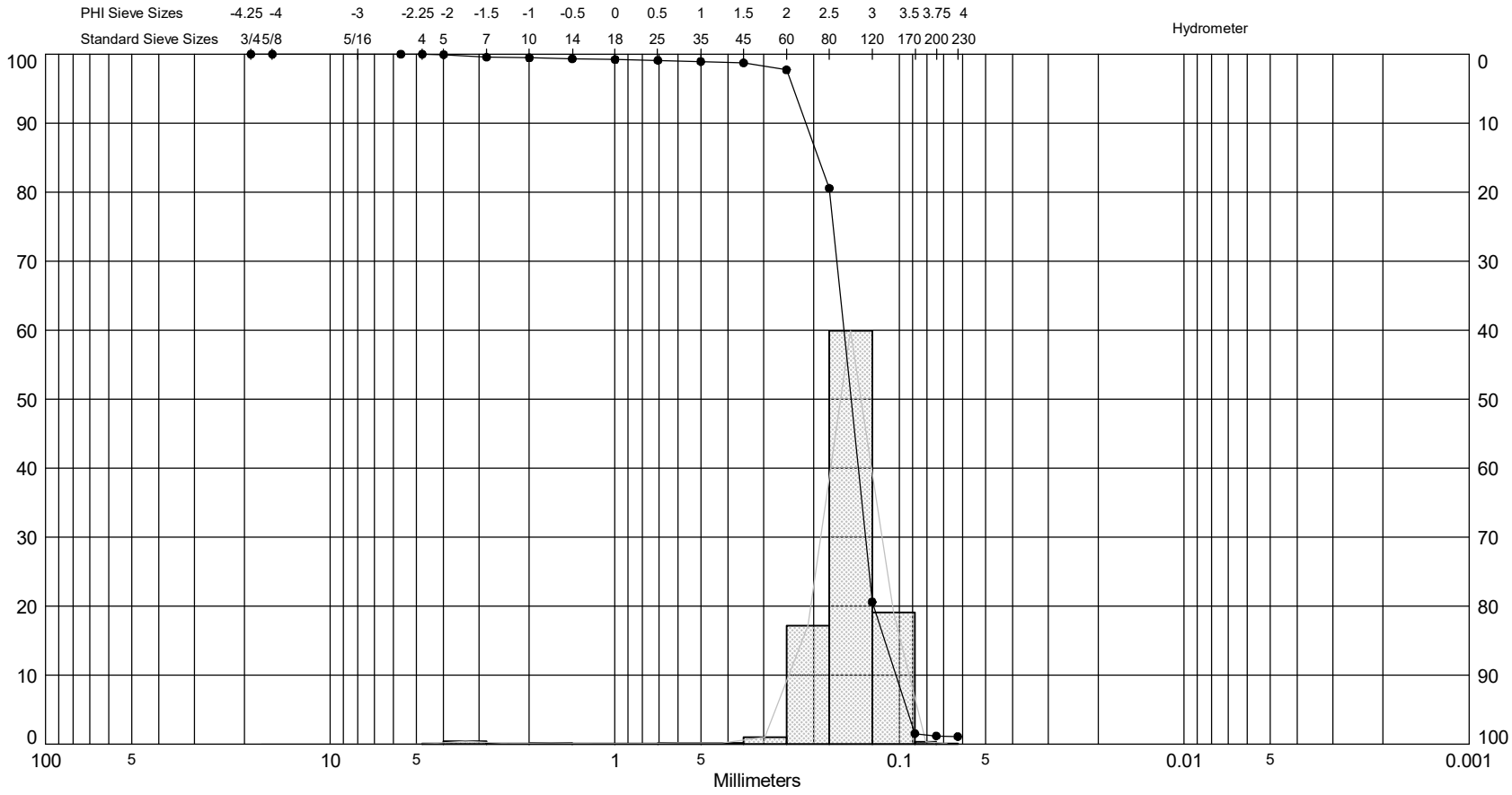
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-43**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 8/1**		

Tare Weight, (g):	51.83	
Dry Wt. Before Washing (g):	181.14	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.20	99.85	100	0.20
#4	4.750	0.29	99.62	100	0.29
#5	4.000	0.11	99.54	100	0.11
#7	2.800	0.45	99.19	100	0.45
#10	2.000	0.57	98.75	100	0.57
#14	1.400	0.61	98.28	100	0.61
#18	1.000	0.56	97.84	80	0.45
#25	0.710	0.69	97.31	70	0.48
#35	0.500	1.22	96.37	50	0.61
#45	0.355	3.75	93.47	30	1.13
#60	0.250	27.87	71.91	2	0.56
#80	0.180	58.67	26.54	0	0.00
#120	0.125	30.29	3.12	0	0.00
#170	0.090	3.09	0.73	0	0.00
#200	0.075	0.12	0.63	0	0.00
#230	0.063	0.01	0.63	0	0.00
Total Shell Content:		**4**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-43 #C	—●—	-24.5	SP	#200 - 1.18 #230 - 1.10			2.75	2.71	-4.47	37.54	0.51

Comments: Sample Depth = 14'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,069
Northing (Y, ft):	2,247,278
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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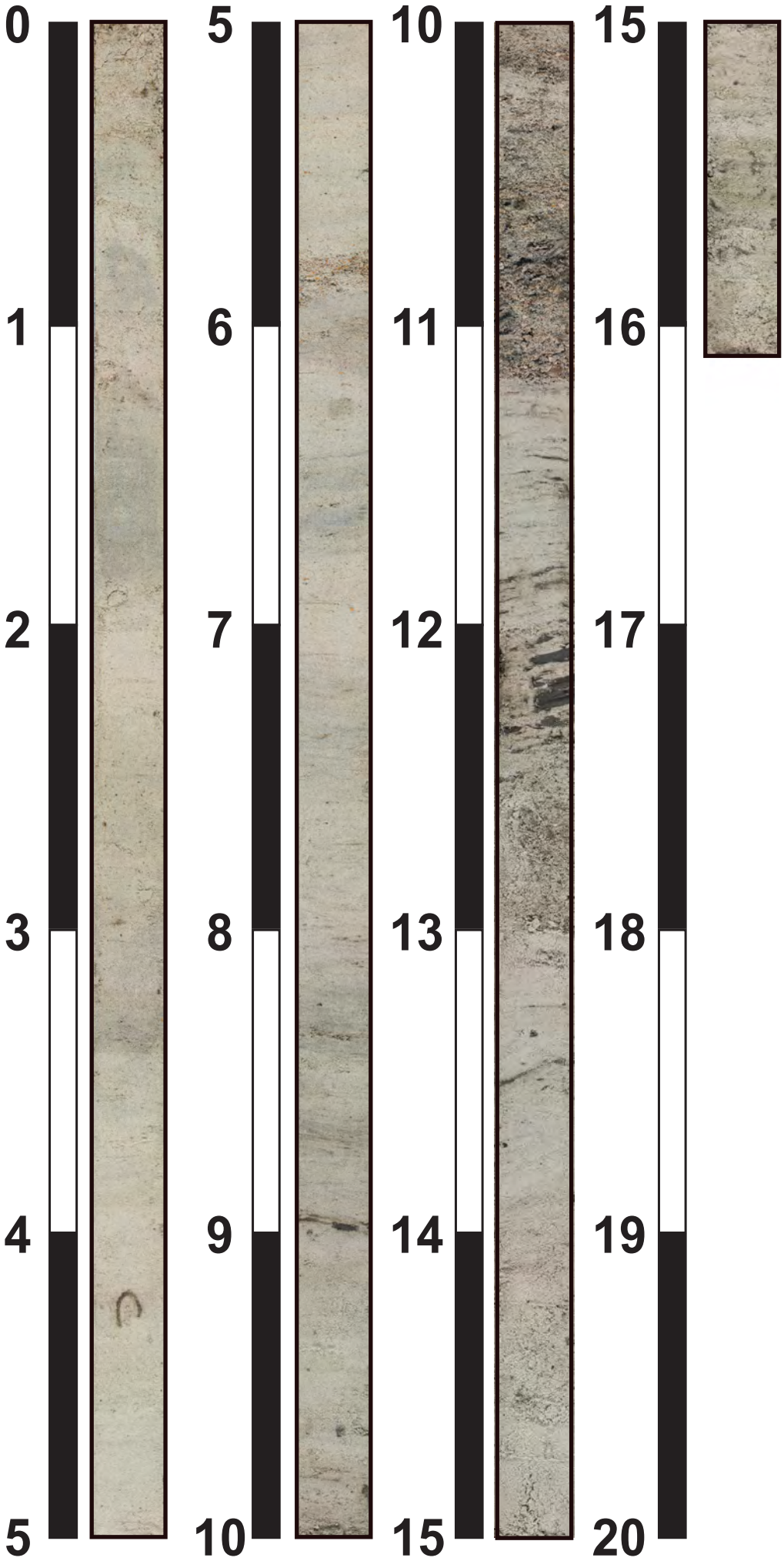
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**14'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-43**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 8/1**		

Tare Weight, (g):	49.99	
Dry Wt. Before Washing (g):	192.94	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.08	99.94	0	0.00
#7	2.800	0.55	99.56	0	0.00
#10	2.000	0.13	99.47	20	0.03
#14	1.400	0.18	99.34	20	0.04
#18	1.000	0.17	99.22	10	0.02
#25	0.710	0.16	99.11	1	0.00
#35	0.500	0.25	98.94	5	0.01
#45	0.355	0.29	98.73	1	0.00
#60	0.250	1.46	97.71	0	0.00
#80	0.180	24.53	80.55	0	0.00
#120	0.125	85.69	20.61	0	0.00
#170	0.090	27.29	1.52	0	0.00
#200	0.075	0.50	1.17	0	0.00
#230	0.063	0.12	1.08	0	0.00
Total Shell Content:		**0**		**%**	



Nassau Sound
Florida
2016 - 2017

C-44

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-44

DRILLING LOG

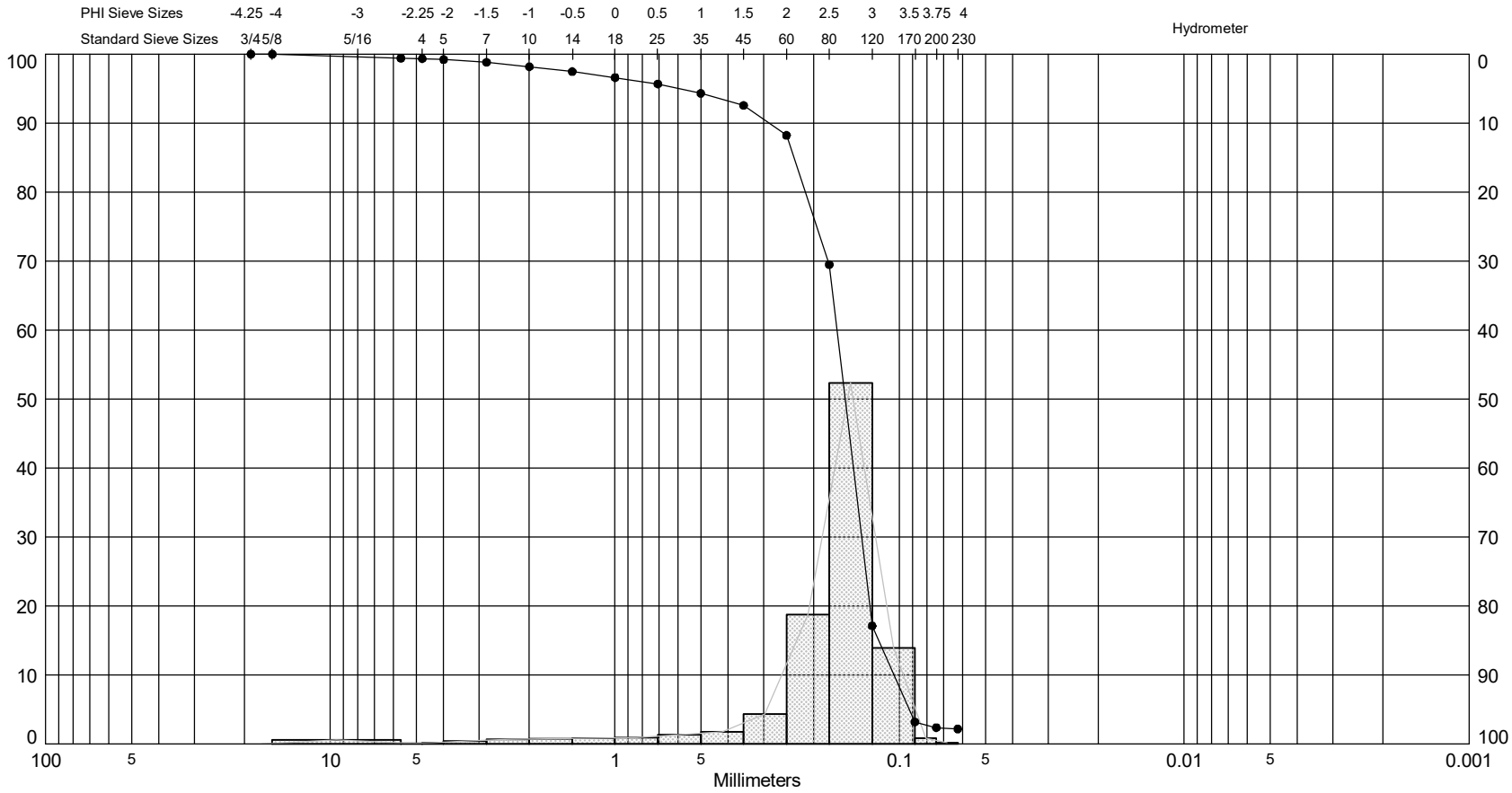
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-44
LOCATION COORDINATES	X = 524,635 Y = 2,248,305
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	14.0 Ft.
15. DATE BORING	STARTED: 07-24-16 09:33 / COMPLETED: 07-24-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-13.1 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	16.1 Ft.
8. TOTAL DEPTH OF BORING	19.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-13.1	0.0					
			Fine SAND, trace silt in burrows, rip-ups, and thin lenses, trace shell fragments, white (5Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.54 Shell: 5%, Fines (#200) - 0.97 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 16.1' Mean (mm): 0.18, Phi Sorting: 0.91 Shell: 5%, Carbonate: 6.0%, Fines (#200) - 2.36 (SP)
					B	Sample #B, Depth = 7.8' - 8.3' Mean (mm): 0.14, Phi Sorting: 0.34 Shell: 0%, Fines (#200) - 0.99 (SP)
-23.1	10.0					
-24.3	11.2		Fine to medium SAND, few shell fragments <4.0cm, light greenish gray (10Y-7/1), (SW).			
-24.8	11.7		Fine SAND, trace silt, light gray (5Y-7/1), (SP).			
-25.4	12.3		SILTY SAND, olive gray (5Y-5/2), (SM).		C	Sample #C, Depth = 12.8' - 13.3' Mean (mm): 0.18, Phi Sorting: 0.58 Shell: 2%, Fines (#200) - 1.08 (SP)
			Fine SAND with trace shell fragments, trace silt, light greenish gray (10Y-7/1), (SP).			
-29.2	16.1					
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-44 #COMP	—●—	-13.1	SP	#200 - 2.36 #230 - 2.17		6.00	2.69	2.47	-3.31	16.78	0.91

Comments: Sample Interval = 0 - 16.1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,635
Northing (Y, ft):	2,248,305
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
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(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

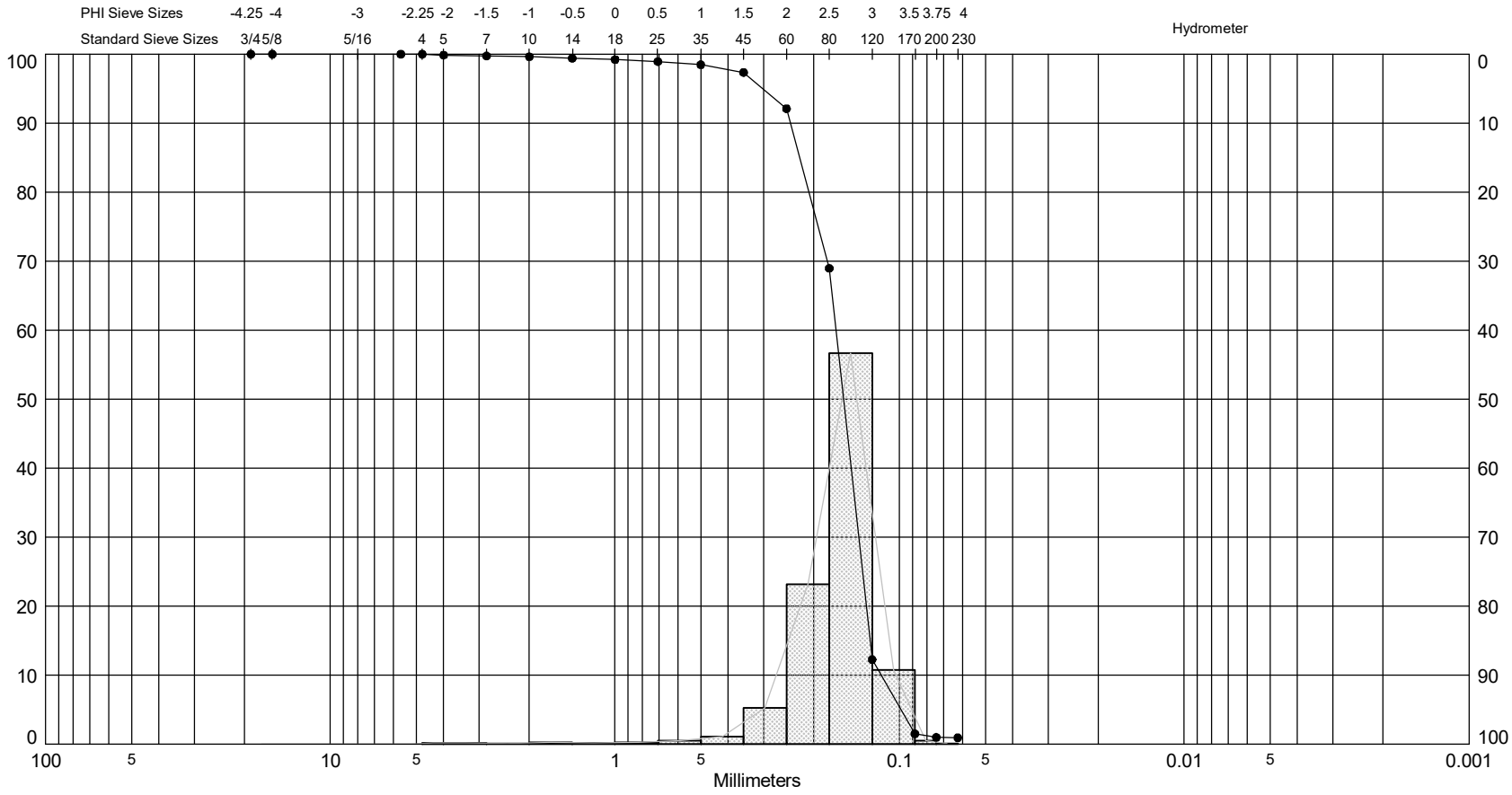
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-16.1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-44**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.83	
Dry Wt. Before Washing (g):	196.74	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.87	99.41	100	0.87
#4	4.750	0.07	99.36	100	0.07
#5	4.000	0.21	99.22	90	0.19
#7	2.800	0.60	98.81	80	0.48
#10	2.000	0.92	98.18	100	0.92
#14	1.400	1.05	97.47	80	0.84
#18	1.000	1.26	96.61	70	0.88
#25	0.710	1.37	95.68	50	0.69
#35	0.500	2.00	94.32	30	0.60
#45	0.355	2.59	92.55	20	0.52
#60	0.250	6.38	88.21	10	0.64
#80	0.180	27.51	69.48	0	0.00
#120	0.125	76.94	17.11	0	0.00
#170	0.090	20.46	3.19	0	0.00
#200	0.075	1.22	2.36	0	0.00
#230	0.063	0.28	2.16	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-44 #A	—●—	-13.9	SP	#200 - 0.97 #230 - 0.92			2.67	2.58	-3.22	22.51	0.54

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,635
Northing (Y, ft):	2,248,305
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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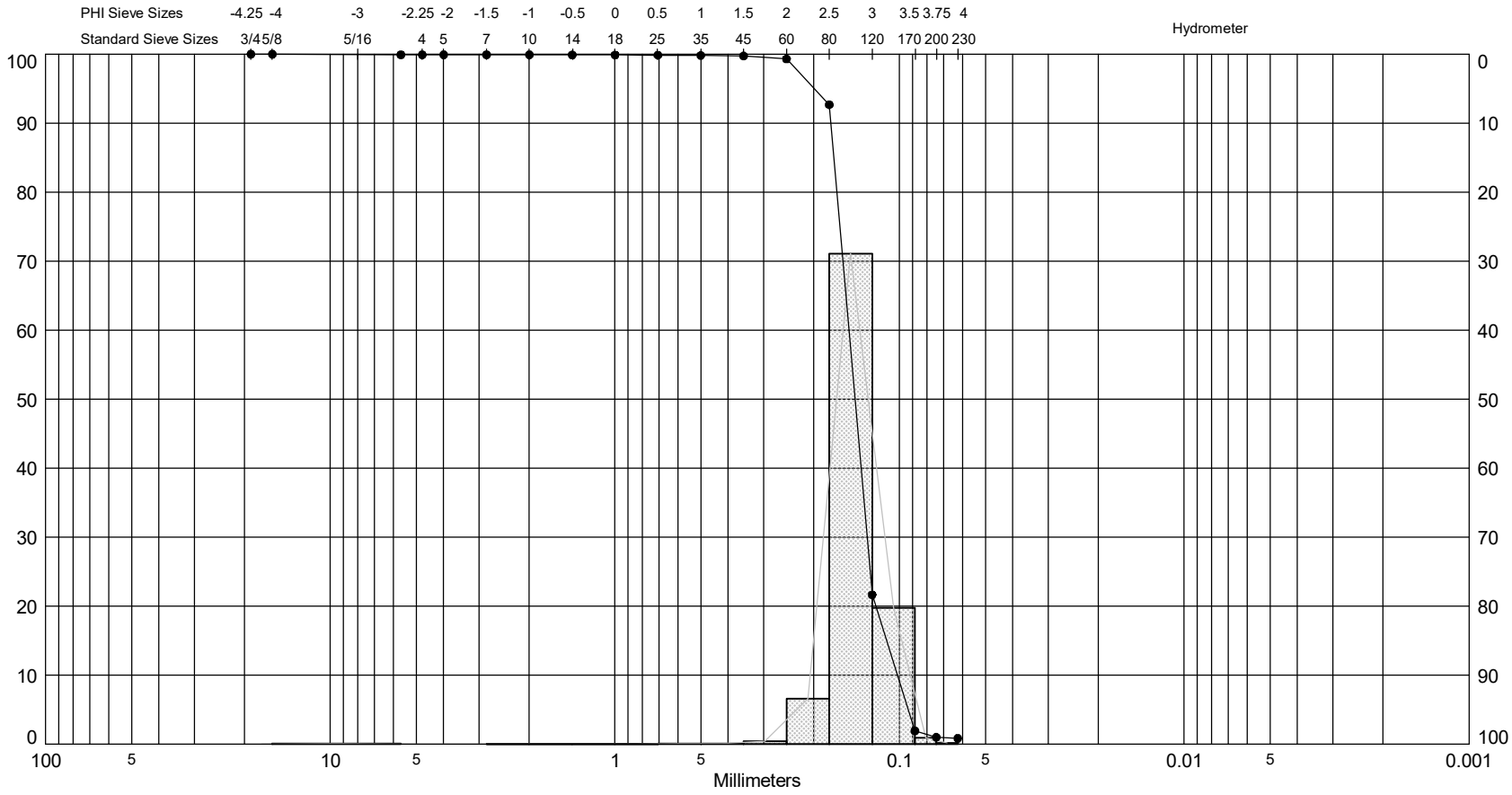
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-44**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.68	
Dry Wt. Before Washing (g):	200.62	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.19	99.87	100	0.19
#7	2.800	0.20	99.74	100	0.20
#10	2.000	0.17	99.63	100	0.17
#14	1.400	0.34	99.40	100	0.34
#18	1.000	0.29	99.21	100	0.29
#25	0.710	0.42	98.93	80	0.34
#35	0.500	0.70	98.47	70	0.49
#45	0.355	1.67	97.36	50	0.84
#60	0.250	7.93	92.11	40	3.17
#80	0.180	34.94	68.96	5	1.75
#120	0.125	85.59	12.26	0	0.00
#170	0.090	16.26	1.48	0	0.00
#200	0.075	0.78	0.97	0	0.00
#230	0.063	0.08	0.91	0	0.00
Total Shell Content:		**5**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-44 #B	—●—	-20.9	SP	#200 - 0.99 #230 - 0.83			2.8	2.81	-5.17	91.99	0.34

Comments: Sample Depth = 8'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,635
Northing (Y, ft):	2,248,305
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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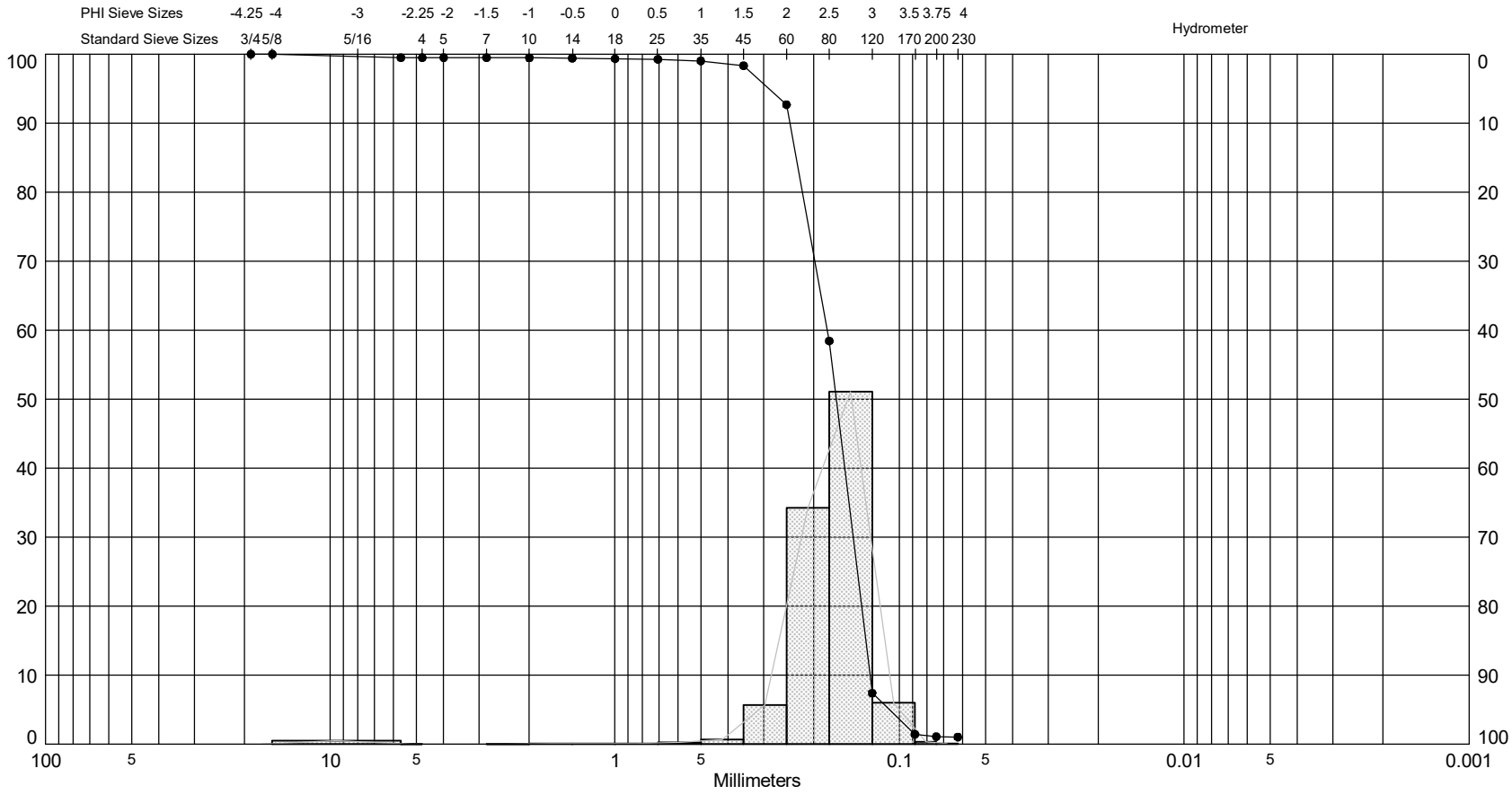
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**8'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-44**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 7/1**		

Tare Weight, (g):	49.60	
Dry Wt. Before Washing (g):	200.58	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.12	99.92	100	0.12
#4	4.750	0.00	99.92	0	0.00
#5	4.000	0.00	99.92	0	0.00
#7	2.800	0.00	99.92	0	0.00
#10	2.000	0.01	99.91	100	0.01
#14	1.400	0.03	99.89	100	0.03
#18	1.000	0.01	99.89	100	0.01
#25	0.710	0.02	99.87	80	0.02
#35	0.500	0.07	99.83	50	0.04
#45	0.355	0.12	99.75	25	0.03
#60	0.250	0.66	99.31	15	0.10
#80	0.180	10.00	92.69	2	0.20
#120	0.125	107.27	21.64	0	0.00
#170	0.090	29.77	1.92	0	0.00
#200	0.075	1.39	1.00	0	0.00
#230	0.063	0.24	0.84	0	0.00
Total Shell Content:		**0**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-44 #C	—●—	-25.9	SP	#200 - 1.08 #230 - 1.03			2.58	2.5	-5.48	52.98	0.58

Comments: Sample Depth = 13'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	524,635
Northing (Y, ft):	2,248,305
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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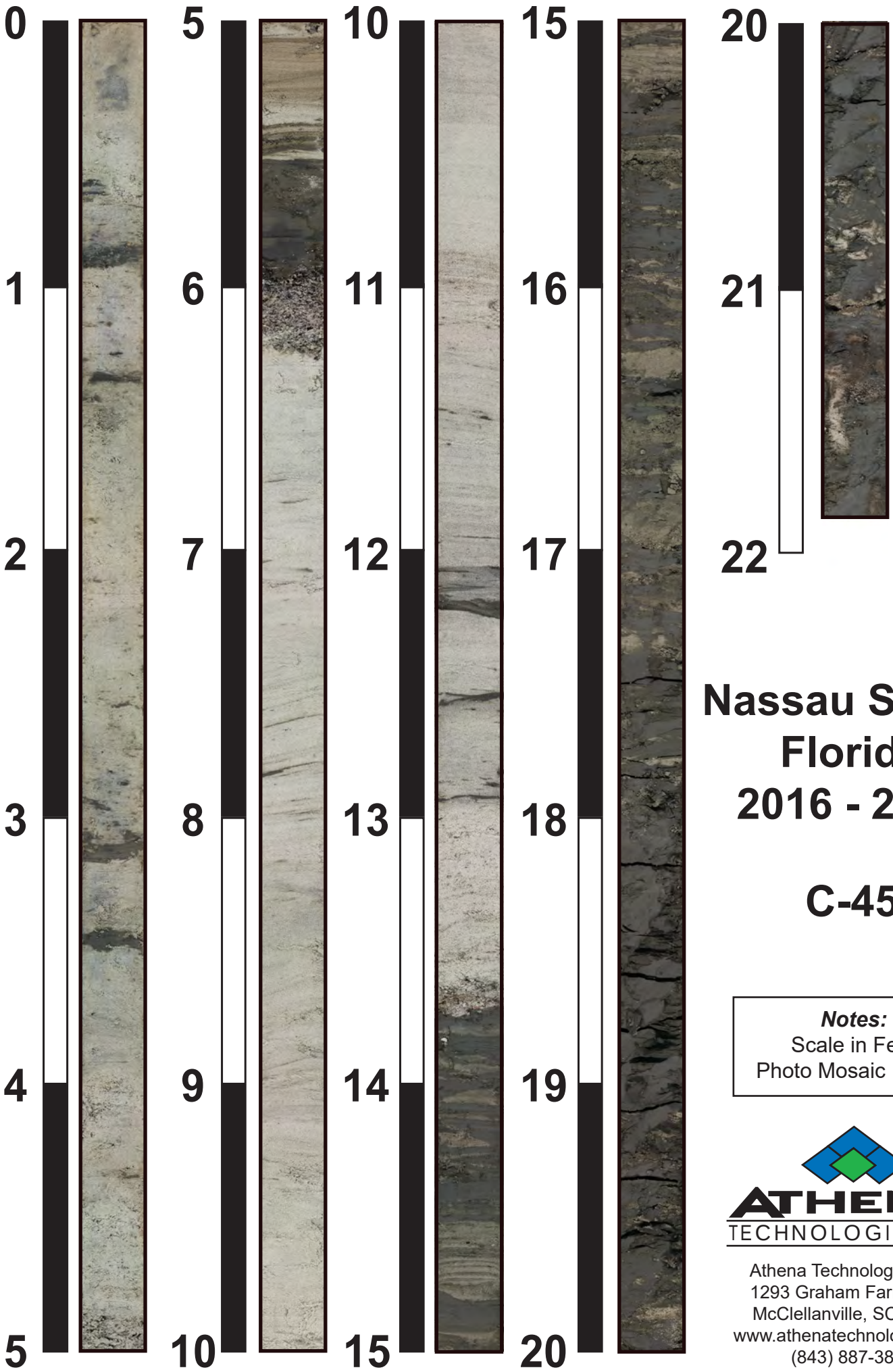
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-44**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.70	
Dry Wt. Before Washing (g):	185.09	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.67	99.50	100	0.67
#4	4.750	0.02	99.48	100	0.02
#5	4.000	0.00	99.48	0	0.00
#7	2.800	0.00	99.48	0	0.00
#10	2.000	0.04	99.45	70	0.03
#14	1.400	0.07	99.40	50	0.04
#18	1.000	0.08	99.34	30	0.02
#25	0.710	0.12	99.25	25	0.03
#35	0.500	0.31	99.02	25	0.08
#45	0.355	0.92	98.33	15	0.14
#60	0.250	7.54	92.68	10	0.75
#80	0.180	45.70	58.42	1	0.46
#120	0.125	68.10	7.36	0	0.00
#170	0.090	7.96	1.39	0	0.00
#200	0.075	0.44	1.06	0	0.00
#230	0.063	0.07	1.01	0	0.00
Total Shell Content:		**2**		**%**	



Nassau Sound
Florida
2016 - 2017

C-45

Notes:
Scale in Feet
Photo Mosaic Image

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Boring Designation C-45

DRILLING LOG

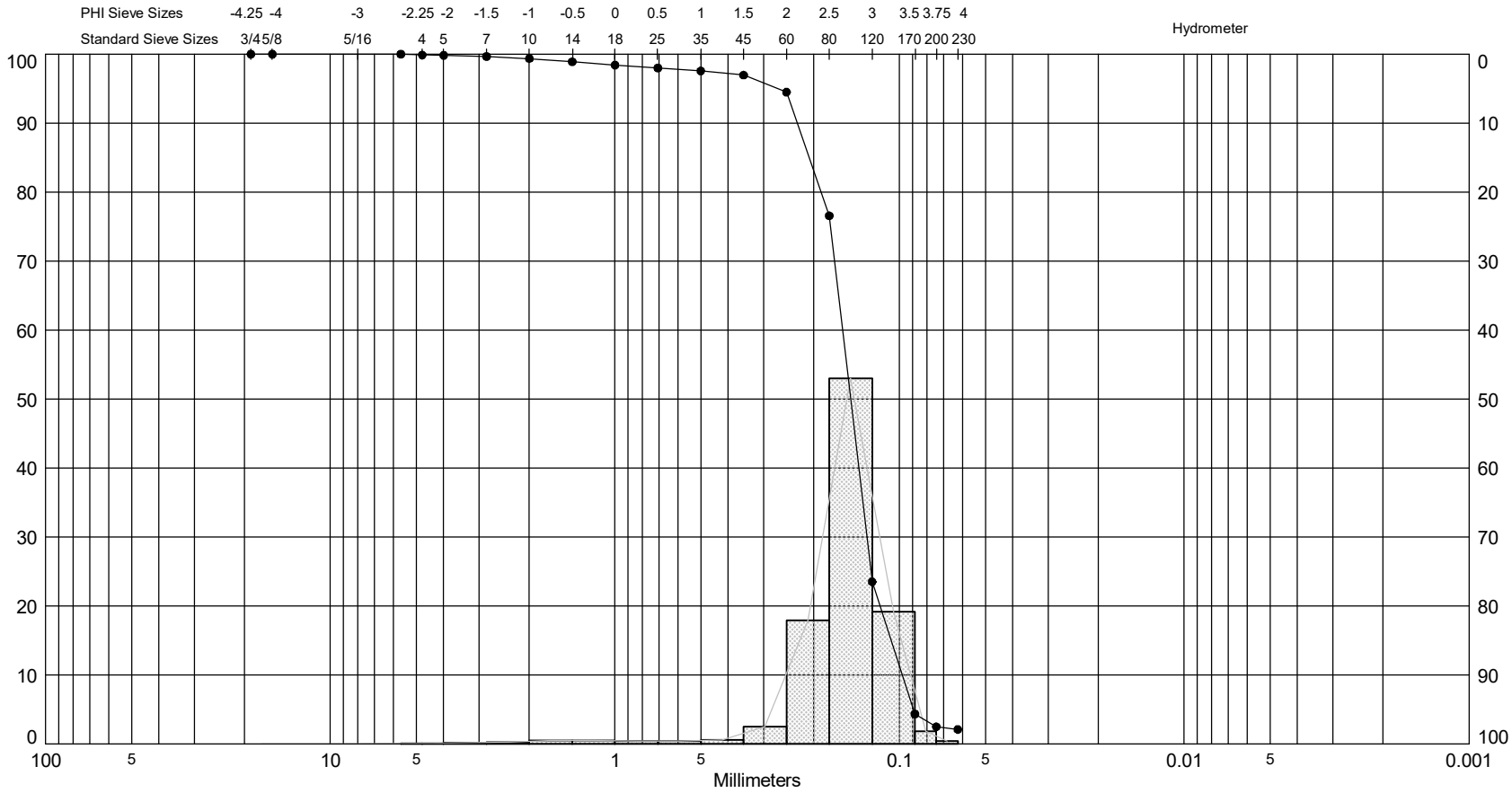
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
2. BORING DESIGNATION	C-45
LOCATION COORDINATES	X = 525,090 Y = 2,249,205
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
14. WATER DEPTH	19.6 Ft.
15. DATE BORING	STARTED 07-25-16 07:29 / COMPLETED 07-25-16
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-21.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	21.8 Ft.
8. TOTAL DEPTH OF BORING	22.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-21.0	0.0				
		Fine SAND, trace silt in lenses, bedding present after 5.0', light greenish gray (10Y-8/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.14, Phi Sorting: 0.47 Shell: 0%, Fines (#200) - 4.05 (SP)
-26.5	5.5				
-26.9	5.9	Medium stiff CLAY, very dark gray (2.5Y-3/1), (CH).		COMP	Sample #COMP, Depth = 0.0' - 13.0' Mean (mm): 0.16, Phi Sorting: 0.65 Shell: 3%, Carbonate: 3.9%, Fines (#200) - 2.48 (SP)
-27.3	6.3	Fine to medium SAND, little shell fragments <0.5cm, light greenish gray (10Y-7/1), (SW).			
		Fine SAND, trace silt in thin lenses, bedding present, light greenish gray (10Y-7/1), (SP).		B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 0.16, Phi Sorting: 0.30 Shell: 0%, Fines (#200) - 0.85 (SP)
-34.7	13.7				
		CLAYEY SAND, interbedded fine sand and clay, very dark greenish gray (5GY-3/1), (SC).			
-37.9	16.9				
		Stiff CLAY, trace sand in infilled burrows, becomes hard downcore, very dark greenish gray (10Y-3/1), (CH).			
-42.8	21.8				
		End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-45 #COMP	—●—	-21.0	SP	#200 - 2.48 #230 - 2.10		3.90	2.75	2.66	-3.41	21	0.65

Comments: Sample Interval = 0 - 13.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,090
Northing (Y, ft):	2,249,205
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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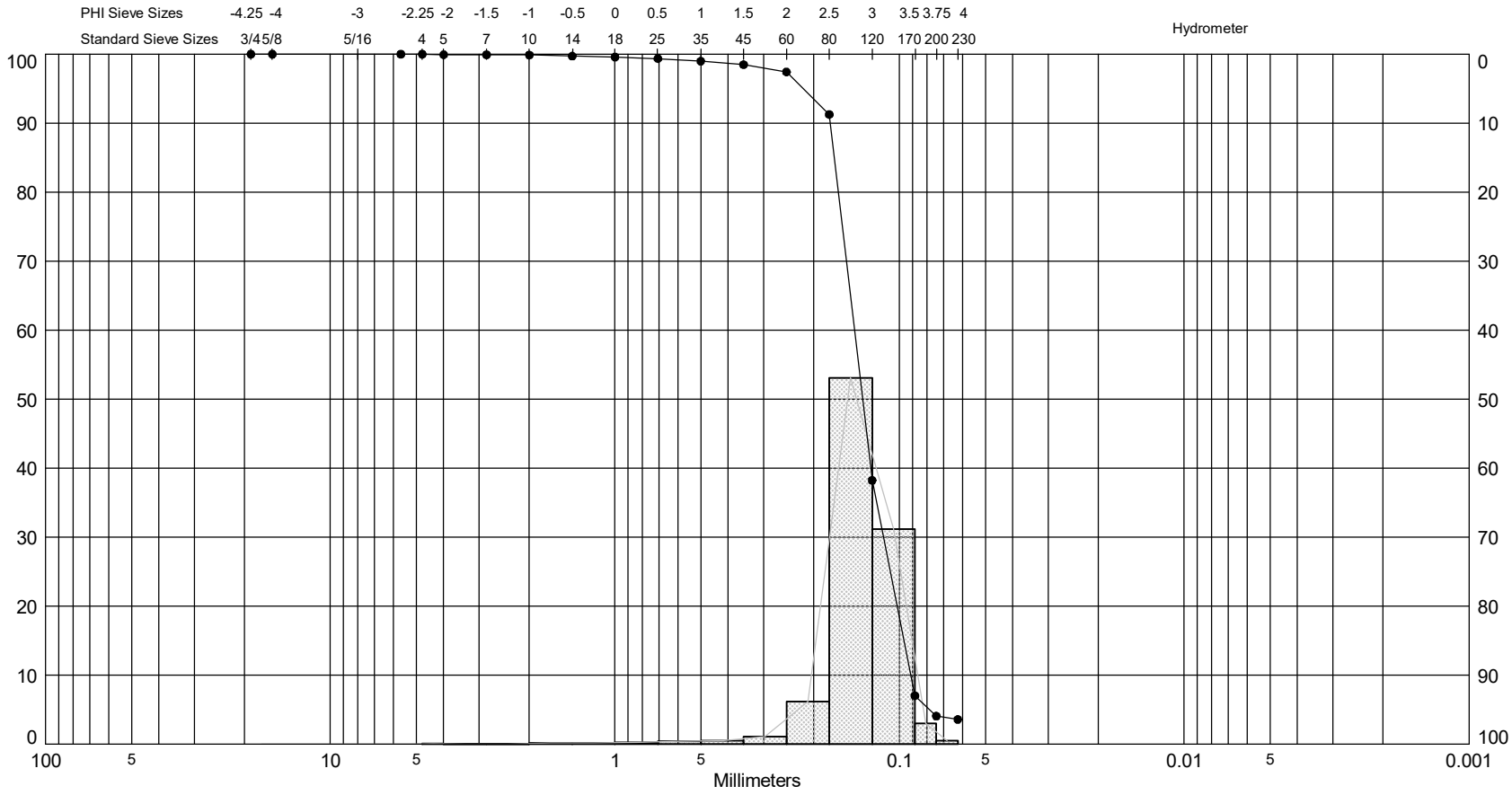
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-13'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-45**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.72	
Dry Wt. Before Washing (g):	219.47	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.20	99.88	100	0.20
#5	4.000	0.09	99.83	100	0.09
#7	2.800	0.29	99.66	100	0.29
#10	2.000	0.50	99.36	100	0.50
#14	1.400	0.80	98.89	70	0.56
#18	1.000	0.82	98.41	60	0.49
#25	0.710	0.72	97.99	50	0.36
#35	0.500	0.73	97.56	40	0.29
#45	0.355	1.04	96.94	30	0.31
#60	0.250	4.20	94.47	25	1.05
#80	0.180	30.44	76.54	1	0.30
#120	0.125	90.04	23.49	0	0.00
#170	0.090	32.57	4.31	0	0.00
#200	0.075	3.14	2.46	0	0.00
#230	0.063	0.64	2.08	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-45 #A	—●—	-21.8	SP	#200 - 4.05 #230 - 3.57			2.89	2.86	-3.22	25.83	0.47

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,090
Northing (Y, ft):	2,249,205
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

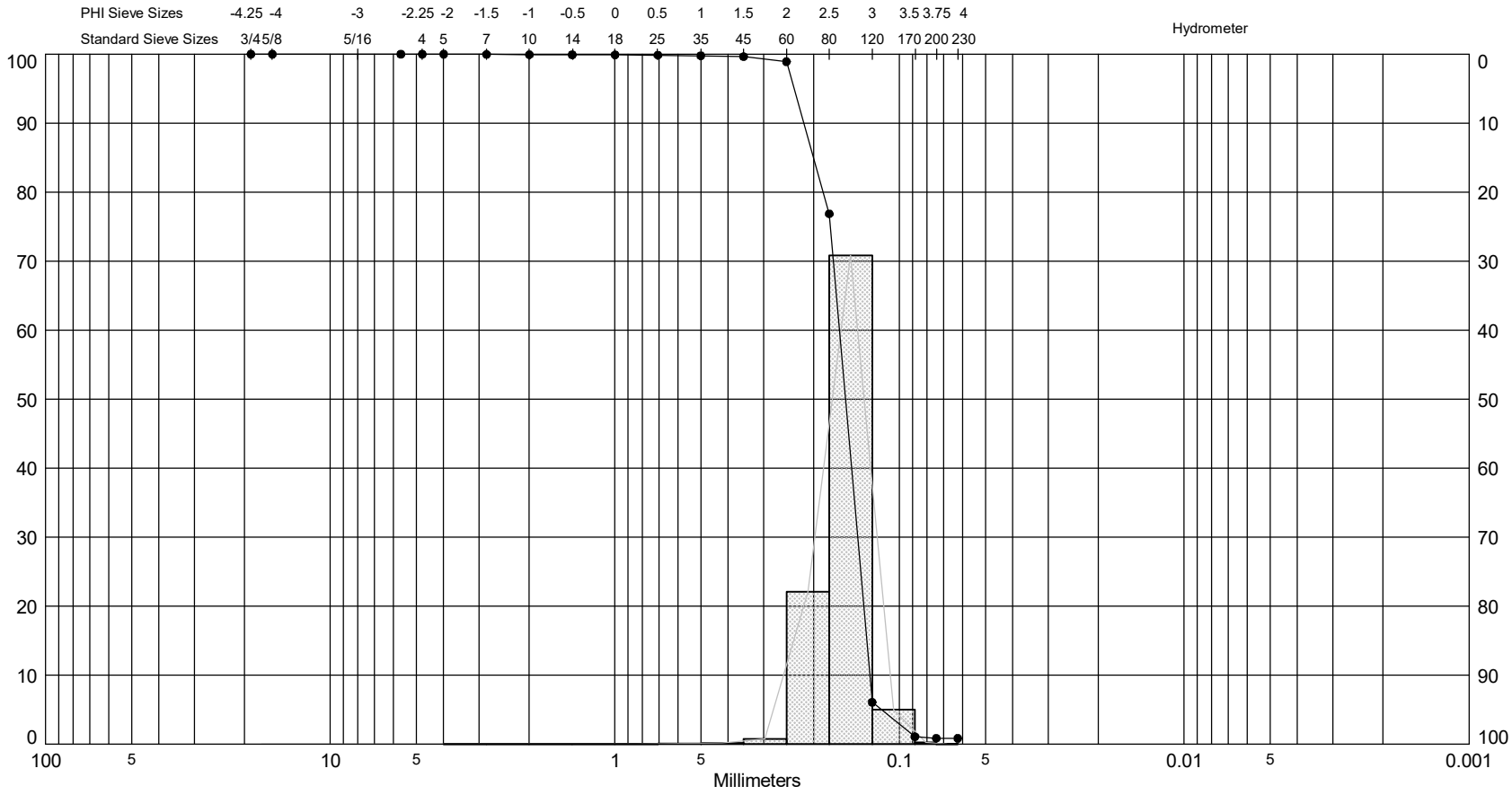
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-45**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 7/1**		

Tare Weight, (g):	49.90	
Dry Wt. Before Washing (g):	204.51	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.11	99.93	100	0.11
#7	2.800	0.02	99.92	100	0.02
#10	2.000	0.06	99.88	100	0.06
#14	1.400	0.24	99.72	60	0.14
#18	1.000	0.21	99.59	40	0.08
#25	0.710	0.32	99.38	30	0.10
#35	0.500	0.60	98.99	10	0.06
#45	0.355	0.78	98.49	5	0.04
#60	0.250	1.62	97.44	1	0.02
#80	0.180	9.52	91.28	0	0.00
#120	0.125	82.02	38.23	0	0.00
#170	0.090	48.24	7.03	0	0.00
#200	0.075	4.59	4.06	0	0.00
#230	0.063	0.74	3.58	0	0.00
Total Shell Content:		**0**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-45 #B	—●—	-30.8	SP	#200 - 0.85 #230 - 0.84			2.69	2.65	-2.74	32.56	0.3

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	03-29-17
Analyzed By:	CM
Easting (X, ft):	525,090
Northing (Y, ft):	2,249,205
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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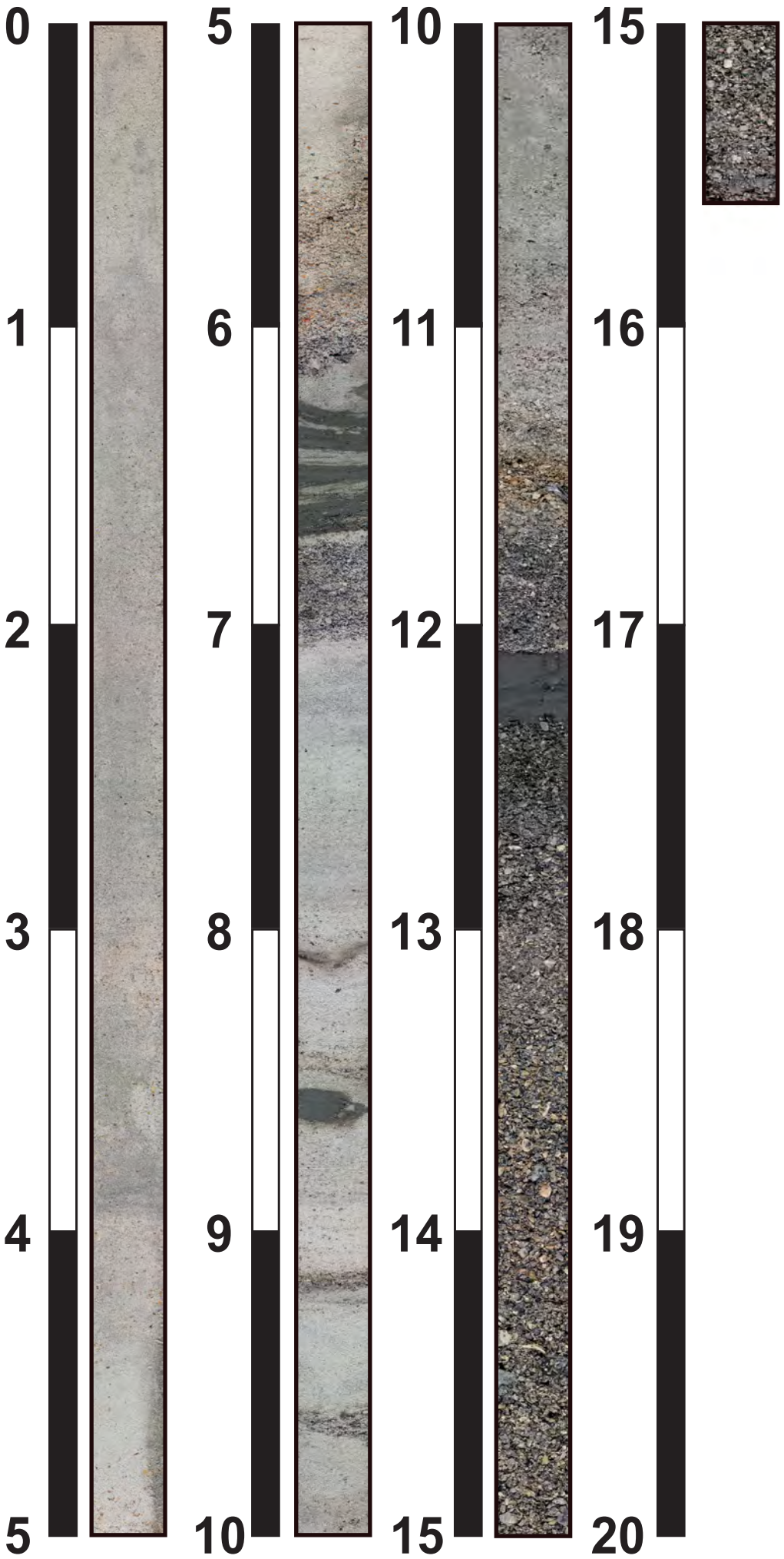
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**3/29/2017**
Boring No.:	**C-45**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, (SP) 5Y 7/1**		

Tare Weight, (g):	49.89	
Dry Wt. Before Washing (g):	203.16	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.04	99.97	100	0.04
#10	2.000	0.06	99.93	95	0.06
#14	1.400	0.03	99.92	100	0.03
#18	1.000	0.01	99.91	100	0.01
#25	0.710	0.04	99.88	50	0.02
#35	0.500	0.14	99.79	30	0.04
#45	0.355	0.20	99.66	15	0.03
#60	0.250	1.12	98.93	10	0.11
#80	0.180	33.80	76.88	1	0.34
#120	0.125	108.54	6.06	0	0.00
#170	0.090	7.63	1.08	0	0.00
#200	0.075	0.34	0.86	0	0.00
#230	0.063	0.02	0.85	0	0.00
Total Shell Content:		**0**		**%**	



Nassau Sound
Florida
2016 - 2017

C-46

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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(843) 887-3800

Boring Designation C-46

DRILLING LOG

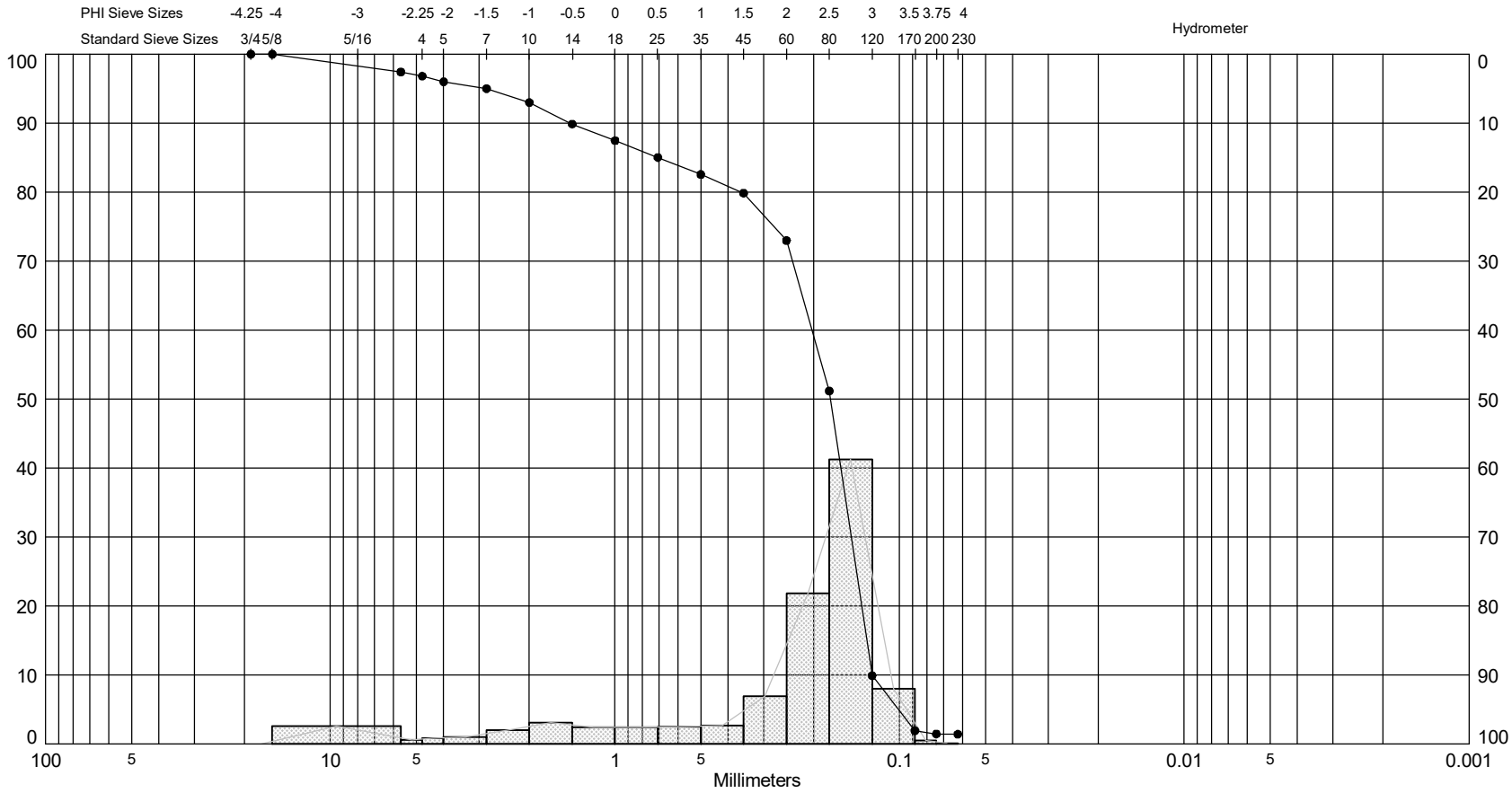
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / HORIZONTAL: NAD 1983 / VERTICAL: NAVD 88
2. BORING DESIGNATION	C-46
LOCATION COORDINATES	X = 525,816 Y = 2,246,630
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED / DEG. FROM VERTICAL / BEARING
14. WATER DEPTH	12.2 Ft.
15. DATE BORING	STARTED: 03-17-17 12:17 / COMPLETED: 03-17-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-11.5 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	15.6 Ft.
8. TOTAL DEPTH OF BORING	18.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-11.5	0.0				
		Fine quartz SAND, few fine to medium sand-size shell, trace silt, poorly graded, loose, subangular, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.61 Shell: 3%, Fines (#200) - 0.86 (SP)
-17.0	5.5			COMP	Sample #COMP, Depth = 0.0' - 12.0' Mean (mm): 0.26, Phi Sorting: 1.49 Shell: 17%, Carbonate: 15.9%, Fines (#200) - 1.45 (SP)
-17.6	6.1	Medium quartz SAND, little medium to coarse sand-size shell, trace silt, poorly graded, subangular, light olive gray (5Y-6/2), (SP).			
-18.2	6.7				
-18.6	7.1	Inberbedded, silty fine SAND (SM; gray [5Y 6/1]) and sandy SILT (ML; dark gray [5Y 4/1]), trace shell, light gray (5Y-7/2), (SP-SM).			
		Medium quartz SAND, little medium to coarse sand-size shell, pooly graded, loose, subangular, gray (5Y-6/1), (SP).			
		Fine quartz SAND, few fine to coarse sand-size shell, trace silt (between 8.0-8.8'), poorly graded, subangular, 8.6' = silt-infilled burrow or rip-up clast, 9.9-11.4' = shell percentage increases to ~20%, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 9.8' - 10.3' Mean (mm): 0.22, Phi Sorting: 1.17 Shell: 10%, Fines (#200) - 1.34 (SP)
-22.9	11.4				
-23.6	12.1	Coarse sand to fine gravel-size SHELL, little medium quartz sand, well graded, subangular, color grades from light olive brown (2.5Y 5/3) to, gray (5Y-5/1), (SW).			
-23.8	12.3	SILT, few fine quartz sand, trace organic material, soft, olive gray (5Y-4/2), (ML).			
		Fine gravel-size SHELL, little medium quartz sand, well graded, very loose, subangular, gray (5Y-5/1), (GW).			
-27.1	15.6				
		End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-46 #COMP	—●—	-11.5	SP	#200 - 1.45 #230 - 1.40		15.90	2.51	1.92	-1.93	6.06	1.49

Comments: Sample Interval = 0 - 12.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,816
Northing (Y, ft):	2,246,630
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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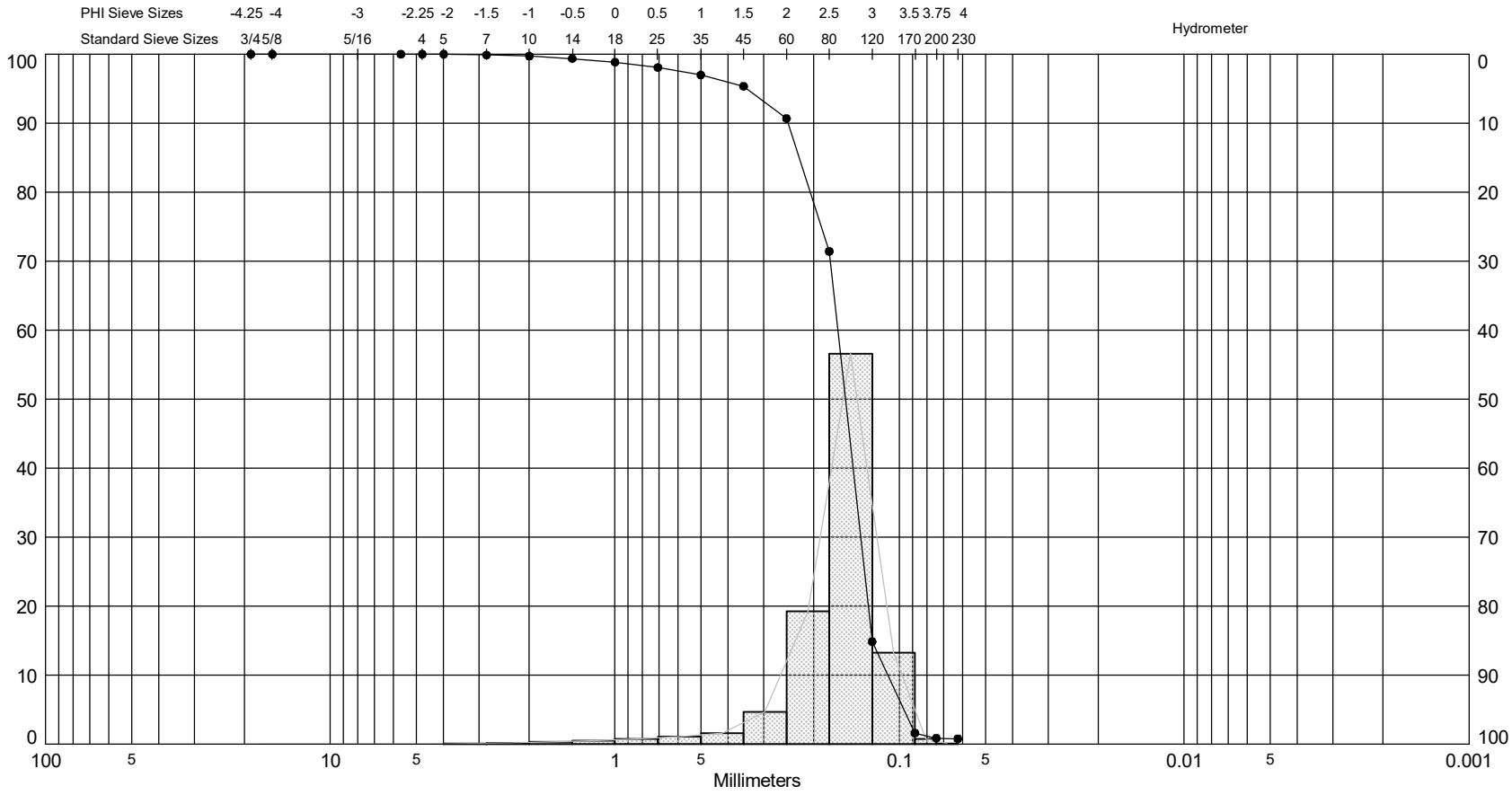
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-12'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-46**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.82	
Dry Wt. Before Washing (g):	187.94	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	3.58	97.41	100	3.58
#4	4.750	0.83	96.81	100	0.83
#5	4.000	1.11	96.00	100	1.11
#7	2.800	1.38	95.00	100	1.38
#10	2.000	2.81	92.97	100	2.81
#14	1.400	4.29	89.86	100	4.29
#18	1.000	3.33	87.45	95	3.16
#25	0.710	3.36	85.02	70	2.35
#35	0.500	3.42	82.54	50	1.71
#45	0.355	3.72	79.85	30	1.12
#60	0.250	9.52	72.96	10	0.95
#80	0.180	30.11	51.16	1	0.30
#120	0.125	57.01	9.88	0	0.00
#170	0.090	11.02	1.90	0	0.00
#200	0.075	0.63	1.45	0	0.00
#230	0.063	0.07	1.40	0	0.00
Total Shell Content:		**17**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-46 #A	—●—	-12.3	SP	#200 - 0.86 #230 - 0.78			2.69	2.57	-2.68	14.15	0.61

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,816
Northing (Y, ft):	2,246,630
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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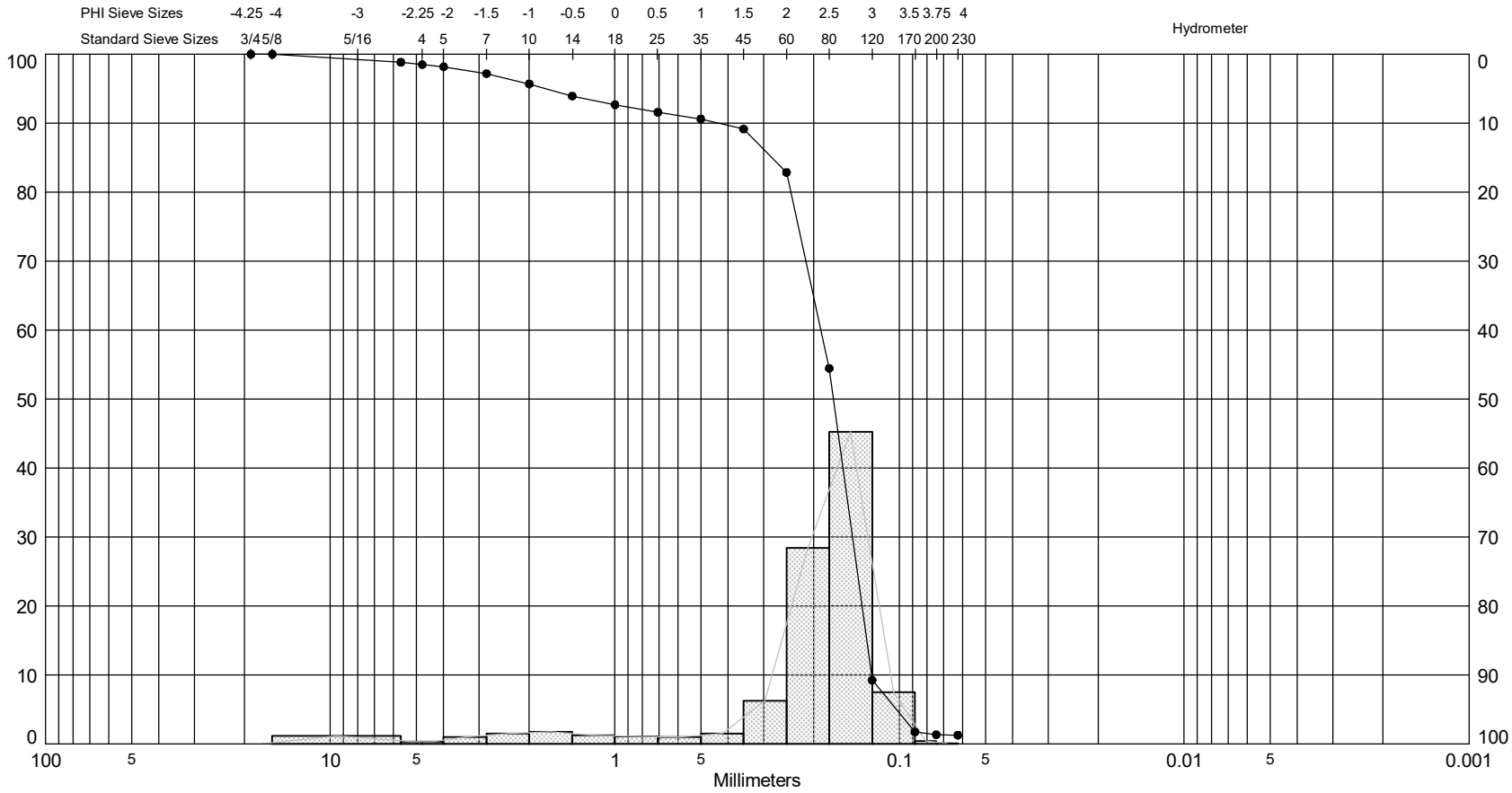
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-46**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.72	
Dry Wt. Before Washing (g):	194.37	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.17	99.88	100	0.17
#10	2.000	0.23	99.72	100	0.23
#14	1.400	0.51	99.37	100	0.51
#18	1.000	0.75	98.85	98	0.74
#25	0.710	1.14	98.06	90	1.03
#35	0.500	1.56	96.99	50	0.78
#45	0.355	2.35	95.36	30	0.71
#60	0.250	6.76	90.69	5	0.34
#80	0.180	27.87	71.42	1	0.28
#120	0.125	81.82	14.86	0	0.00
#170	0.090	19.18	1.60	0	0.00
#200	0.075	1.07	0.86	0	0.00
#230	0.063	0.11	0.78	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-46 #B	—●—	-21.3	SP	#200 - 1.34 #230 - 1.28			2.55	2.2	-2.71	10.56	1.17

Comments: Sample Depth = 10'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,816
Northing (Y, ft):	2,246,630
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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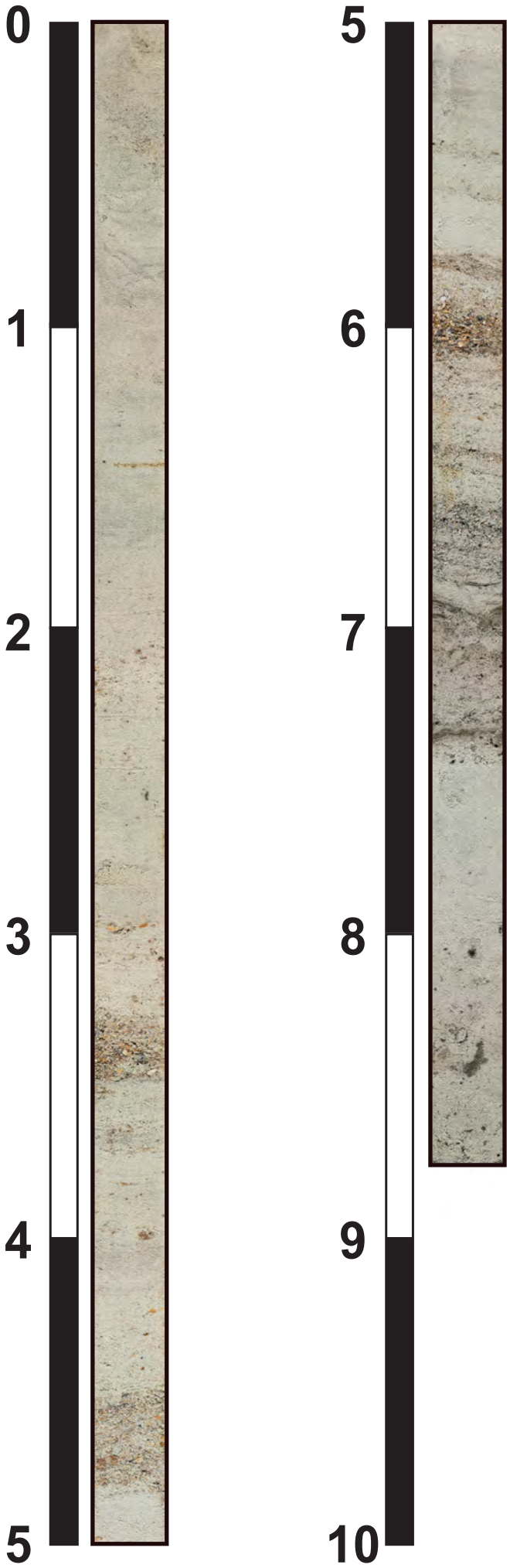
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**10'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-46**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	47.84	
Dry Wt. Before Washing (g):	187.49	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	1.63	98.83	100	1.63
#4	4.750	0.47	98.50	100	0.47
#5	4.000	0.43	98.19	100	0.43
#7	2.800	1.40	97.19	100	1.40
#10	2.000	2.07	95.70	100	2.07
#14	1.400	2.47	93.93	100	2.47
#18	1.000	1.78	92.66	95	1.69
#25	0.710	1.49	91.59	70	1.04
#35	0.500	1.37	90.61	50	0.69
#45	0.355	2.05	89.14	40	0.82
#60	0.250	8.77	82.86	10	0.88
#80	0.180	39.67	54.46	1	0.40
#120	0.125	63.13	9.25	0	0.00
#170	0.090	10.49	1.74	0	0.00
#200	0.075	0.55	1.35	0	0.00
#230	0.063	0.08	1.29	0	0.00
Total Shell Content:		**10**		**%**	



Nassau Sound
Florida
2016 - 2017

C-47

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
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(843) 887-3800

Boring Designation C-47

DRILLING LOG

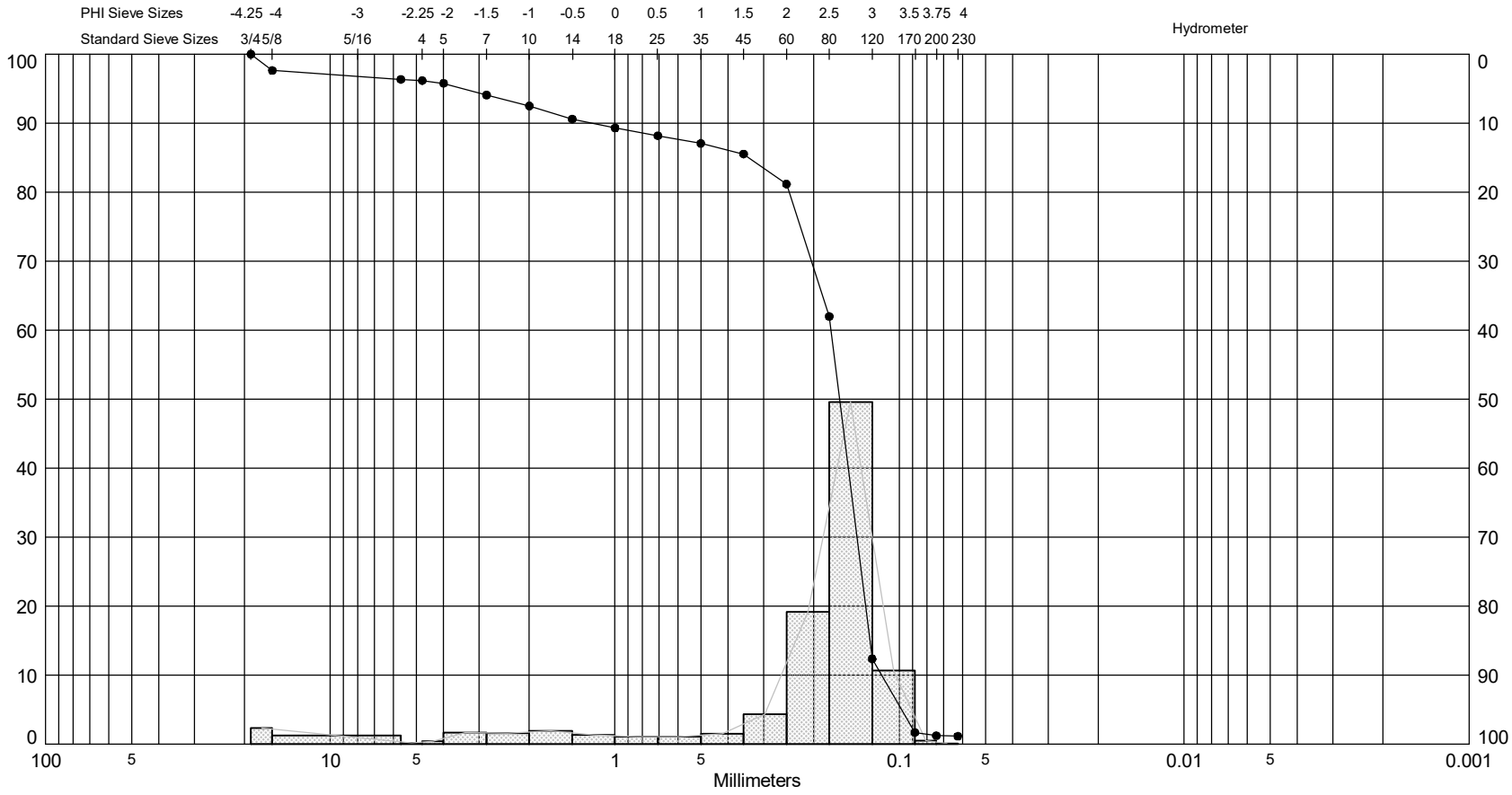
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
2. BORING DESIGNATION	C-47
LOCATION COORDINATES	X = 525,880 Y = 2,247,459
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	9.3 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East
HORIZONTAL	NAD 1983
VERTICAL	NAVD 88
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED 3 / UNDISTURBED (UD)
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	11.3 Ft.
15. DATE BORING	STARTED 07-12-16 12:48 / COMPLETED 07-12-16
16. ELEVATION TOP OF BORING	-11.1 Ft.
17. TOTAL RECOVERY FOR BORING	8.7 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	SEXTON

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-11.1	0.0					
-14.3	3.2		Fine SAND, trace shell fragments, light greenish gray (10Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.15, Phi Sorting: 0.43 Shell: 1%, Fines (#200) - 1.12 (SP)
-17.9	6.8		Fine SAND, trace shell fragments in 2-3 lenses, light greenish gray (10Y-7/1), (SP).		COMP	Sample #COMP, Depth = 0.0' - 8.5' Mean (mm): 0.24, Phi Sorting: 1.59 Shell: 13%, Carbonate: 13.1%, Fines (#200) - 1.21 (SP)
-19.8	8.7		Fine SAND, trace shell fragments, trace silt in lenses., light greenish gray (10Y-7/1), (SP).		B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.16, Phi Sorting: 0.78 Shell: 8%, Fines (#200) - 3.05 (SP)
			End of Boring			

0 5 10 15 20 25

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-47 #COMP	—●—	-11.1	SP	#200 - 1.21 #230 - 1.13		13.10	2.62	2.07	-2.51	8.76	1.59

Comments: Sample Interval = 0 - 8.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,880
Northing (Y, ft):	2,247,459
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
ph 843-887-3800
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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

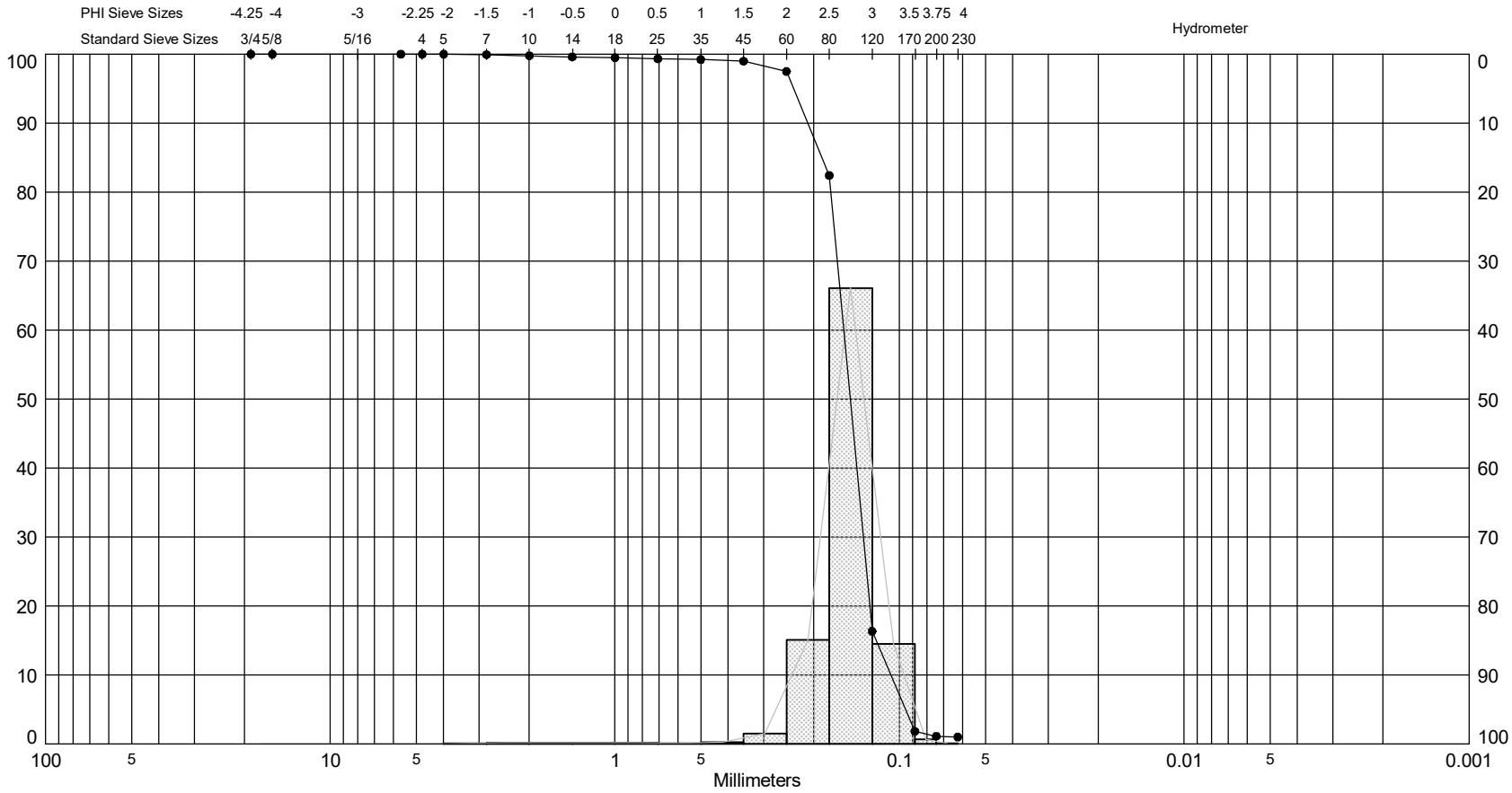
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-8.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-47**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, little carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	50.63	
Dry Wt. Before Washing (g):	186.29	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	3.22	97.63	100	3.22
#3.5	5.600	1.73	96.35	100	1.73
#4	4.750	0.22	96.19	100	0.22
#5	4.000	0.54	95.79	100	0.54
#7	2.800	2.31	94.09	100	2.31
#10	2.000	2.17	92.49	100	2.17
#14	1.400	2.56	90.60	100	2.56
#18	1.000	1.77	89.30	100	1.77
#25	0.710	1.51	88.18	90	1.36
#35	0.500	1.52	87.06	50	0.76
#45	0.355	2.07	85.54	30	0.62
#60	0.250	5.91	81.18	5	0.30
#80	0.180	26.04	61.99	1	0.26
#120	0.125	67.31	12.37	0	0.00
#170	0.090	14.48	1.70	0	0.00
#200	0.075	0.65	1.22	0	0.00
#230	0.063	0.11	1.14	0	0.00
Total Shell Content:		**13**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-47 #A	—●—	-11.9	SP	#200 - 1.12 #230 - 1.00			2.75	2.71	-3.71	32.34	0.43

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,880
Northing (Y, ft):	2,247,459
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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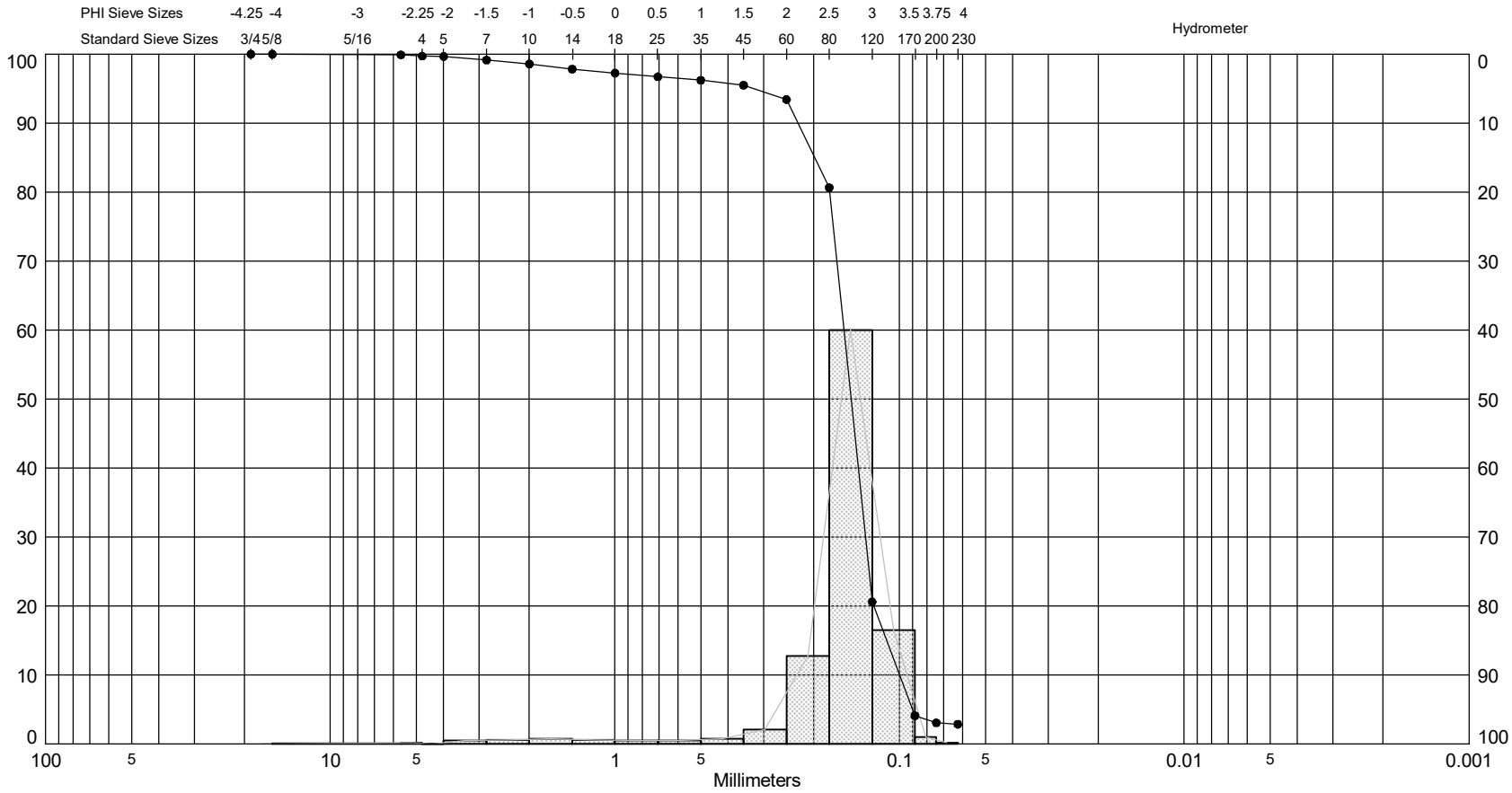
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-47**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.98	
Dry Wt. Before Washing (g):	192.87	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.10	99.93	100	0.10
#10	2.000	0.21	99.78	100	0.21
#14	1.400	0.24	99.62	100	0.24
#18	1.000	0.18	99.49	98	0.18
#25	0.710	0.22	99.34	95	0.21
#35	0.500	0.16	99.22	90	0.14
#45	0.355	0.35	98.98	50	0.18
#60	0.250	2.13	97.49	5	0.11
#80	0.180	21.55	82.41	1	0.22
#120	0.125	94.41	16.33	0	0.00
#170	0.090	20.75	1.81	0	0.00
#200	0.075	1.00	1.11	0	0.00
#230	0.063	0.17	0.99	0	0.00
Total Shell Content:		**1**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-47 #B	—●—	-17.9	SP	#200 - 3.05 #230 - 2.86			2.76	2.61	-3.78	20.5	0.78

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	525,880
Northing (Y, ft):	2,247,459
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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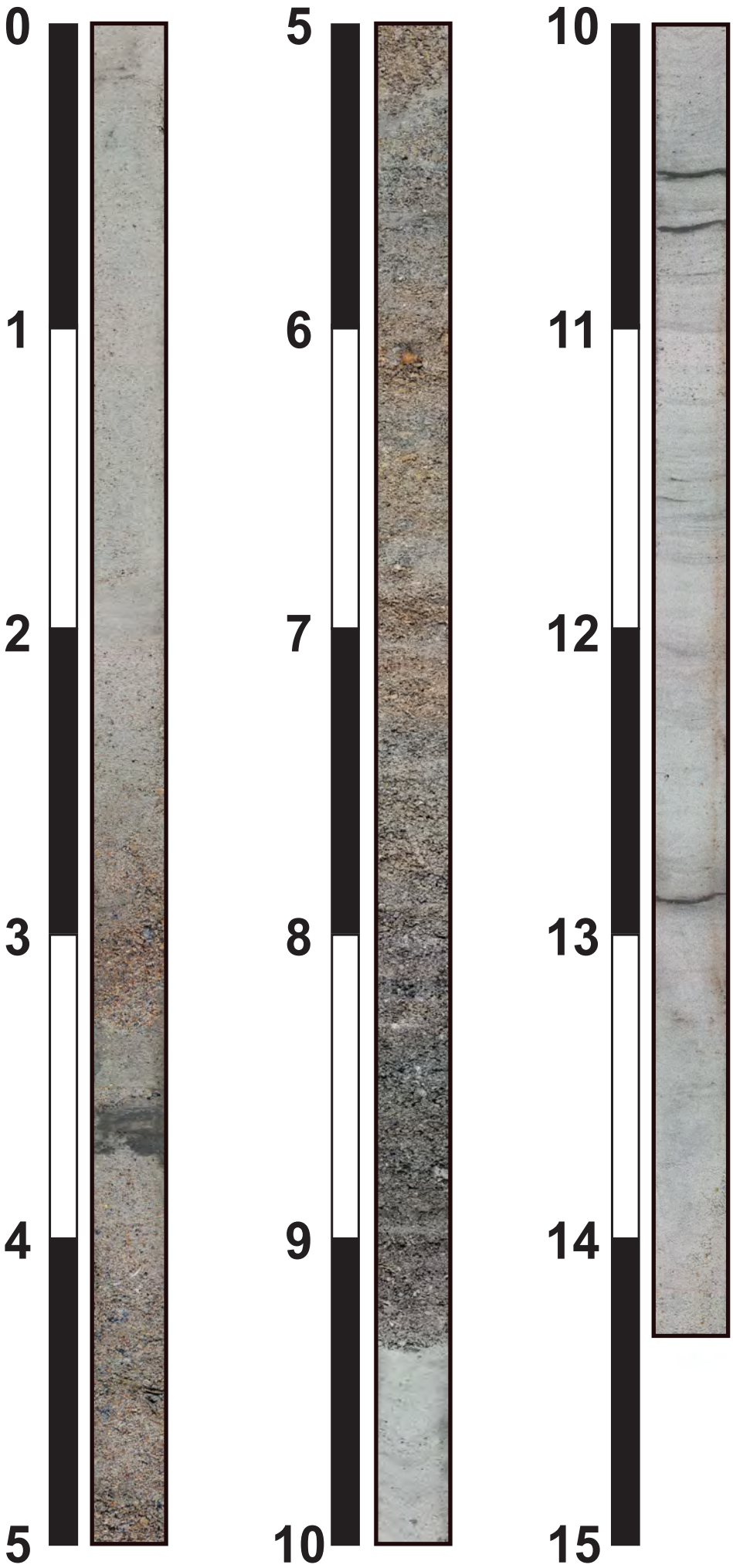
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-47**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.38	
Dry Wt. Before Washing (g):	195.58	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.15	99.90	100	0.15
#4	4.750	0.28	99.70	100	0.28
#5	4.000	0.06	99.66	100	0.06
#7	2.800	0.77	99.13	100	0.77
#10	2.000	0.79	98.58	100	0.79
#14	1.400	1.09	97.82	100	1.09
#18	1.000	0.83	97.25	100	0.83
#25	0.710	0.77	96.71	95	0.73
#35	0.500	0.74	96.20	90	0.67
#45	0.355	1.03	95.49	70	0.72
#60	0.250	2.99	93.41	50	1.50
#80	0.180	18.44	80.62	20	3.69
#120	0.125	86.58	20.58	1	0.87
#170	0.090	23.82	4.06	0	0.00
#200	0.075	1.48	3.04	0	0.00
#230	0.063	0.27	2.85	0	0.00
Total Shell Content:		**8**		**%**	



Nassau Sound
Florida
2016 - 2017

C-48

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

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Boring Designation C-48

DRILLING LOG

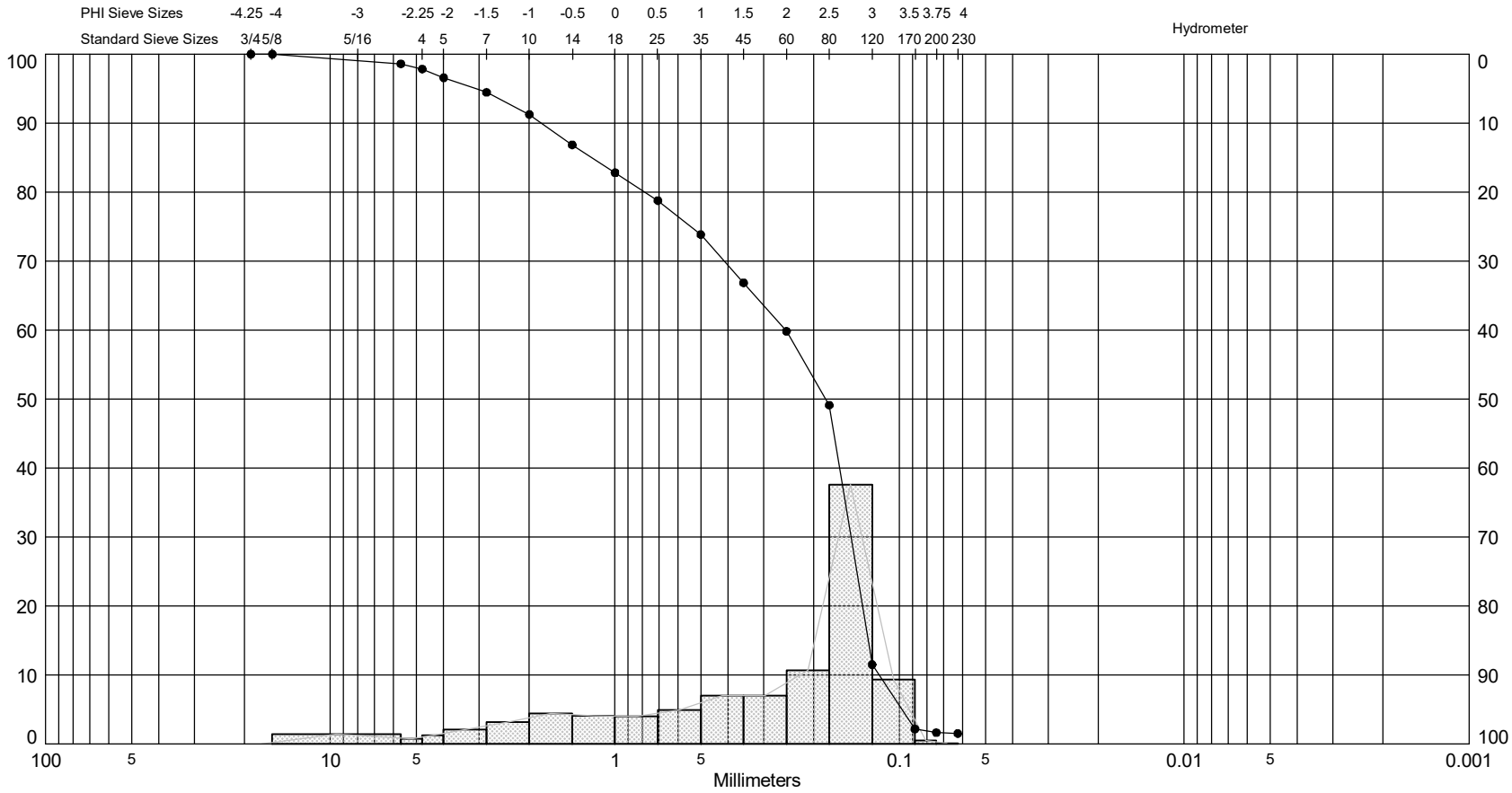
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	C-48
LOCATION COORDINATES	X = 523,701 Y = 2,249,069
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL / BEARING	
14. WATER DEPTH	13.5 Ft.
15. DATE BORING	STARTED: 03-17-17 08:51 / COMPLETED: 03-17-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-15.2 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	14.3 Ft.
8. TOTAL DEPTH OF BORING	18.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-15.2	0.0					
			Fine quartz SAND, trace fine to medium sand-size shell, poorly graded, loose, subangular, 2.1' = shell percentage increases slightly, light gray (5Y-7/2), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.17, Phi Sorting: 0.65 Shell: 6%, Fines (#200) - 0.95 (SP)
-17.9	2.7					
-18.5	3.3		Medium quartz SAND, little medium to coarse sand-size shell, trace silt, well graded, loose, subangular, light brownish gray (2.5Y-6/2), (SW).			
-18.9	3.7		Fine quartz SAND, few silt in burrows, few fine to medium sand-size shell, poorly graded, loose, subangular, light olive gray (5Y-6/2), (SP-SM).			
			Medium quartz SAND, little grading to some (at 8.5') medium sand to fine gravel-size shell, trace silt, well graded, subangular, color grades from light gray (2.5Y 7/2) to, gray (5Y-5/1), (SW).		COMP	Sample #COMP, Depth = 0.0' - 14.0' Mean (mm): 0.31, Phi Sorting: 1.57 Shell: 30%, Carbonate: 24.1%, Fines (#200) - 1.63 (SP)
					B	Sample #B, Depth = 6.8' - 7.3' Mean (mm): 0.89, Phi Sorting: 1.94 Shell: 58%, Fines (#200) - 2.14 (SP)
-24.5	9.3					
			Fine quartz SAND, trace silt in laminations, trace fine to medium sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		C	Sample #C, Depth = 13.3' - 13.8' Mean (mm): 0.15, Phi Sorting: 0.29 Shell: 0%, Fines (#200) - 1.50 (SP)
-29.5	14.3					
			End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-48 #COMP	—●—	-15.2	SP	#200 - 1.63 #230 - 1.52		24.10	2.46	1.68	-1.22	3.57	1.57

Comments: Sample Interval = 0 - 14.0'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,701
Northing (Y, ft):	2,249,069
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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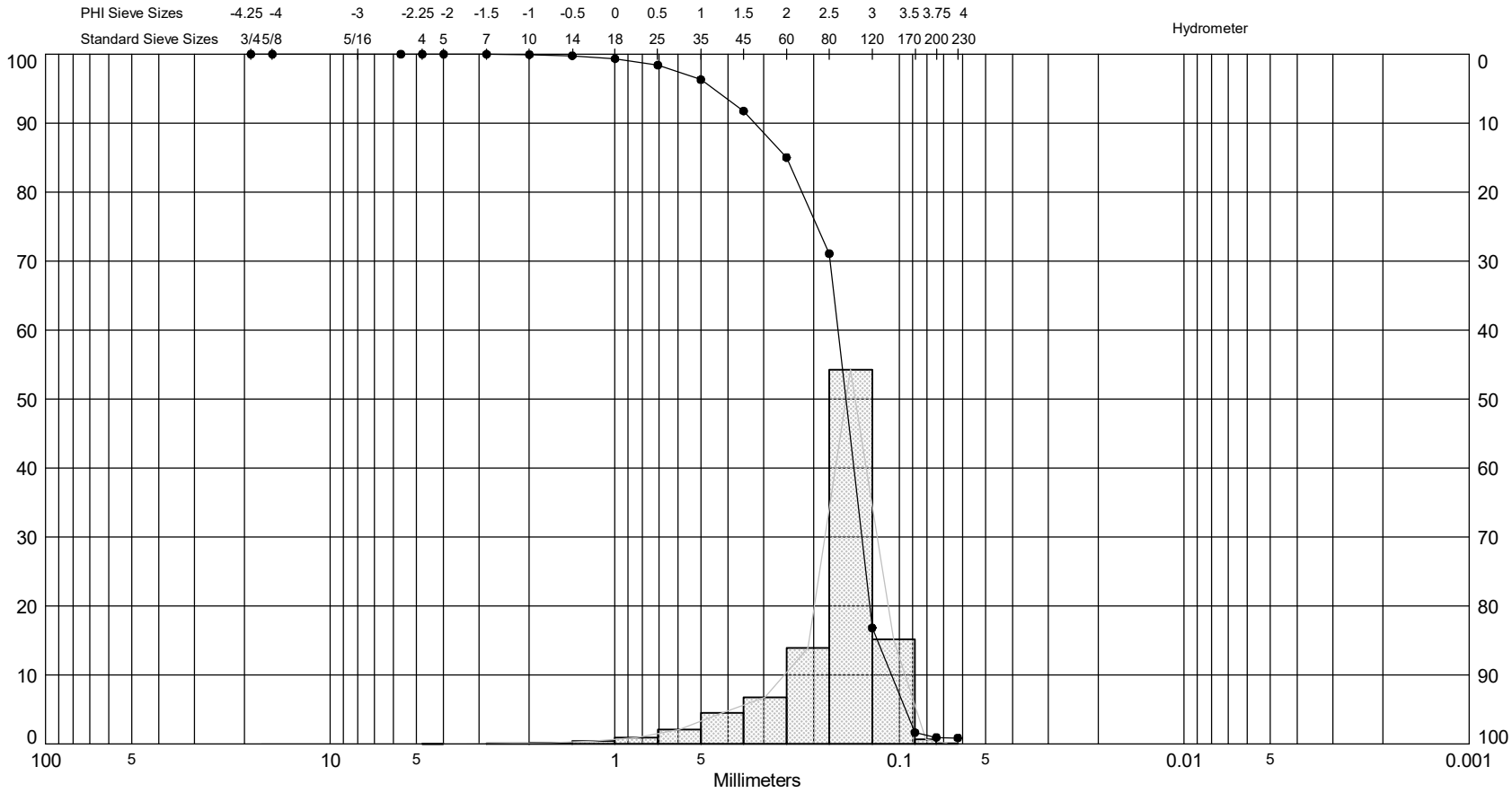
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-14'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-48**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, some carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.43	
Dry Wt. Before Washing (g):	197.36	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	2.04	98.60	100	2.04
#4	4.750	1.09	97.86	100	1.09
#5	4.000	1.85	96.59	100	1.85
#7	2.800	3.09	94.47	100	3.09
#10	2.000	4.66	91.28	100	4.66
#14	1.400	6.43	86.87	100	6.43
#18	1.000	5.92	82.81	98	5.80
#25	0.710	5.87	78.79	90	5.28
#35	0.500	7.19	73.86	70	5.03
#45	0.355	10.20	66.87	50	5.10
#60	0.250	10.27	59.84	30	3.08
#80	0.180	15.62	49.13	5	0.78
#120	0.125	54.90	11.51	0	0.00
#170	0.090	13.63	2.17	0	0.00
#200	0.075	0.78	1.64	0	0.00
#230	0.063	0.16	1.53	0	0.00
Total Shell Content:		**30**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-48 #A	—●—	-16.0	SP	#200 - 0.95 #230 - 0.87			2.69	2.54	-1.8	7.36	0.65

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,701
Northing (Y, ft):	2,249,069
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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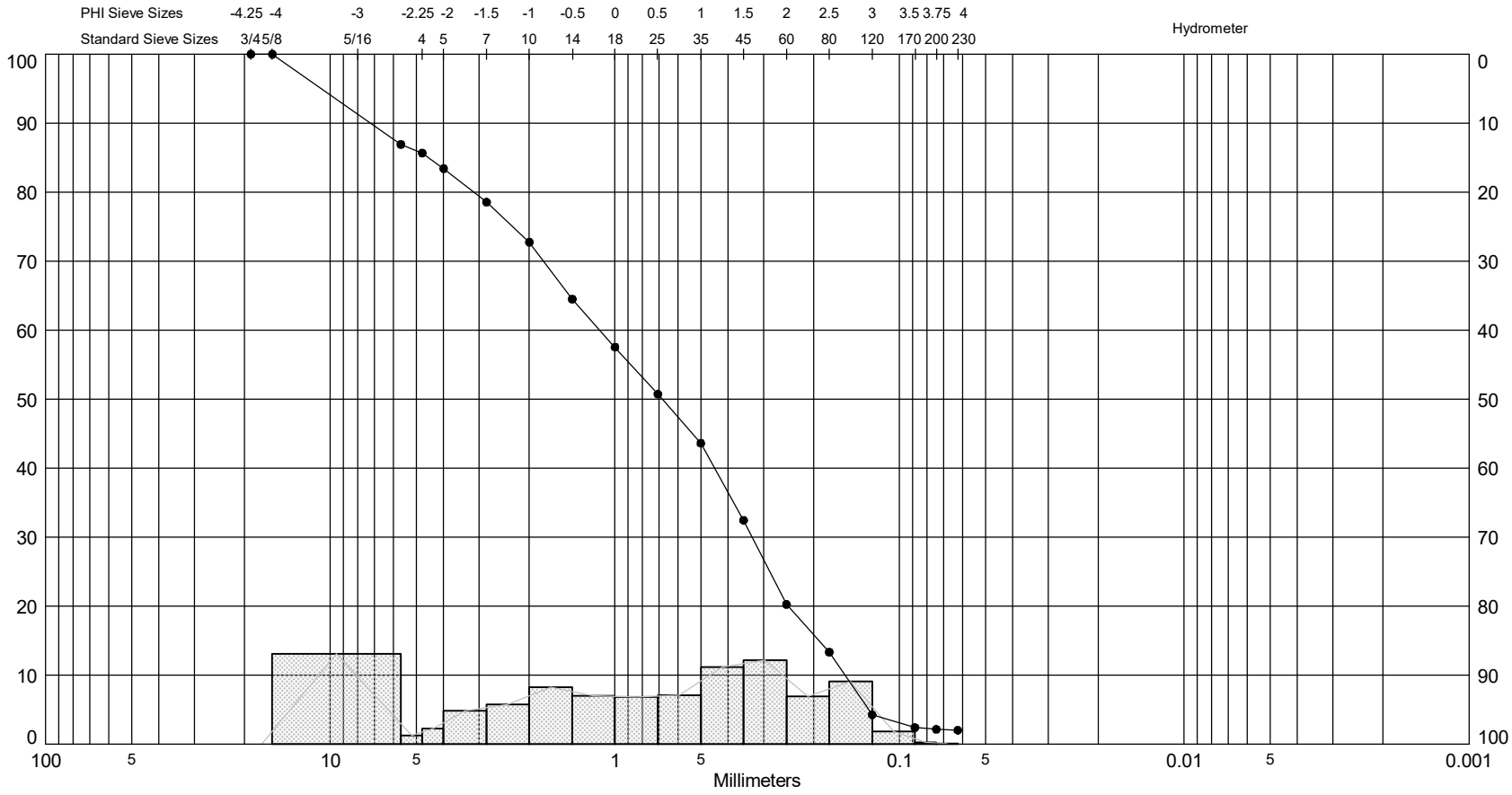
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-48**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, few carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.40	
Dry Wt. Before Washing (g):	197.55	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	100	0.00
#3.5	5.600	0.00	100.00	100	0.00
#4	4.750	0.00	100.00	100	0.00
#5	4.000	0.02	99.99	100	0.02
#7	2.800	0.00	99.99	0	0.00
#10	2.000	0.07	99.94	100	0.07
#14	1.400	0.24	99.78	100	0.24
#18	1.000	0.64	99.35	98	0.63
#25	0.710	1.40	98.40	90	1.26
#35	0.500	3.12	96.29	70	2.18
#45	0.355	6.71	91.77	50	3.36
#60	0.250	9.99	85.02	10	1.00
#80	0.180	20.66	71.08	1	0.21
#120	0.125	80.40	16.81	0	0.00
#170	0.090	22.47	1.64	0	0.00
#200	0.075	1.02	0.95	0	0.00
#230	0.063	0.12	0.87	0	0.00
Total Shell Content:		**6**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-48 #B	—●—	-22.0	SP	#200 - 2.14 #230 - 2.02			0.55	0.17	-0.38	2.04	1.94

Comments: Sample Depth = 7'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,701
Northing (Y, ft):	2,249,069
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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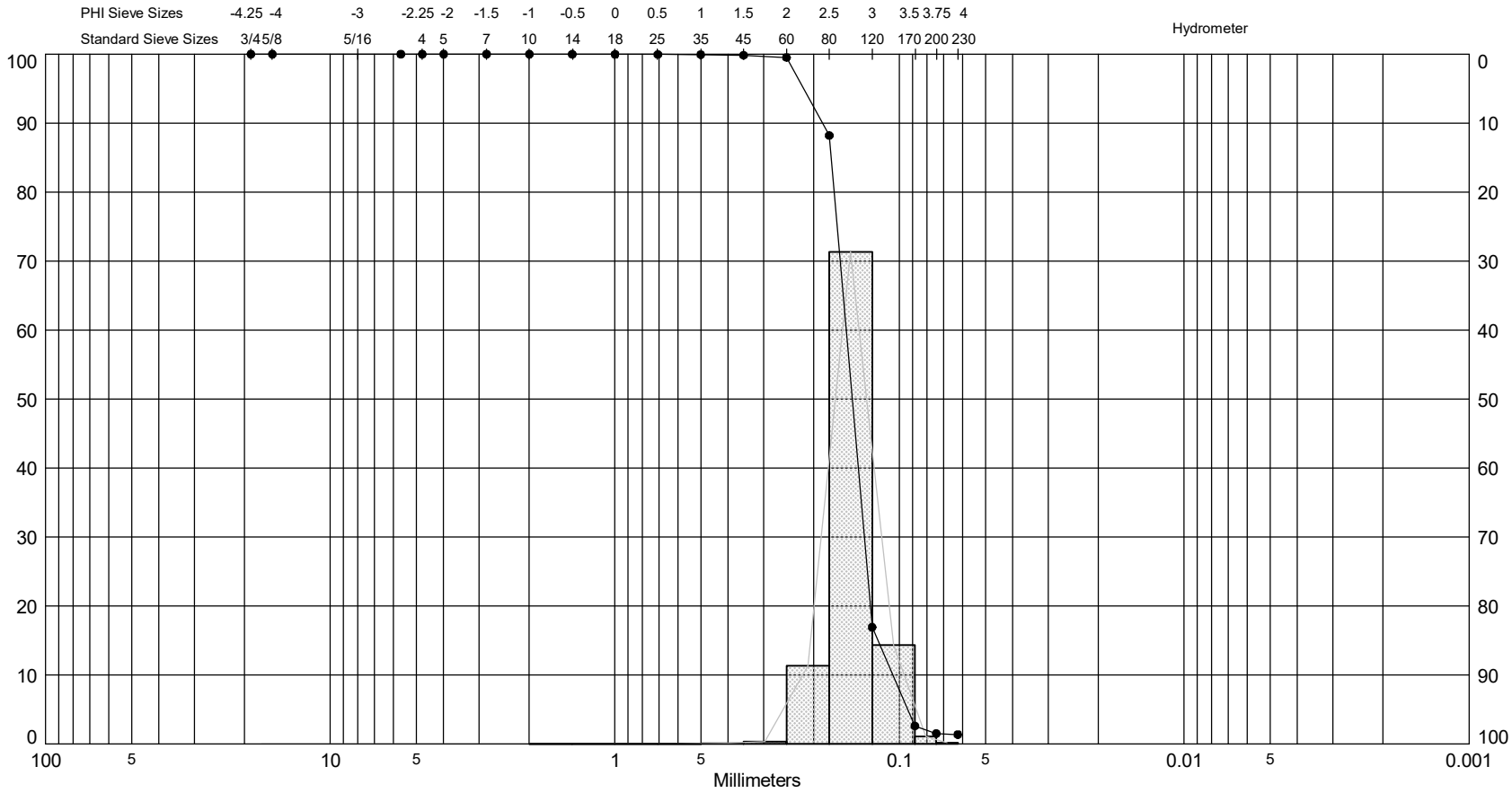
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**7'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-48**		
Sample No.:	**B**		
Description:	**SHELL, mostly coarse to fine-grained fragments, mostly carbonate, little fine-grained quartz sand (SP) 5Y 7/1**		

Tare Weight, (g):	50.02	
Dry Wt. Before Washing (g):	195.29	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	19.01	86.91	100	19.01
#4	4.750	1.80	85.67	100	1.80
#5	4.000	3.29	83.41	100	3.29
#7	2.800	7.06	78.55	100	7.06
#10	2.000	8.41	72.76	100	8.41
#14	1.400	12.00	64.50	100	12.00
#18	1.000	10.11	57.54	100	10.11
#25	0.710	9.91	50.72	90	8.92
#35	0.500	10.31	43.62	70	7.22
#45	0.355	16.22	32.46	30	4.87
#60	0.250	17.73	20.25	5	0.89
#80	0.180	10.04	13.34	1	0.10
#120	0.125	13.19	4.26	0	0.00
#170	0.090	2.71	2.39	0	0.00
#200	0.075	0.36	2.15	0	0.00
#230	0.063	0.17	2.03	0	0.00
Total Shell Content:		**58**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-48 #C	—●—	-28.5	SP	#200 - 1.50 #230 - 1.36			2.77	2.77	-0.39	9.52	0.29

Comments: Sample Depth = 13.5

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	523,701
Northing (Y, ft):	2,249,069
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

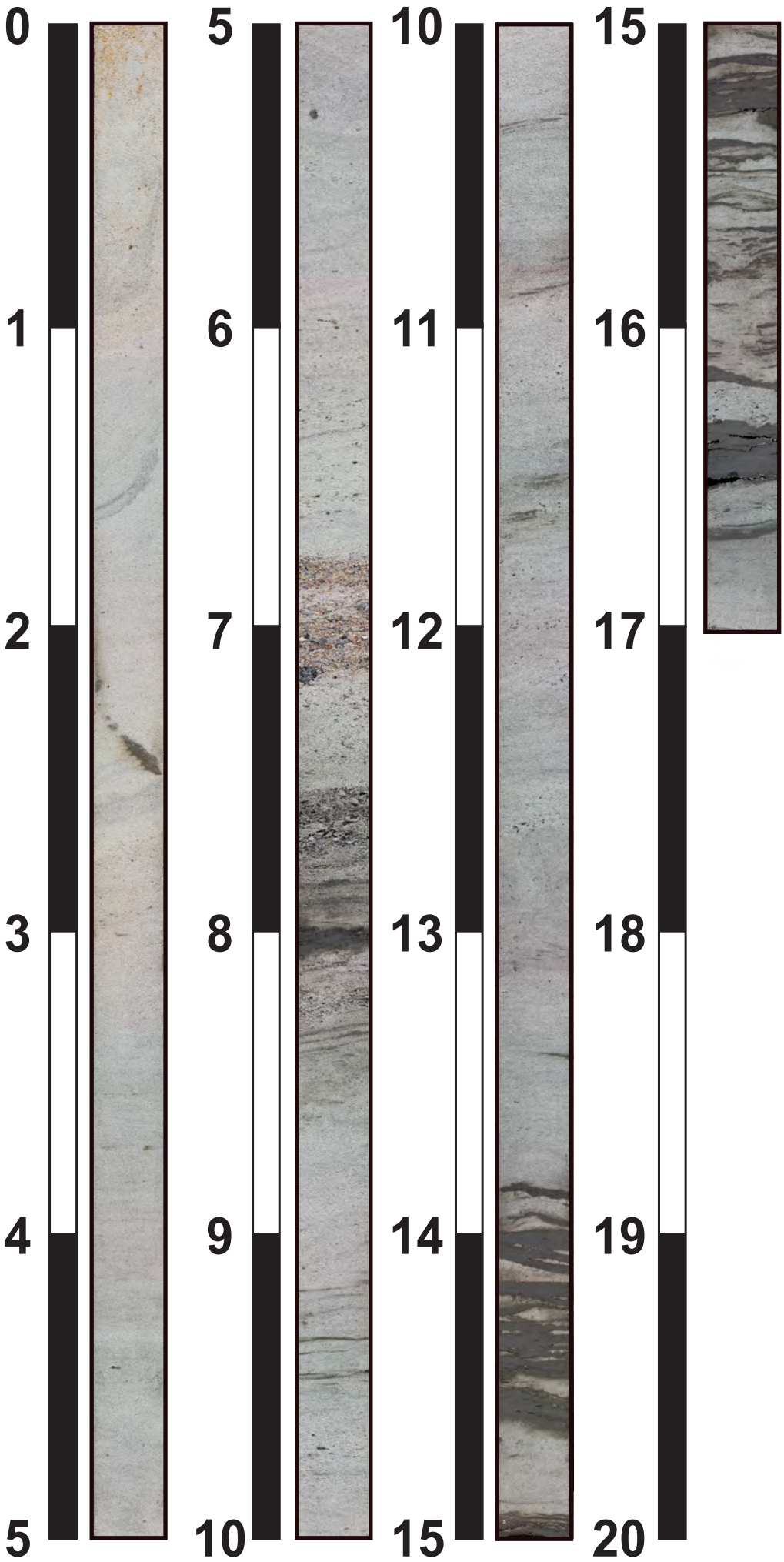
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**13.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-48**		
Sample No.:	**C**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 6/1**		

Tare Weight, (g):	51.63	
Dry Wt. Before Washing (g):	166.26	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.01	99.99	100	0.01
#18	1.000	0.02	99.97	100	0.02
#25	0.710	0.01	99.97	100	0.01
#35	0.500	0.02	99.95	100	0.02
#45	0.355	0.10	99.86	90	0.09
#60	0.250	0.36	99.55	1	0.00
#80	0.180	12.99	88.21	1	0.13
#120	0.125	81.73	16.92	0	0.00
#170	0.090	16.40	2.61	0	0.00
#200	0.075	1.26	1.51	0	0.00
#230	0.063	0.16	1.37	0	0.00
Total Shell Content:		**0**		**%**	



Nassau Sound
Florida
2016 - 2017

C-49

Notes:
Scale in Feet
Photo Mosaic Image

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

Boring Designation C-49

DRILLING LOG

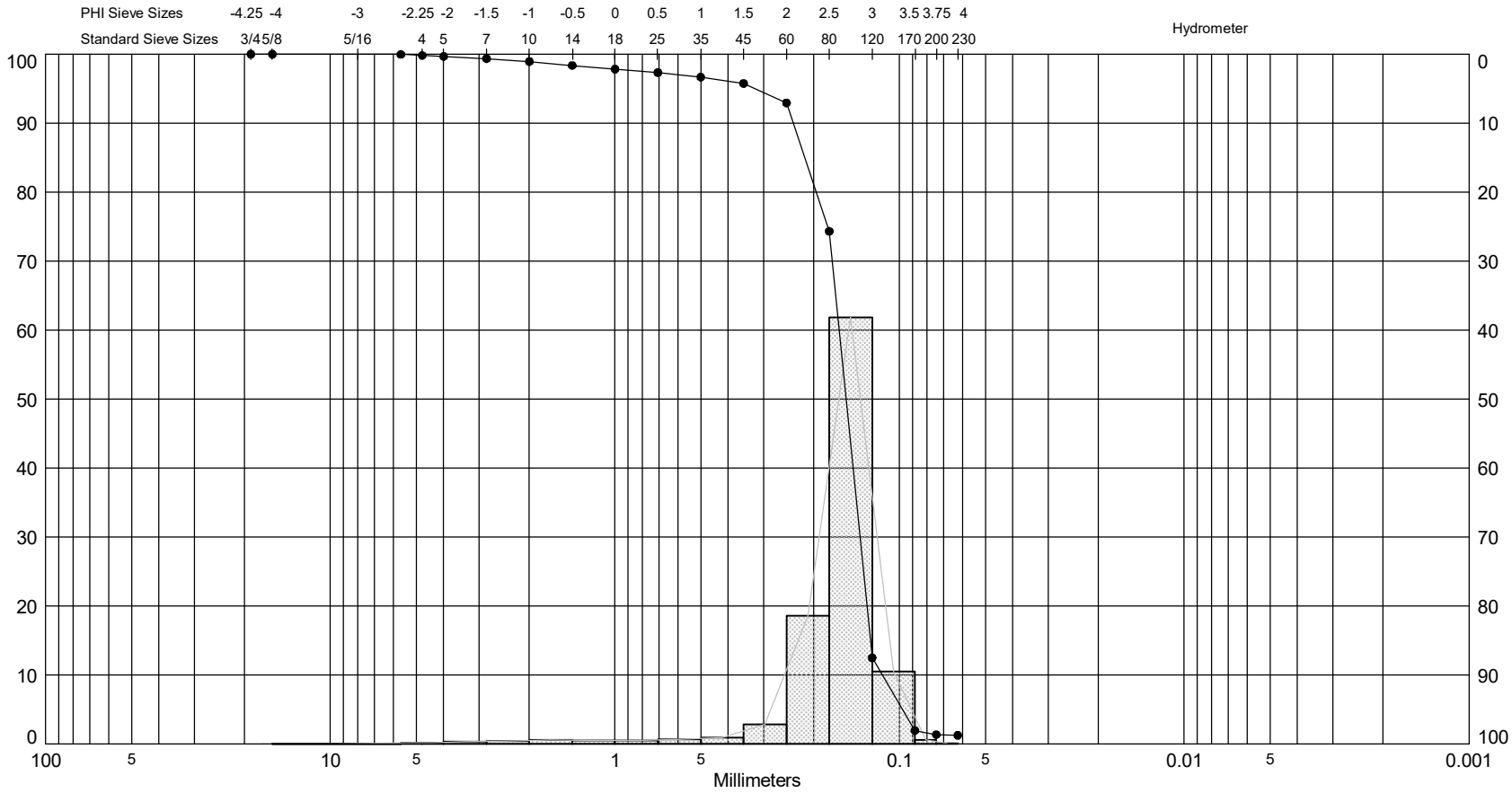
CLIENT	Olsen Associates, Inc.
PROJECT OWNER	
SHEET	1 OF 1 SHEETS
1. PROJECT	Geotechnical Evaluation Nassau Sound (Amelia Island), Florida
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	Florida State Plane East / NAD 1983 / NAVD 88
2. BORING DESIGNATION	C-49
LOCATION COORDINATES	X = 527,152 Y = 2,246,690
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
4. NAME OF DRILLER	McClellan
13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL / BEARING	
14. WATER DEPTH	10.1 Ft.
15. DATE BORING	STARTED: 03-18-17 13:19 / COMPLETED: 03-18-17
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	-10.2 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	17 Ft.
8. TOTAL DEPTH OF BORING	20.0 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-10.2	0.0					
			Fine quartz SAND, trace silt in occasional burrow, trace fine to medium sand-size shell, poorly graded, loose, subangular, 2.4' = silt-infilled Callianassa major burrow, 6.8-7.2' = shell percentage increases to ~30%, light gray (5Y-7/1), (SP).		A	Sample #A, Depth = 0.8' - 1.3' Mean (mm): 0.18, Phi Sorting: 0.52 Shell: 2%, Fines (#200) - 1.07 (SP)
					COMP	Sample #COMP, Depth = 0.0' - 13.5' Mean (mm): 0.17, Phi Sorting: 0.70 Shell: 3%, Carbonate: 4.1%, Fines (#200) - 1.35 (SP)
-17.7	7.5					
-18.0	7.8		Medium quartz SAND, some medium to coarse sand-size shell, poorly graded, loose, subangular, gray (5Y-5/1), (SP).			
-18.3	8.1		Silty fine quartz SAND, little silt in burrows and laminations, trace fine sand-size shell, olive gray (5Y-5/2), (SM).			
			Fine quartz SAND, trace silt in laminations and burrows, trace fine to medium sand-size shell, poorly graded, loose, subangular, light gray (5Y-7/1), (SP).		B	Sample #B, Depth = 10.8' - 11.3' Mean (mm): 0.15, Phi Sorting: 0.53 Shell: 2%, Fines (#200) - 1.11 (SP)
-24.0	13.8					
			Interbedded, SILT (ML; dark gray [5Y 4/1]) and fine quartz SAND (SP; gray [5Y 6/1]), trace fine to medium sand-size shell, olive gray (5Y-4/2), (SM).			
-27.2	17.0					
			End of Boring			

0 5 10 15 20

FLORIDA DEP ROSS 2016-07-18 OLSEN, NASSAU SOUND.GPJ FL DEP ROSS.GDT 6/15/17

SAJ FORM 1836 JUN 02 **MODIFIED FOR THE FLORIDA DEP** JUN 04



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-49 #COMP	—●—	-10.2	SP	#200 - 1.35 #230 - 1.25		4.10	2.7	2.56	-3.83	22.17	0.7

Comments: Sample Interval = 0 - 13.5'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,152
Northing (Y, ft):	2,246,690
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

ATHENA TECHNOLOGIES, INC.

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SIEVE ANALYSIS OAI NASSAU SOUND (AMELIA ISLAND) 2016-2017.GPJ FL DEP ROSS.GDT 6/23/17

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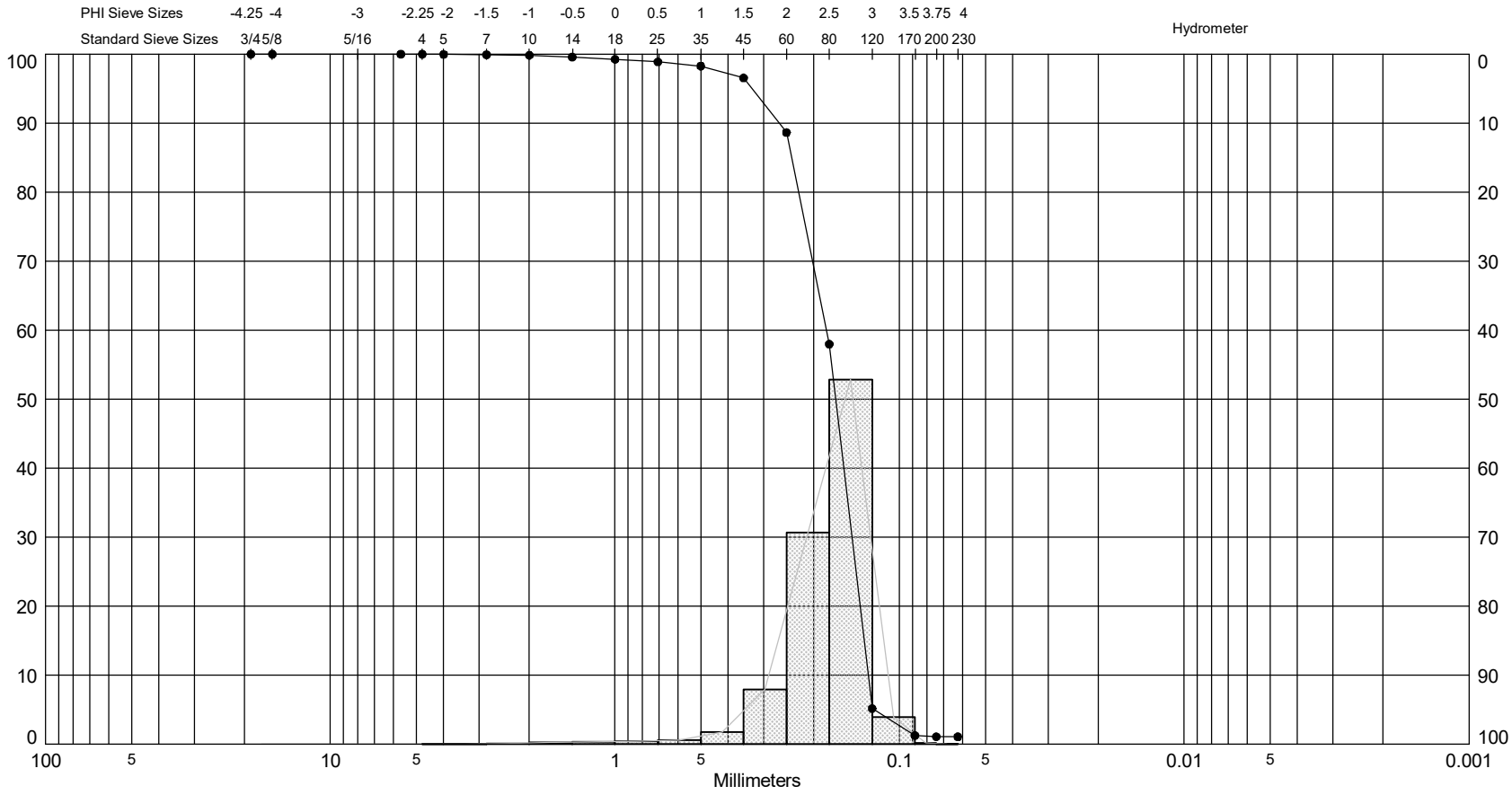
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**0-13.5'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-49**		
Sample No.:	**Comp**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.75	
Dry Wt. Before Washing (g):	208.01	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.06	99.96	100	0.06
#4	4.750	0.23	99.81	100	0.23
#5	4.000	0.20	99.69	100	0.20
#7	2.800	0.50	99.37	100	0.50
#10	2.000	0.65	98.95	100	0.65
#14	1.400	0.89	98.38	100	0.89
#18	1.000	0.83	97.85	98	0.81
#25	0.710	0.79	97.34	80	0.63
#35	0.500	1.02	96.69	50	0.51
#45	0.355	1.44	95.77	20	0.29
#60	0.250	4.40	92.95	5	0.22
#80	0.180	29.09	74.34	1	0.29
#120	0.125	96.65	12.49	0	0.00
#170	0.090	16.44	1.96	0	0.00
#200	0.075	0.94	1.36	0	0.00
#230	0.063	0.15	1.27	0	0.00
Total Shell Content:		**3**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-49 #A	—●—	-11.0	SP	#200 - 1.07 #230 - 1.05			2.58	2.46	-2.64	16.11	0.52

Comments: Sample Depth = 1'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,152
Northing (Y, ft):	2,246,690
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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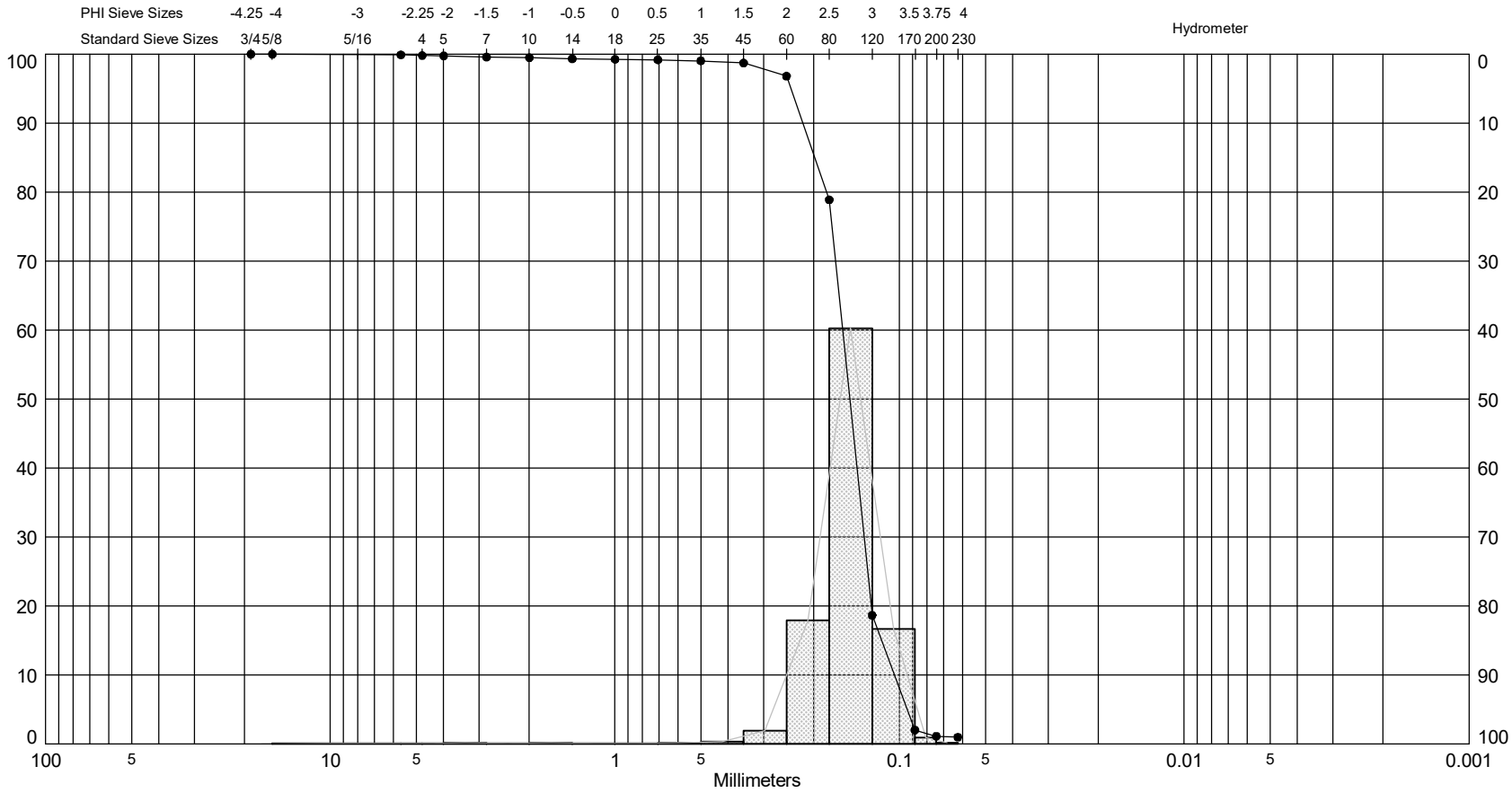
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**1'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-49**		
Sample No.:	**A**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	49.72	
Dry Wt. Before Washing (g):	170.99	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.05	99.96	100	0.05
#7	2.800	0.05	99.92	100	0.05
#10	2.000	0.09	99.84	100	0.09
#14	1.400	0.32	99.58	100	0.32
#18	1.000	0.39	99.26	98	0.38
#25	0.710	0.47	98.87	90	0.42
#35	0.500	0.73	98.27	50	0.37
#45	0.355	2.10	96.54	30	0.63
#60	0.250	9.61	88.61	1	0.10
#80	0.180	37.18	57.95	0	0.00
#120	0.125	64.06	5.13	0	0.00
#170	0.090	4.74	1.22	0	0.00
#200	0.075	0.21	1.05	0	0.00
#230	0.063	0.03	1.02	0	0.00
Total Shell Content:		**2**		**%**	



Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort
C-49 #B	—●—	-21.0	SP	#200 - 1.11 #230 - 0.96			2.74	2.69	-4.81	44.21	0.53

Comments: Sample Depth = 11'

Depths and elevations based on measured values

Sample Information	
Project Name:	Geotechnical Evaluation
Analysis Date:	05-09-17
Analyzed By:	CM
Easting (X, ft):	527,152
Northing (Y, ft):	2,246,690
Horizontal System:	NAD 1983
Vertical System:	NAVD 88

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VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**Nassau Sound**	**Depth:**	**11'**
Project No.:	**EQ175023**	**Date:**	**5/9/2017**
Boring No.:	**C-49**		
Sample No.:	**B**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace carbonate, (SP) 5Y 7/1**		

Tare Weight, (g):	51.64	
Dry Wt. Before Washing (g):	160.38	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)		% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
#3.5	5.600	0.11	99.90	100	0.11
#4	4.750	0.11	99.80	100	0.11
#5	4.000	0.05	99.75	100	0.05
#7	2.800	0.19	99.58	100	0.19
#10	2.000	0.11	99.48	100	0.11
#14	1.400	0.15	99.34	100	0.15
#18	1.000	0.08	99.26	100	0.08
#25	0.710	0.10	99.17	90	0.09
#35	0.500	0.15	99.03	70	0.11
#45	0.355	0.35	98.71	50	0.18
#60	0.250	2.09	96.79	30	0.63
#80	0.180	19.49	78.87	1	0.19
#120	0.125	65.50	18.63	0	0.00
#170	0.090	18.08	2.00	0	0.00
#200	0.075	0.98	1.10	0	0.00
#230	0.063	0.16	0.96	0	0.00
Total Shell Content:		**2**		**%**	

Appendix B:
Penetrometer Logs

ATHENA TECHNOLOGIES, INC.

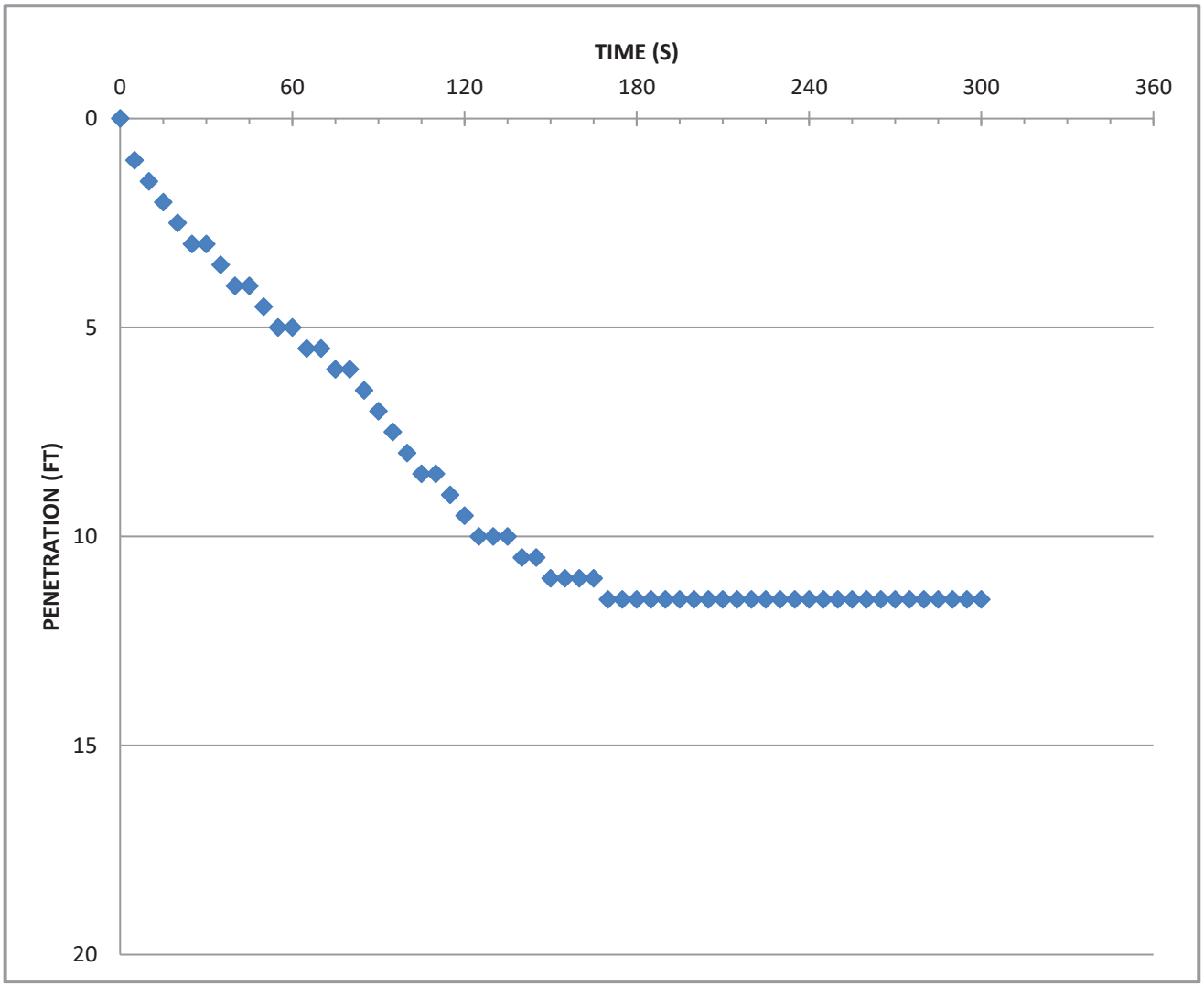
1293 Graham Farm Road, PO Box 68
McClellanville, South Carolina 29458
(843) 887-3800
www.athenatechnologies.com

VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-01	**NORTHING:**	2249289.14
PENETRATION:	11.5	**EASTING:**	524294.08
RECOVERY:	9.8	**WATER DEPTH:**	19.5
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-19.60
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-31.10



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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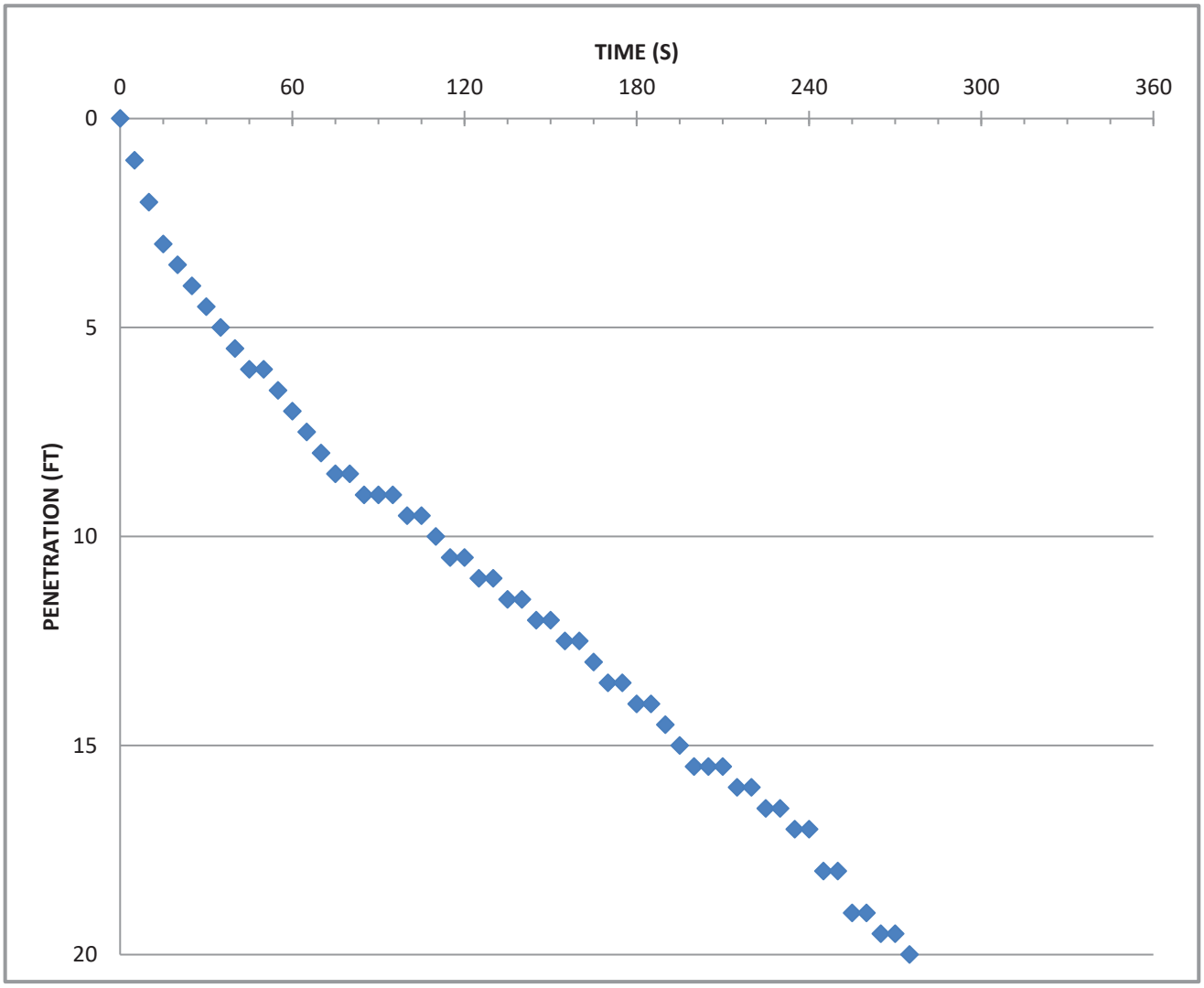
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-02	NORTHING:	2249893.15
PENETRATION:	20.0	EASTING:	525075.96
RECOVERY:	17.8	WATER DEPTH:	20.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-22.52
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-42.52



TOTAL RUN TIME: 275s

NOTES:

All measurements in feet.

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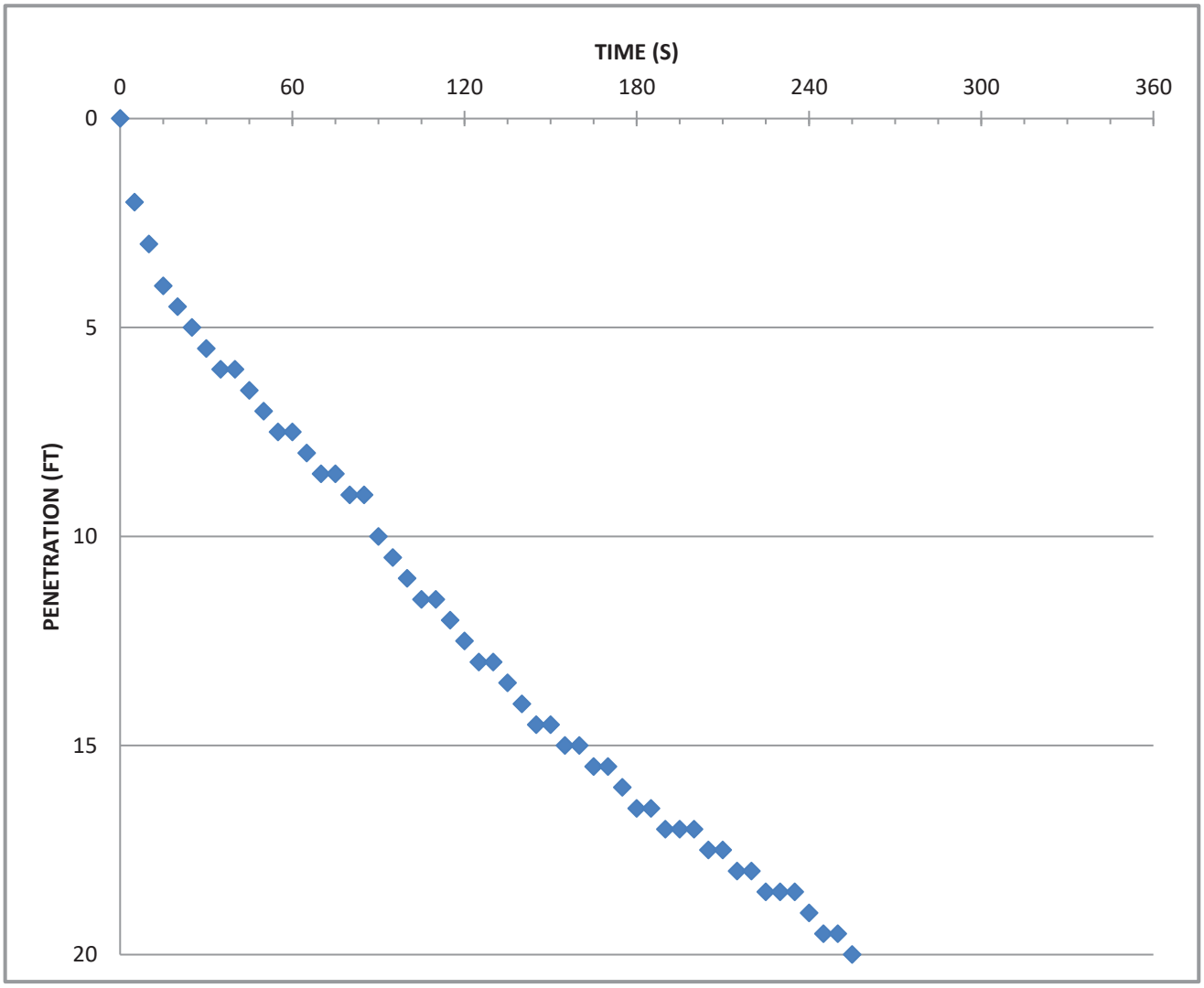
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

11 Jul 16

CORE ID:	C-03	NORTHING:	2246964.3
PENETRATION:	20.0	EASTING:	520837.01
RECOVERY:	16.3	WATER DEPTH:	5.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.02
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-29.02



TOTAL RUN TIME: 255s

NOTES:

All measurements in feet.

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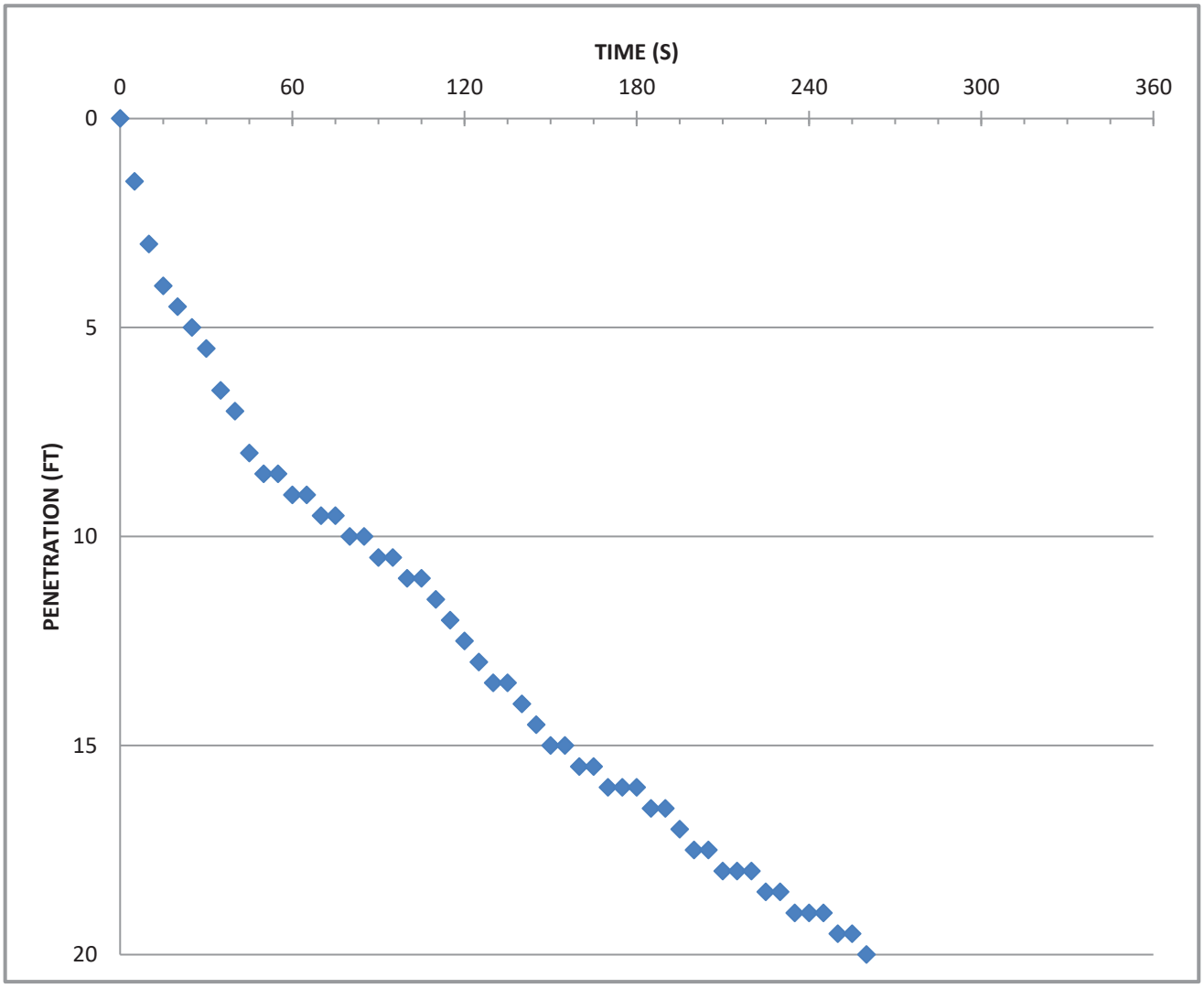
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-04	NORTHING:	2248660.15
PENETRATION:	20.0	EASTING:	525101.12
RECOVERY:	17.2	WATER DEPTH:	16.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-18.94
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-38.94



TOTAL RUN TIME: 260s

NOTES:

All measurements in feet.

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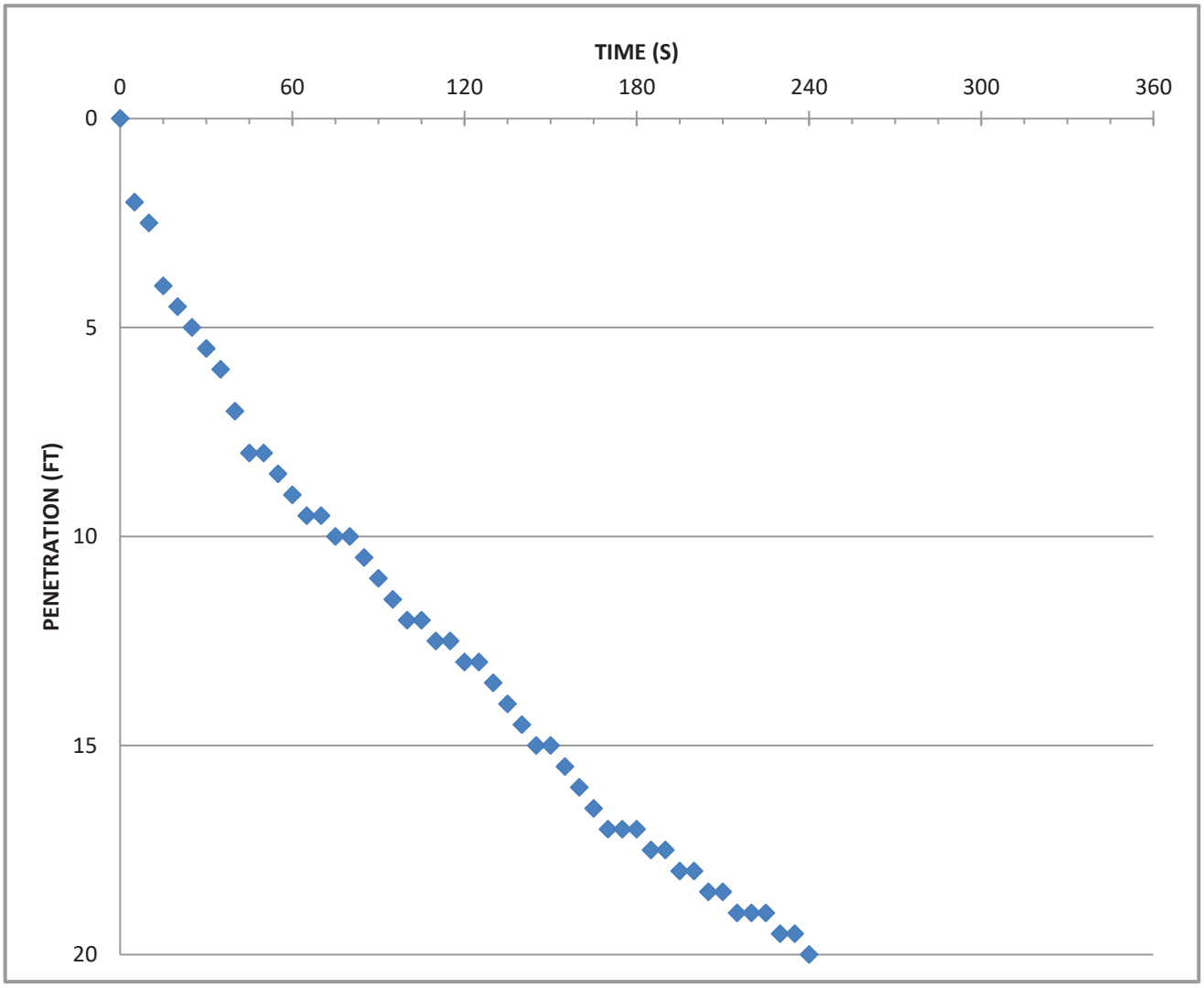
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-05	NORTHING:	2248031.97
PENETRATION:	20.0	EASTING:	525119
RECOVERY:	19.6	WATER DEPTH:	10.2
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-11.95
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-31.95



TOTAL RUN TIME: 240s

NOTES:

All measurements in feet.

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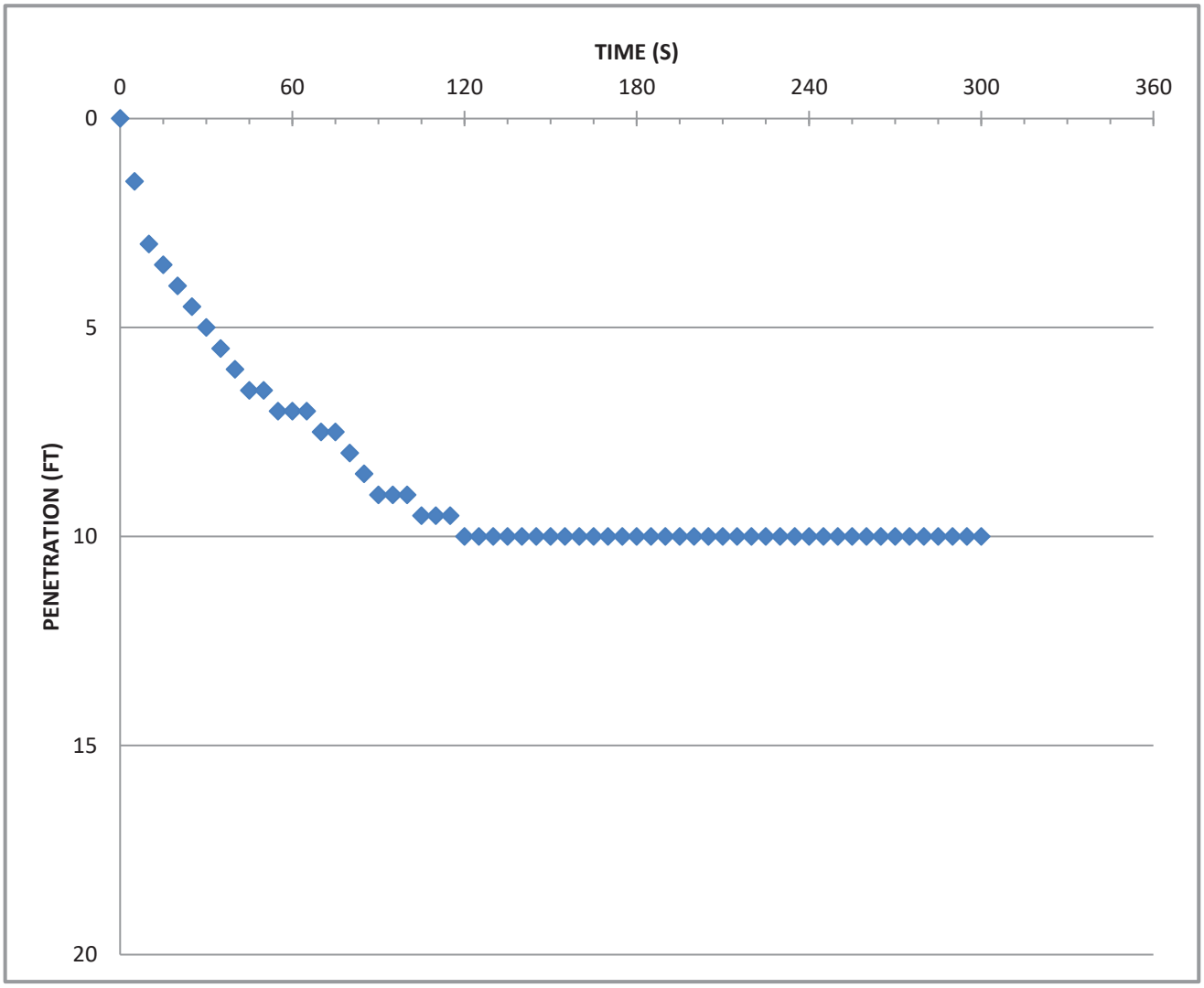
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

11 Jul 16

CORE ID:	C-06	NORTHING:	2247017.06
PENETRATION:	10.0	EASTING:	521533.72
RECOVERY:	8.8	WATER DEPTH:	6.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-8.96
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-18.96



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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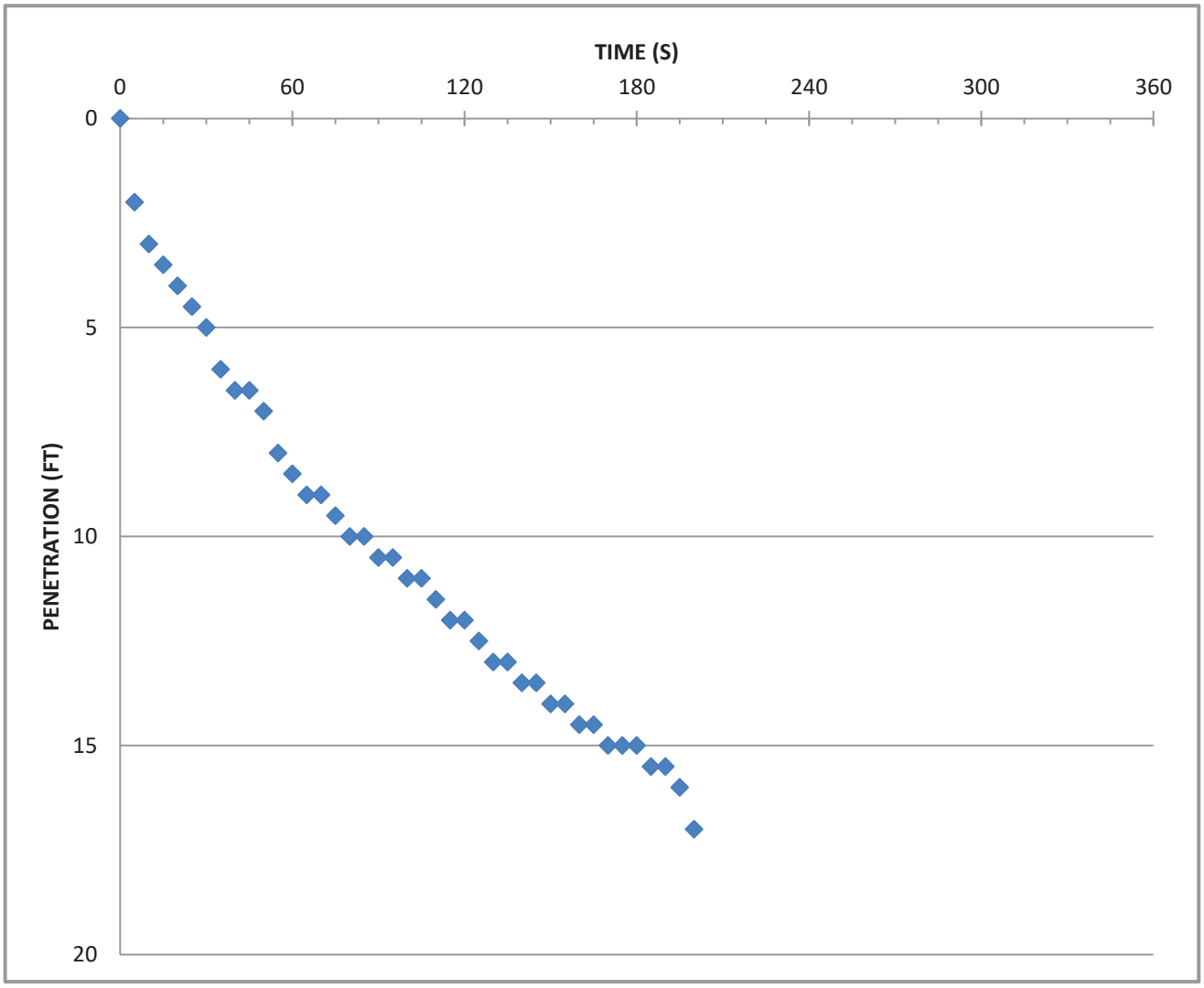
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

11 Jul 16

CORE ID:	C-07	NORTHING:	2247720.71
PENETRATION:	17.0	EASTING:	521485.22
RECOVERY:	14.5	WATER DEPTH:	8.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-8.71
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-25.71



TOTAL RUN TIME: 200s

NOTES:

All measurements in feet.

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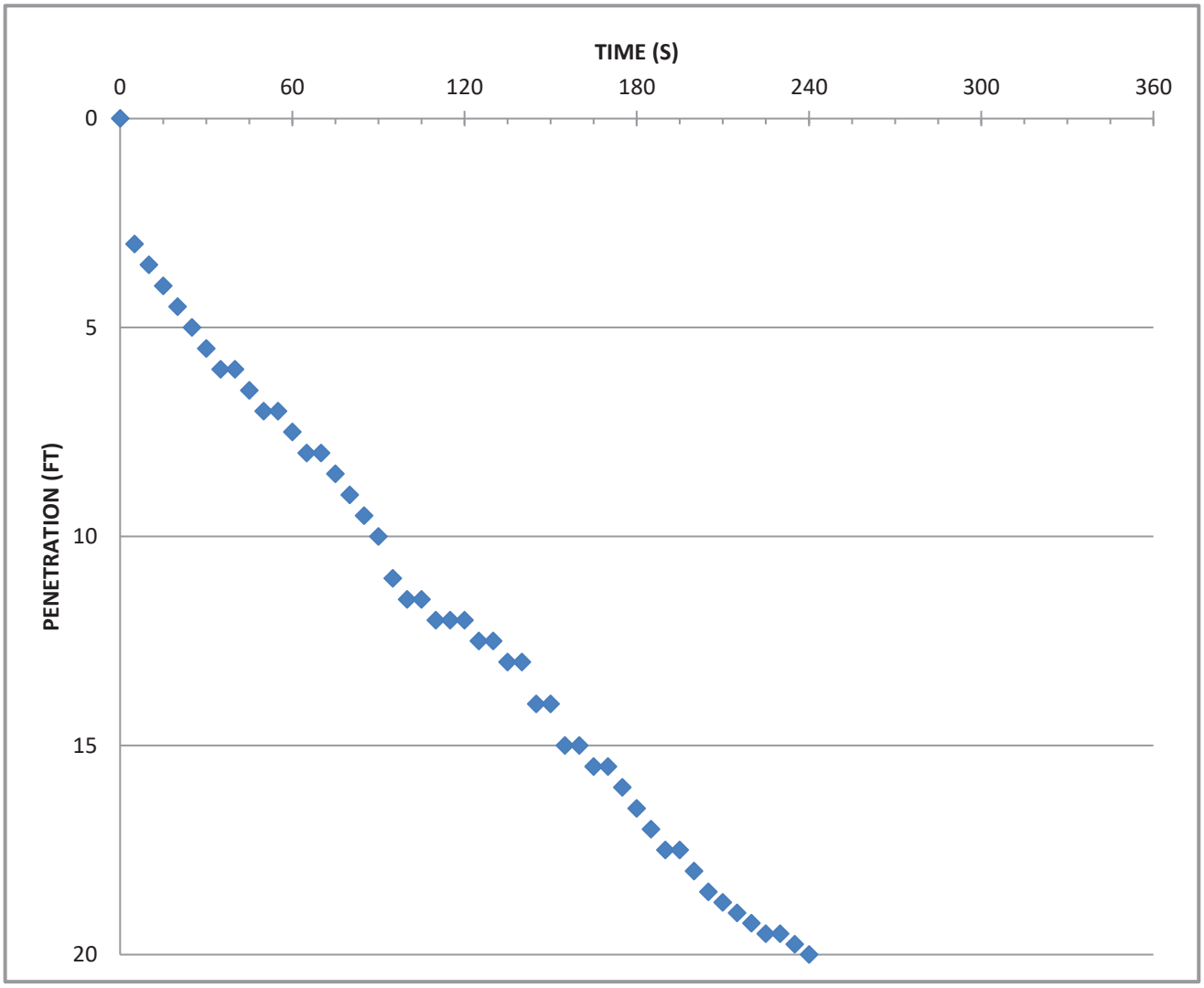
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

22 Aug 16

CORE ID:	C-08	NORTHING:	2249631
PENETRATION:	20.0	EASTING:	523914
RECOVERY:	16.5	WATER DEPTH:	24.2
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	NA
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	NA



TOTAL RUN TIME: 240s

NOTES:

All measurements in feet.

NA = Elevation data not available; Florida Permanent Reference Network was not operational.

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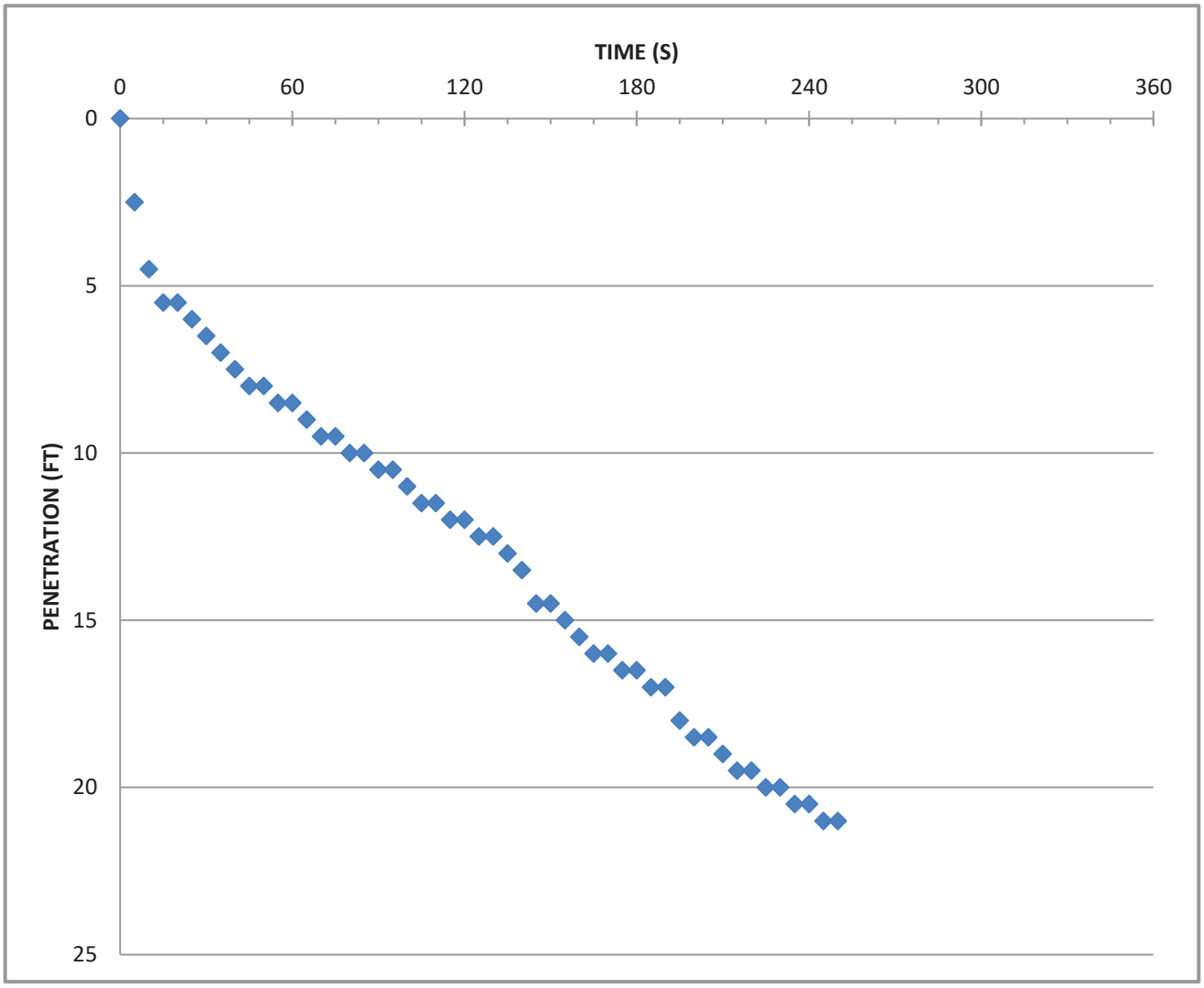
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-09	**NORTHING:**	2249778.01
PENETRATION:	21.0	**EASTING:**	525855.8
RECOVERY:	20.9	**WATER DEPTH:**	20.3
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-22.44
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-43.44



TOTAL RUN TIME: 250s

NOTES:

All measurements in feet.

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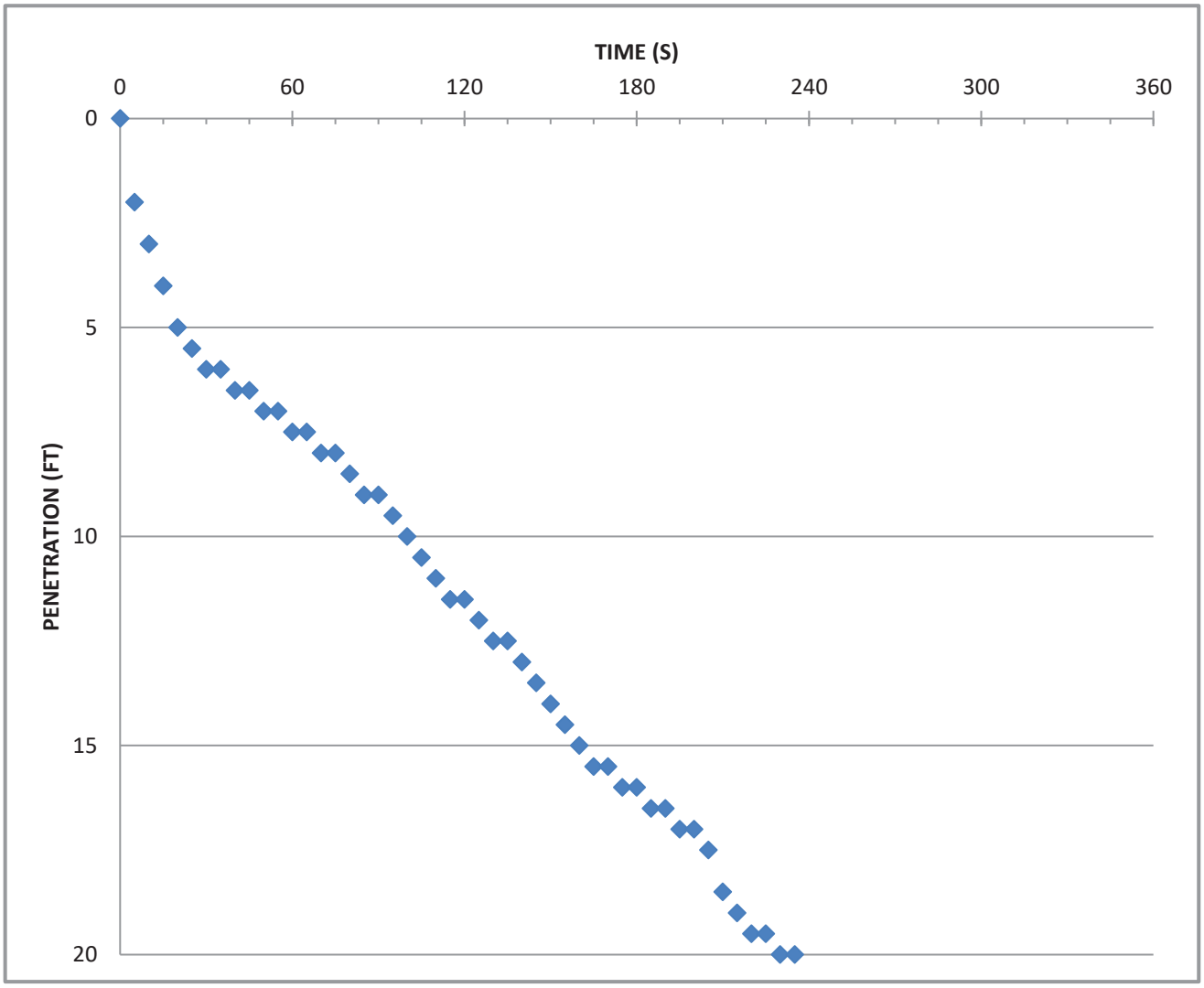
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-10	NORTHING:	2248987.77
PENETRATION:	20.0	EASTING:	525898.72
RECOVERY:	18.5	WATER DEPTH:	16.7
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-17.58
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-37.58



TOTAL RUN TIME: 235s

NOTES:

All measurements in feet.

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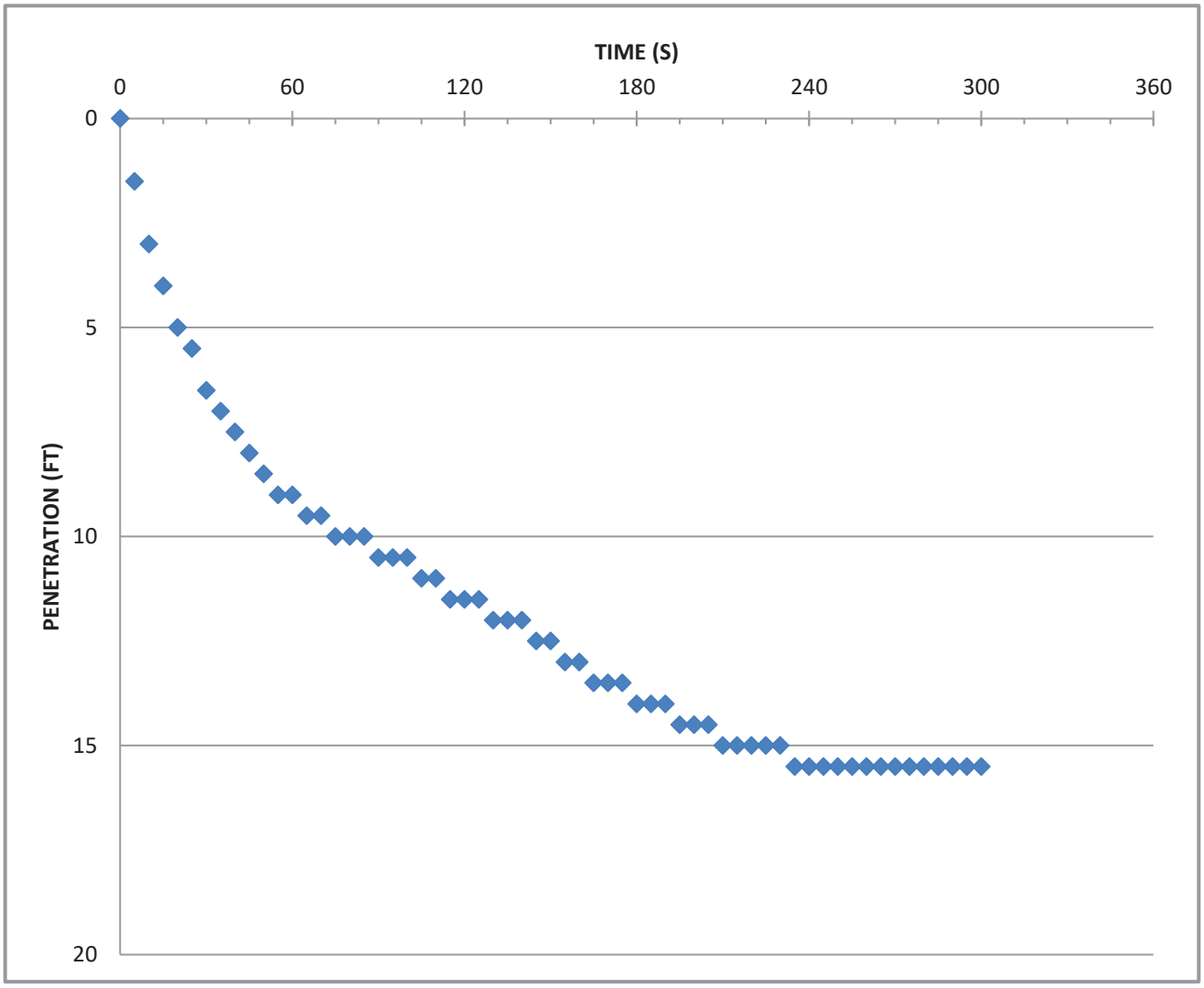
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-11	NORTHING:	2248095.1
PENETRATION:	15.5	EASTING:	525902.64
RECOVERY:	14.8	WATER DEPTH:	10.9
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-12.38
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-27.88



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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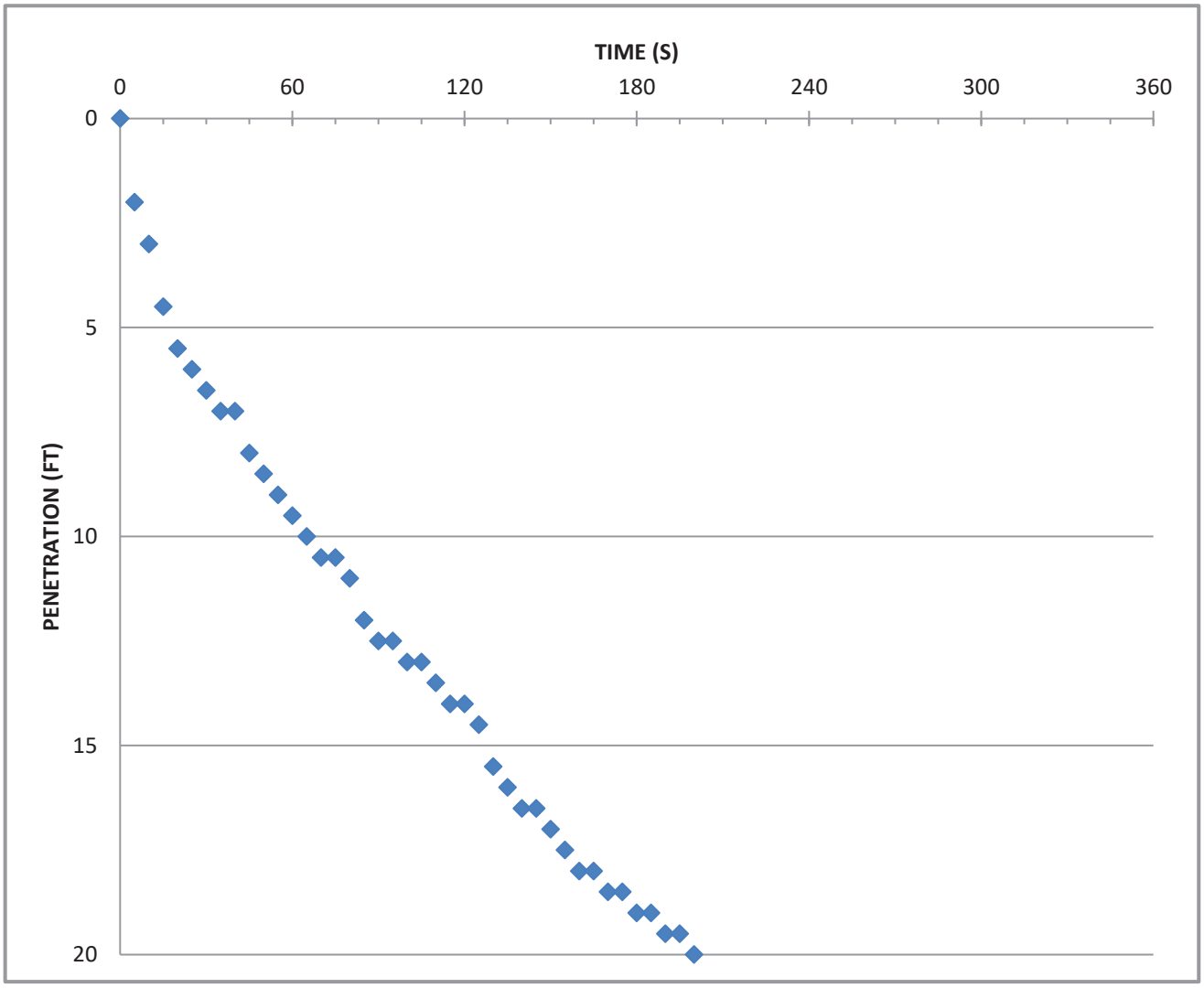
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-12	NORTHING:	2248984.07
PENETRATION:	20.0	EASTING:	526610.87
RECOVERY:	19.8	WATER DEPTH:	14.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-17.36
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-37.36



TOTAL RUN TIME: 200s

NOTES:

All measurements in feet.

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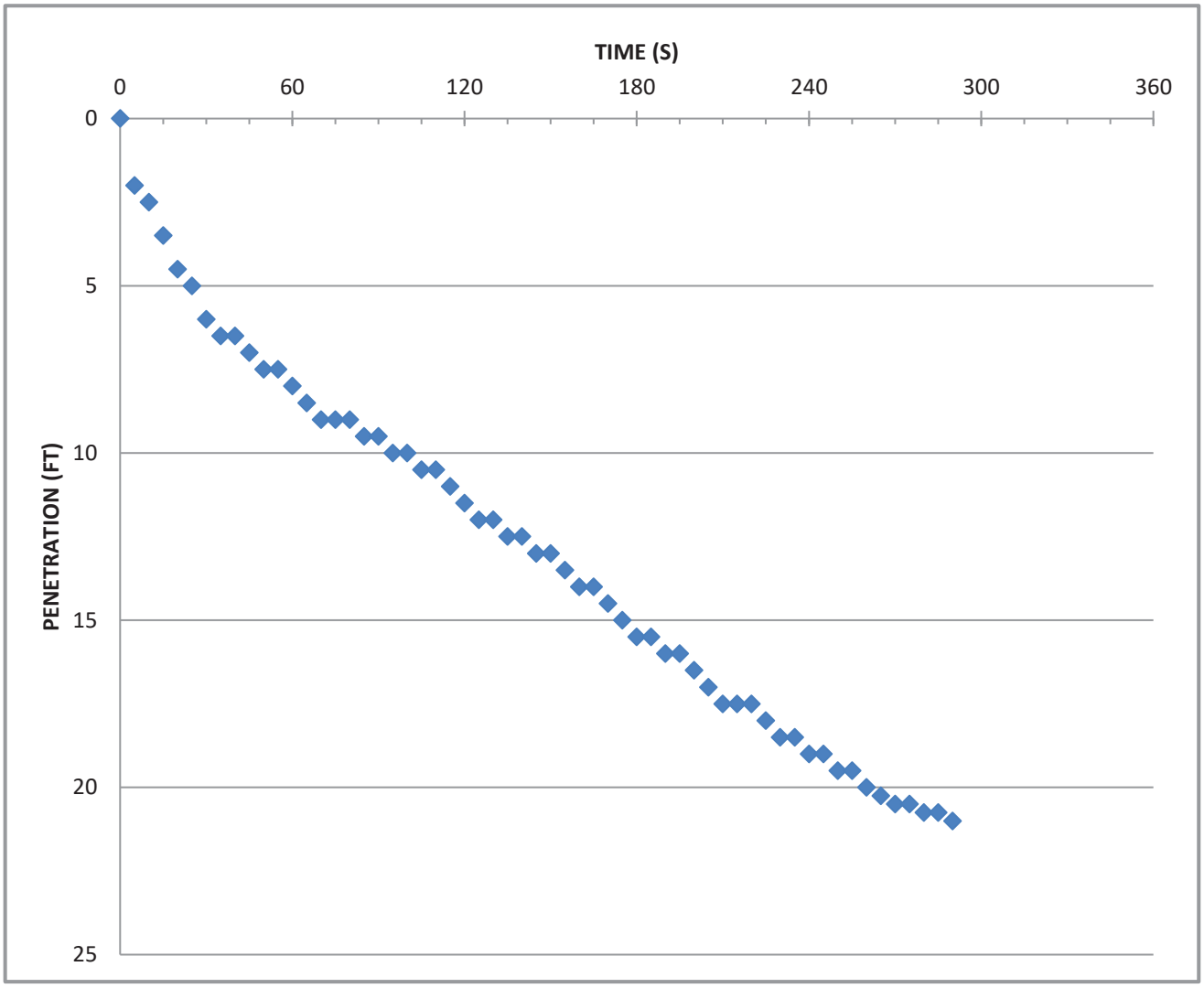
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-13	NORTHING:	2248114.66
PENETRATION:	21.0	EASTING:	526637.14
RECOVERY:	20.2	WATER DEPTH:	12.9
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-11.98
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-32.98



TOTAL RUN TIME: 290s

NOTES:

All measurements in feet.

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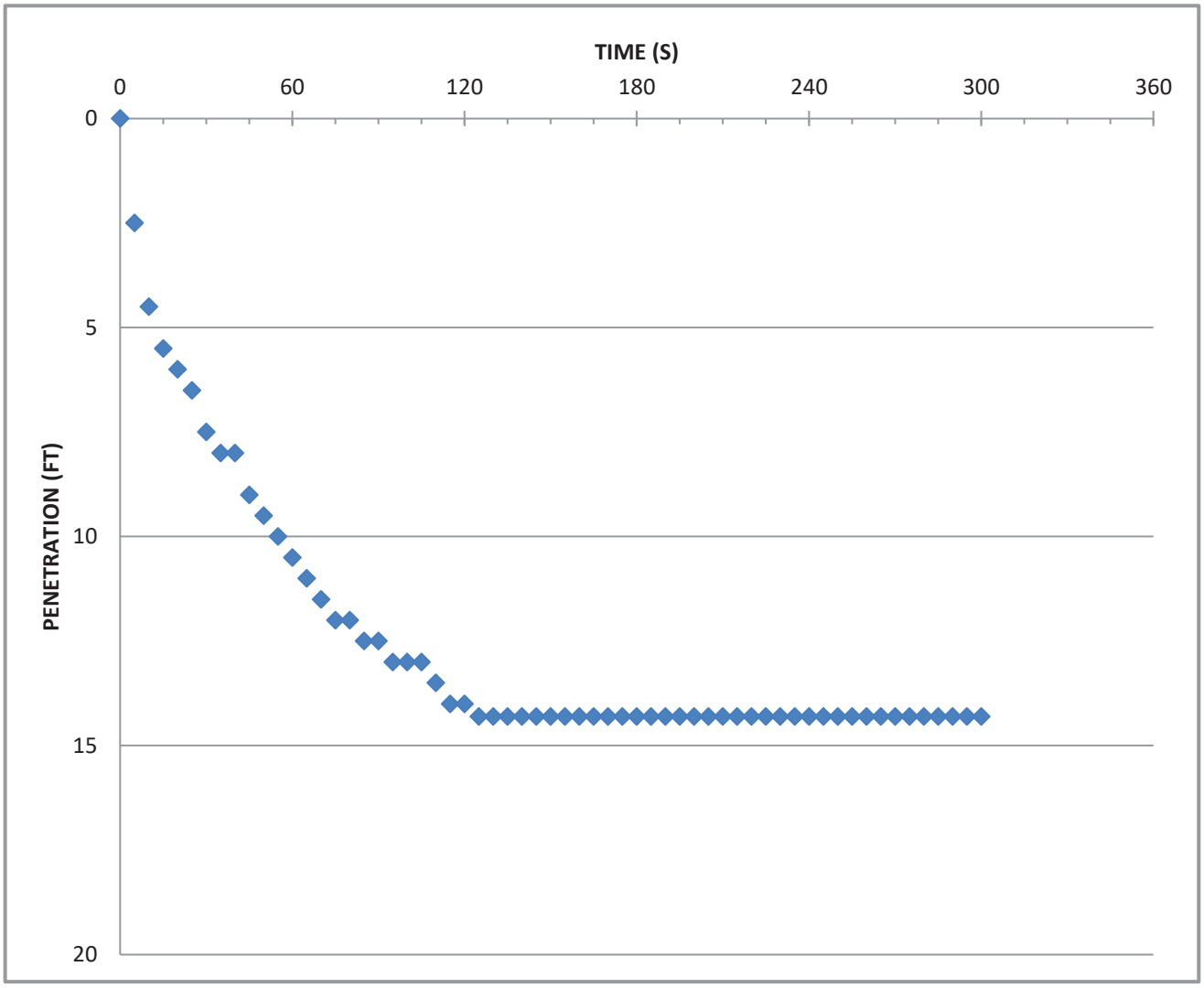
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

24 Jul 16

CORE ID:	C-14	NORTHING:	2247777
PENETRATION:	14.3	EASTING:	522188
RECOVERY:	11.2	WATER DEPTH:	11.7
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.46
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-23.76



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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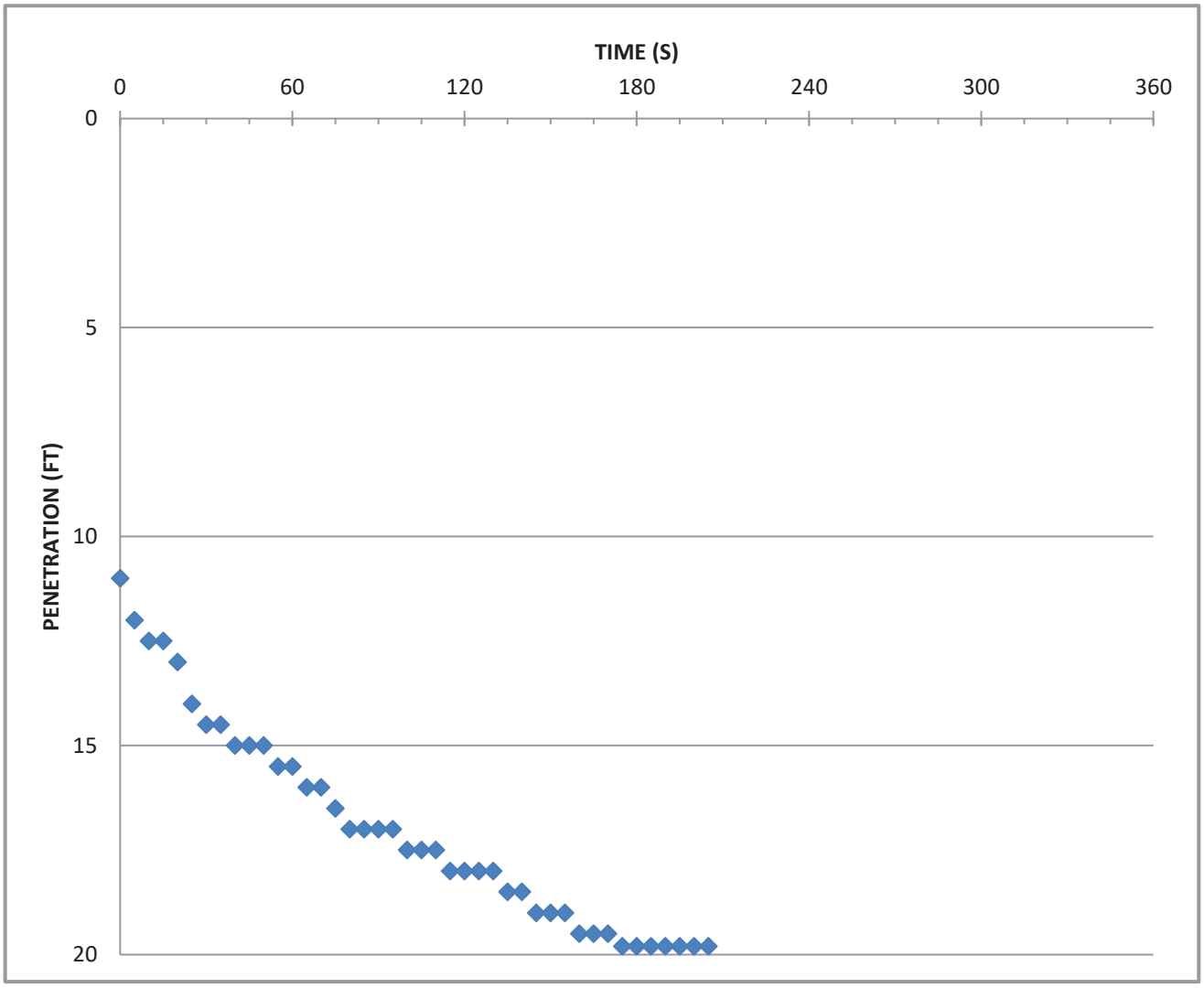
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

24 Jul 16

CORE ID:	C-14 Jet	NORTHING:	2247777
PENETRATION:	8.8	EASTING:	522188
RECOVERY:	6.1	WATER DEPTH:	11.7
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.46
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-29.26



TOTAL RUN TIME: 205s

NOTES:

All measurements in feet.

Jetted to 11 feet below sediment surface; continued core run to 19.8 feet below sediment surface.

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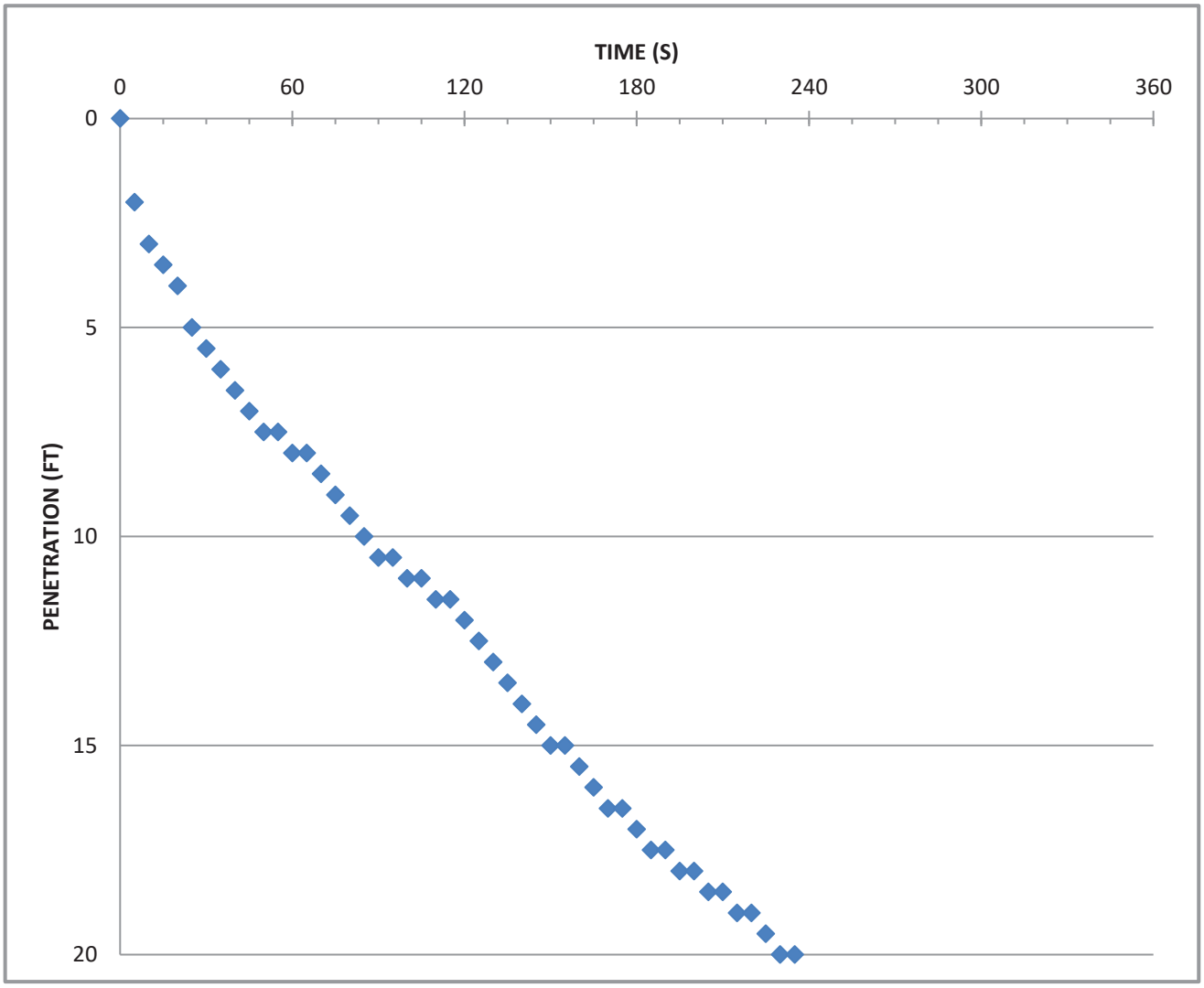
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

27 Jul 16

CORE ID:	C-15	NORTHING:	2249178
PENETRATION:	20.0	EASTING:	522083
RECOVERY:	16.0	WATER DEPTH:	5.6
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-8.30
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-28.30



TOTAL RUN TIME: 235s

NOTES:

All measurements in feet.

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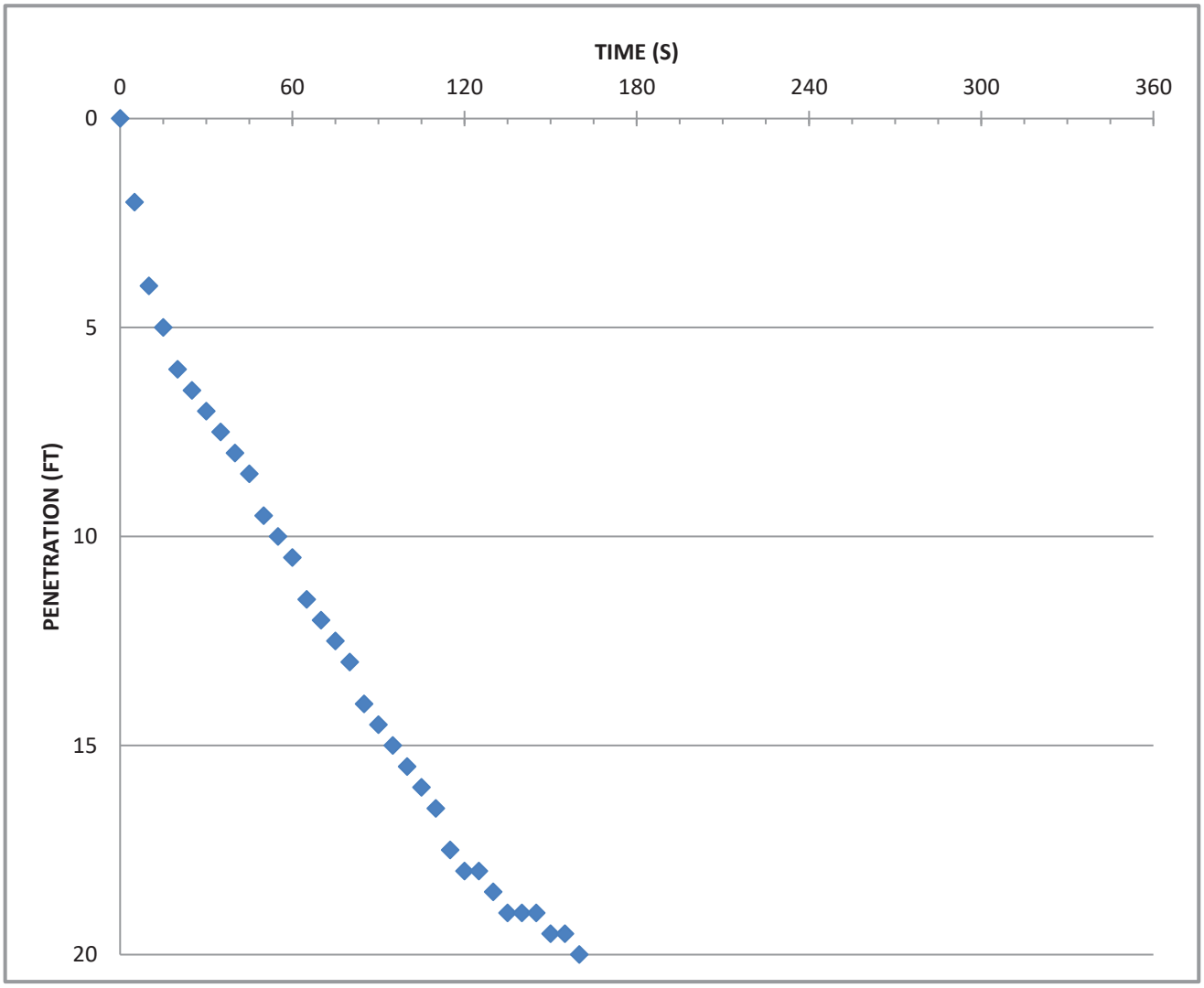
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-16	NORTHING:	2247427.14
PENETRATION:	20.0	EASTING:	526636.26
RECOVERY:	15.0	WATER DEPTH:	13.6
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-14.13
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-34.13



TOTAL RUN TIME: 160s

NOTES:

All measurements in feet.

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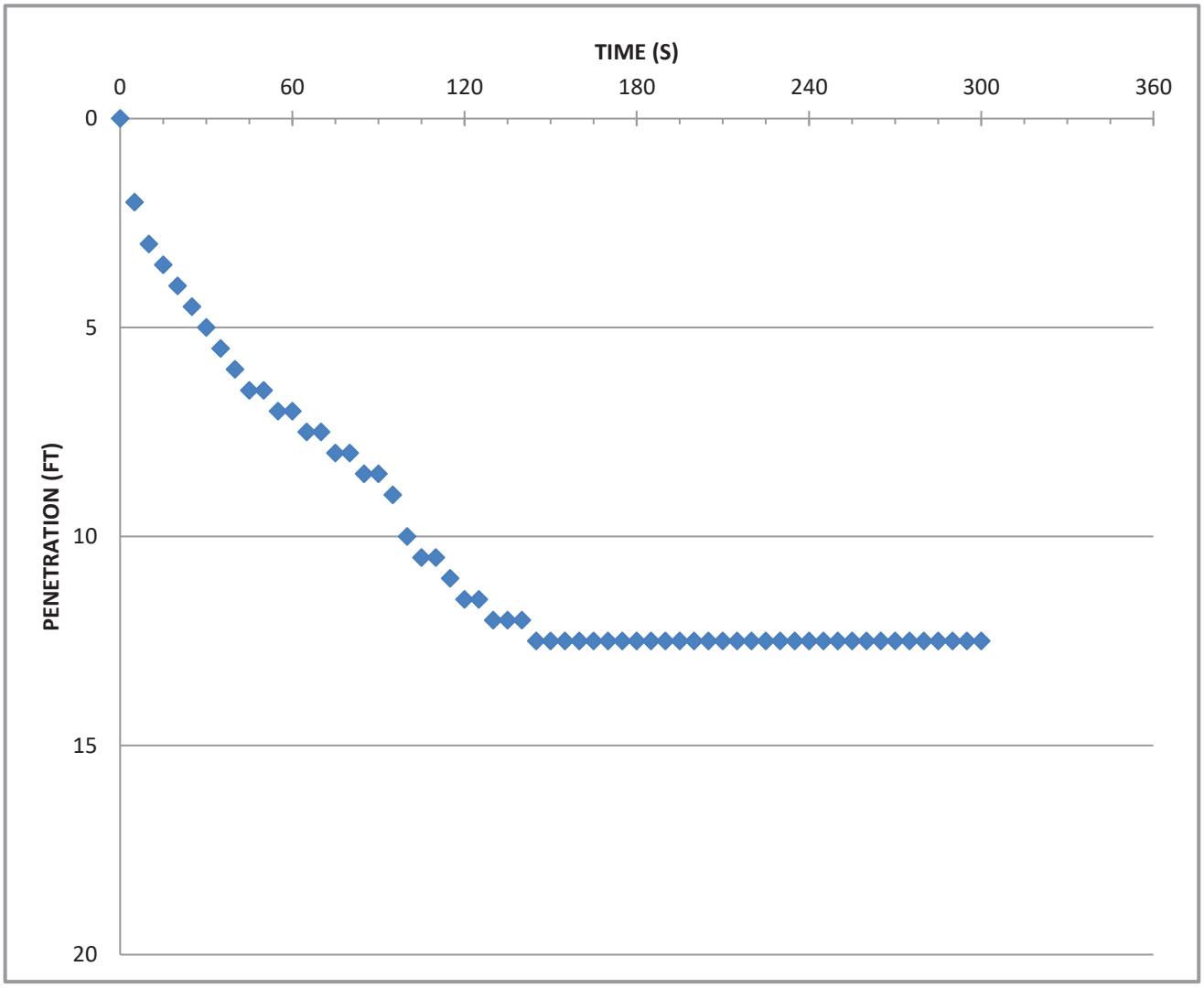
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

23 Jul 16

CORE ID:	C-17	**NORTHING:**	2250268.26
PENETRATION:	12.5	**EASTING:**	522359.2
RECOVERY:	11.0	**WATER DEPTH:**	12.8
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-15.53
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-28.03



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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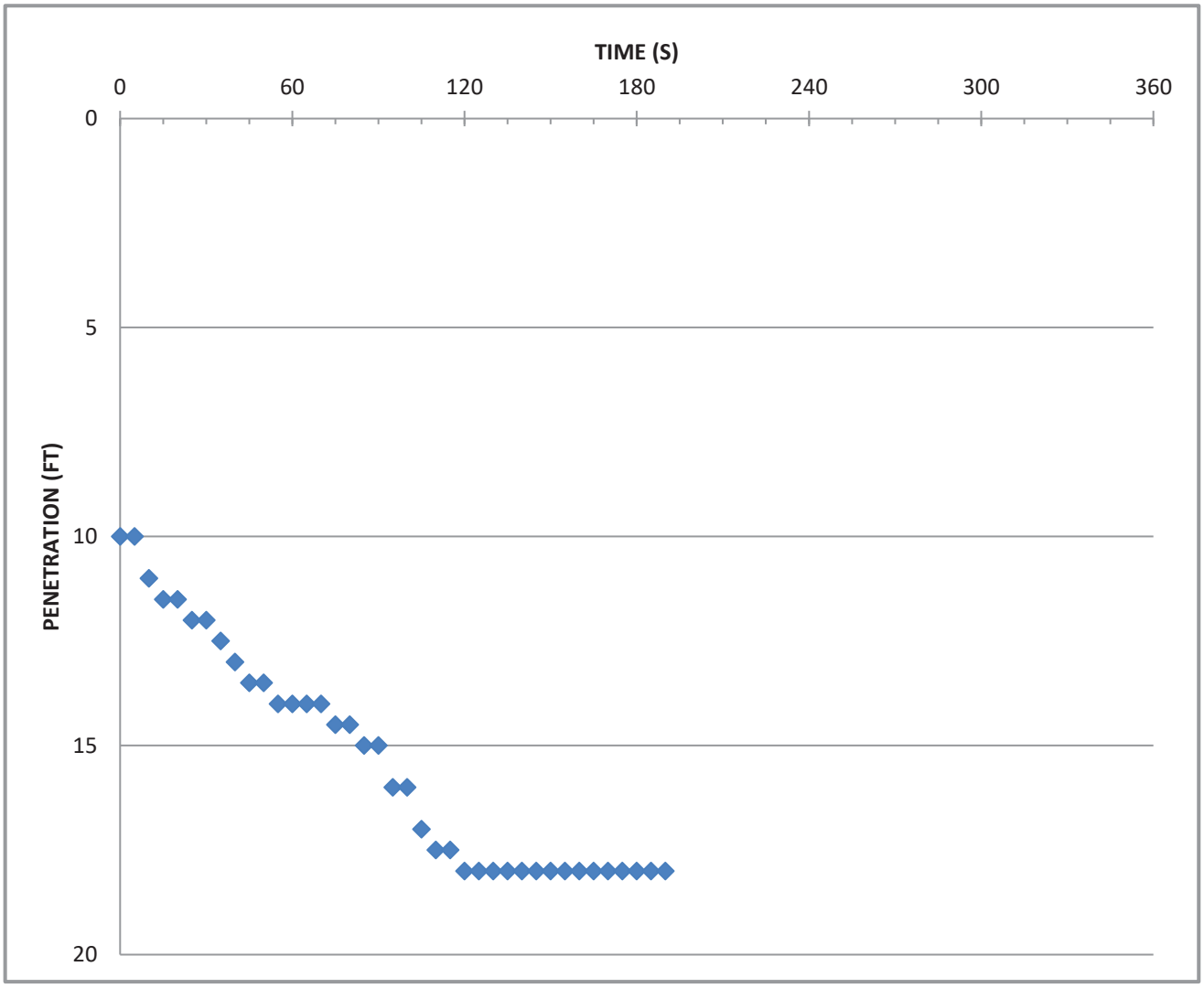
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

23 Jul 16

CORE ID:	C-17 Jet	NORTHING:	2250268.26
PENETRATION:	8.0	EASTING:	522359.2
RECOVERY:	5.5	WATER DEPTH:	12.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-15.53
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-33.53



TOTAL RUN TIME: 190s

NOTES:

All measurements in feet.

Jetted to 10 feet below sediment surface; continued core run to 18.0 feet below sediment surface.

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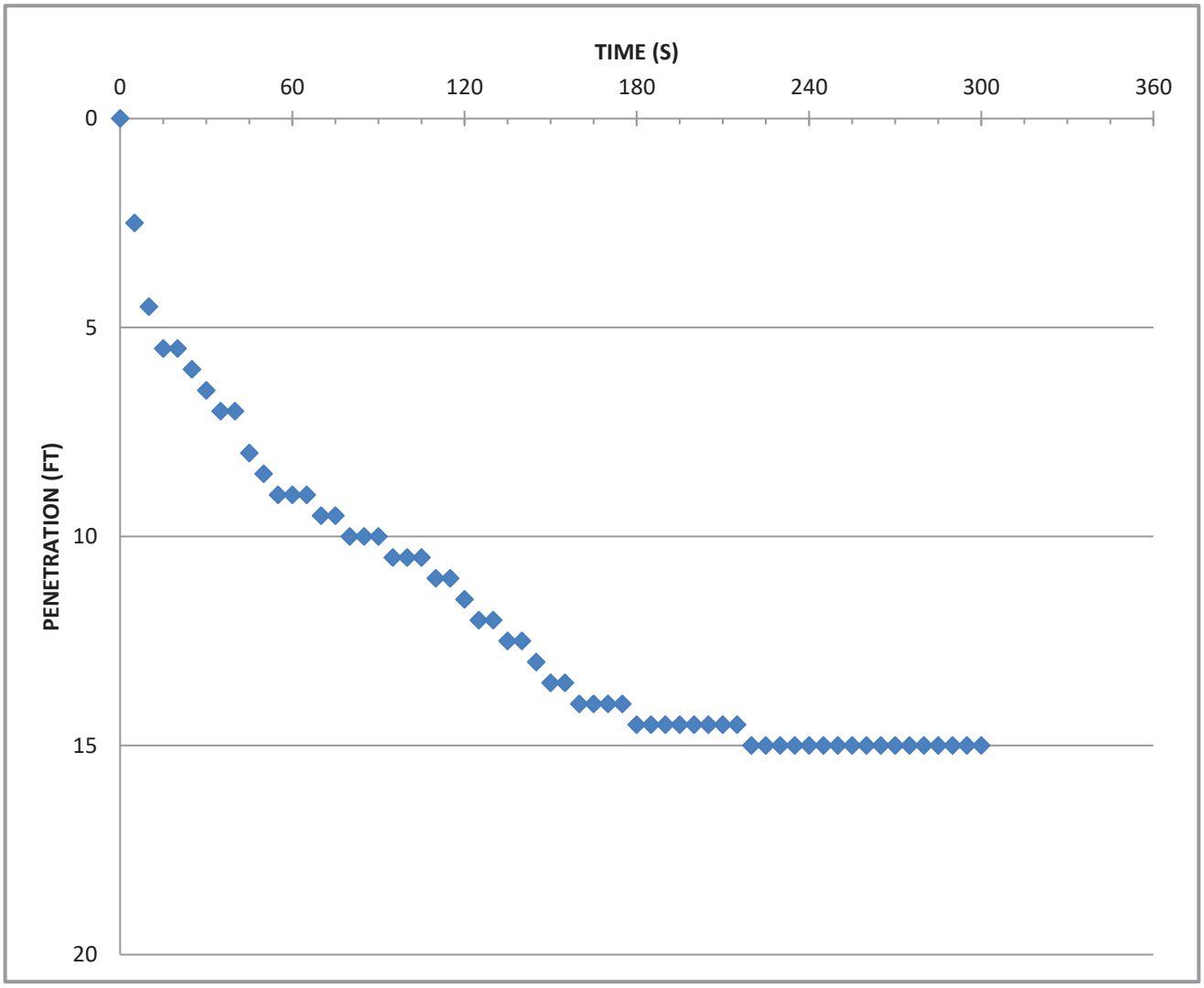
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-18	NORTHING:	2247045.7
PENETRATION:	15.0	EASTING:	526513.69
RECOVERY:	13.0	WATER DEPTH:	12.1
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-12.91
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-27.91



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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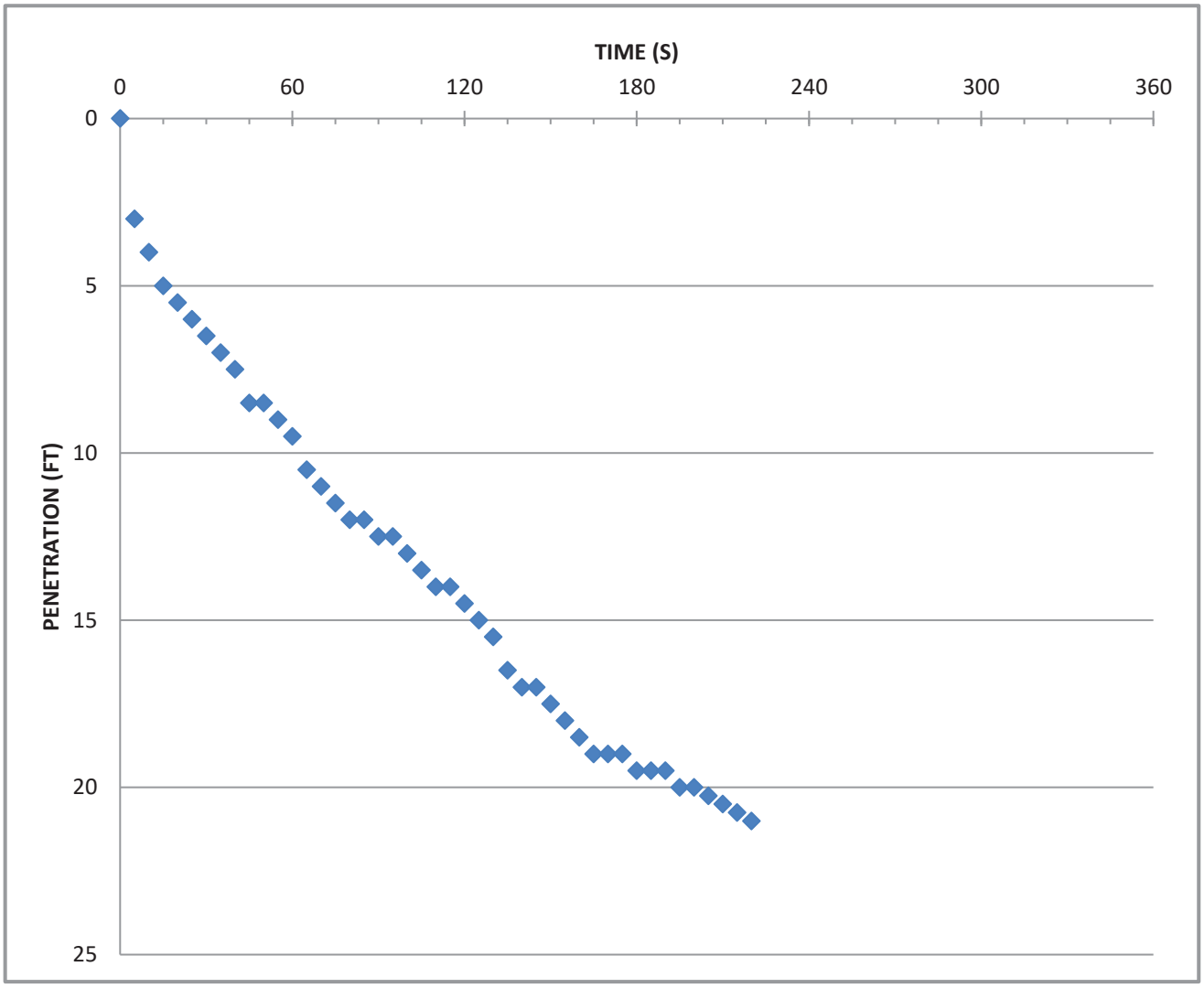
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-19	NORTHING:	2248804.65
PENETRATION:	21.0	EASTING:	527443.66
RECOVERY:	20.5	WATER DEPTH:	15.3
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-18.37
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-39.37



TOTAL RUN TIME: 220s

NOTES:

All measurements in feet.

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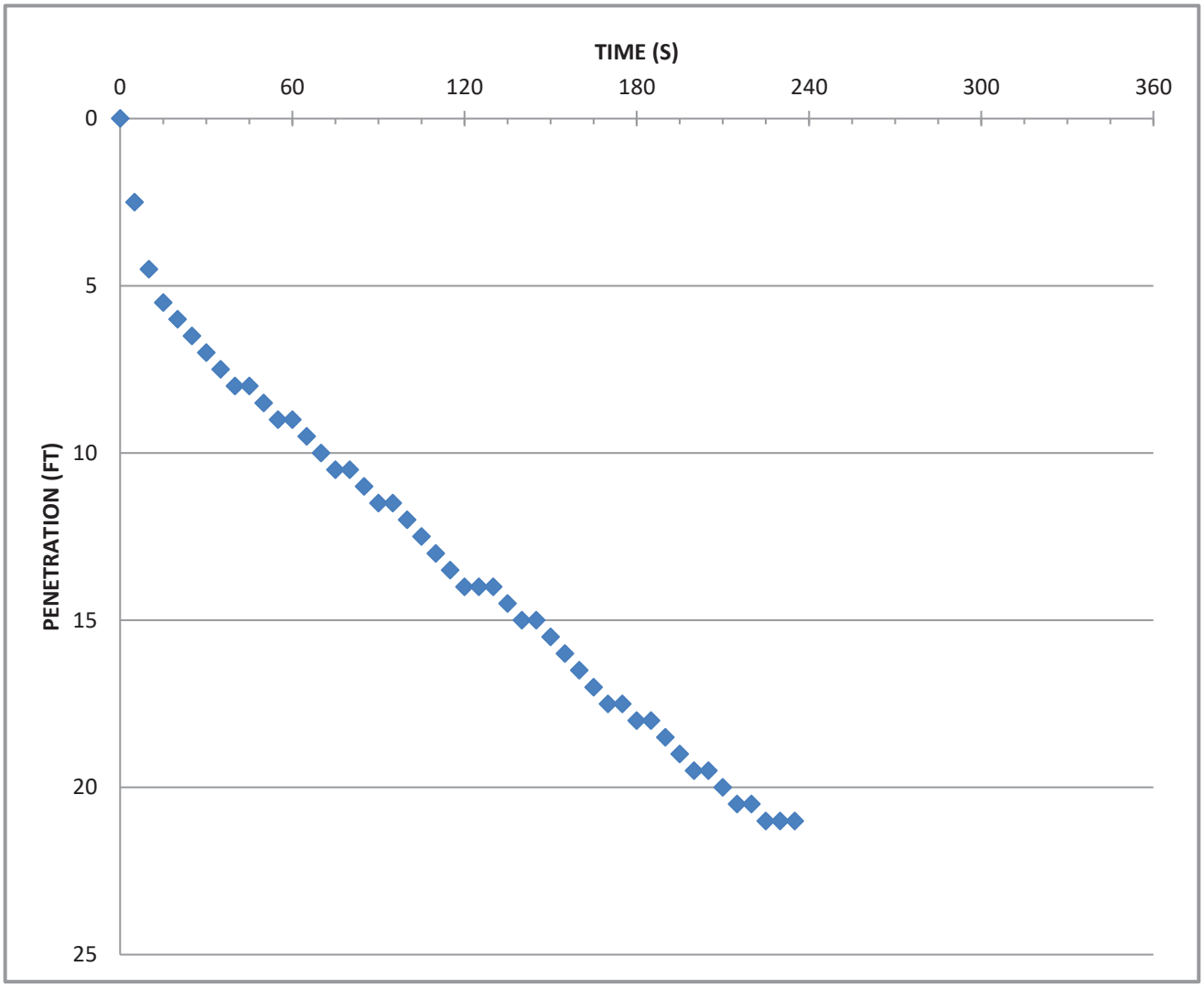
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-20	**NORTHING:**	2248218.01
PENETRATION:	21.0	**EASTING:**	527471.66
RECOVERY:	20.5	**WATER DEPTH:**	15.9
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-15.67
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-36.67



TOTAL RUN TIME: 235s

NOTES:

All measurements in feet.

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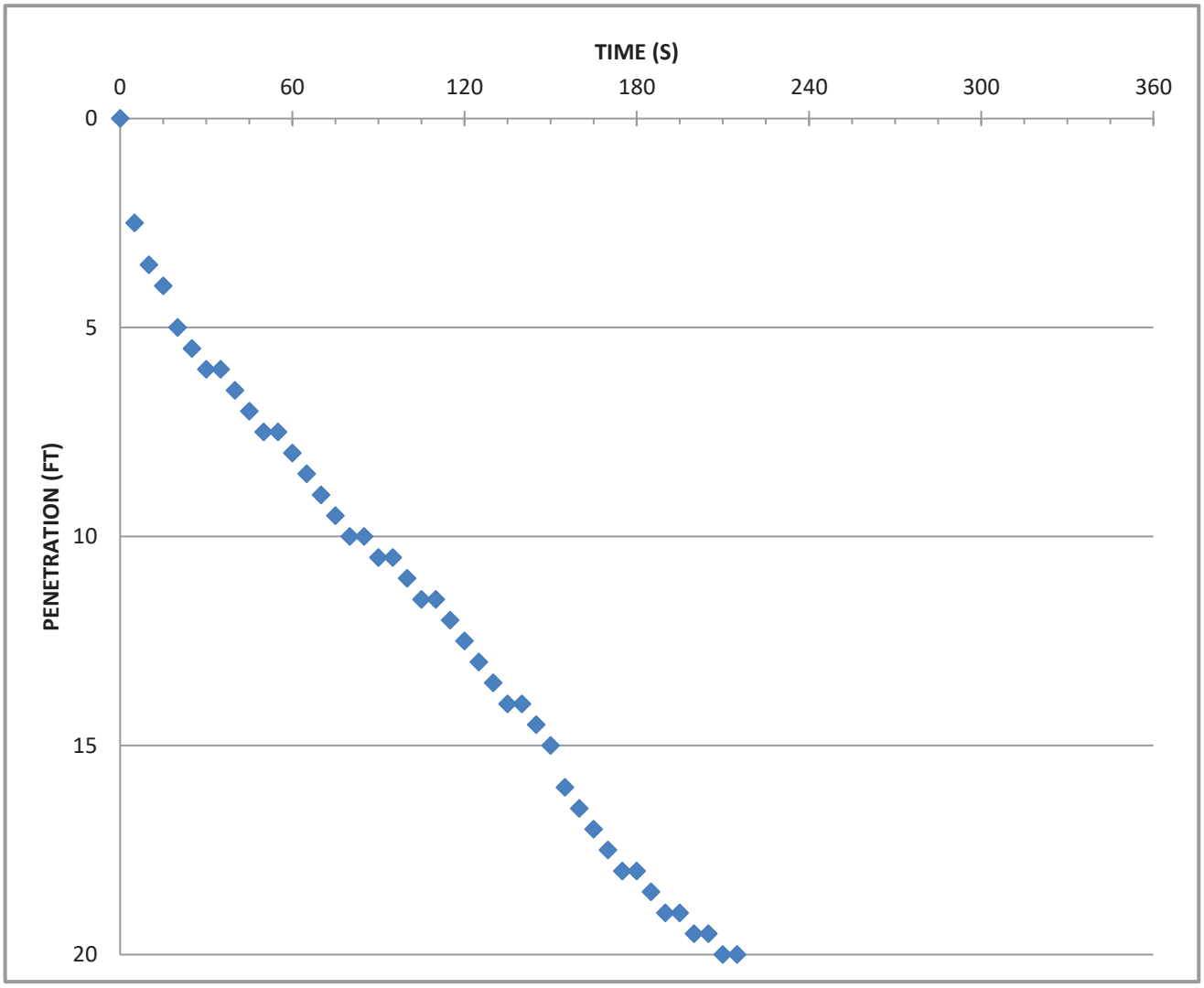
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-21	NORTHING:	2247577.74
PENETRATION:	20.0	EASTING:	527480.89
RECOVERY:	17.6	WATER DEPTH:	10.9
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-14.44
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-34.44



TOTAL RUN TIME: 215s

NOTES:

All measurements in feet.

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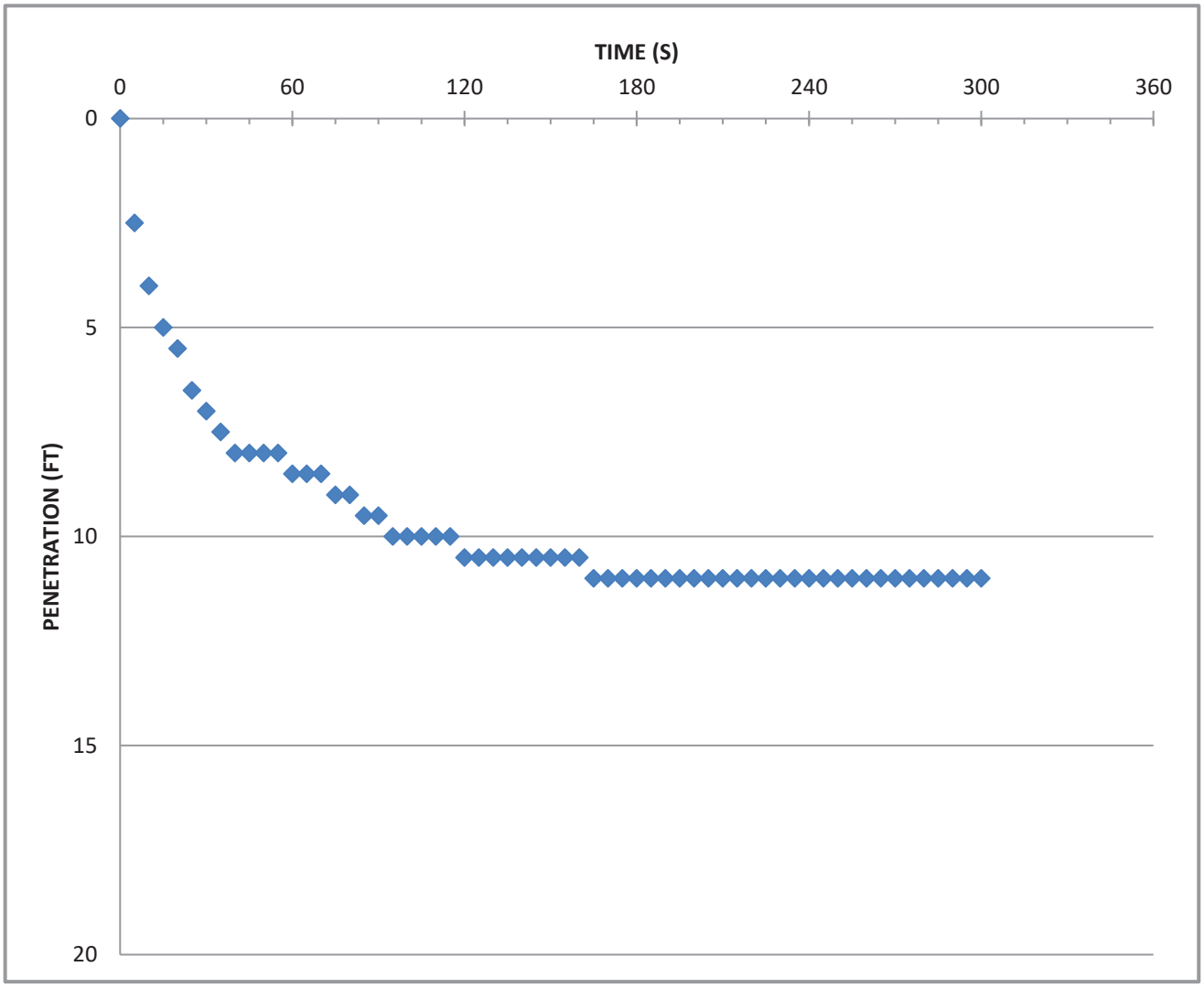
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-22	NORTHING:	2247269.92
PENETRATION:	11.0	EASTING:	523086.59
RECOVERY:	10.1	WATER DEPTH:	9.7
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.54
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-20.54



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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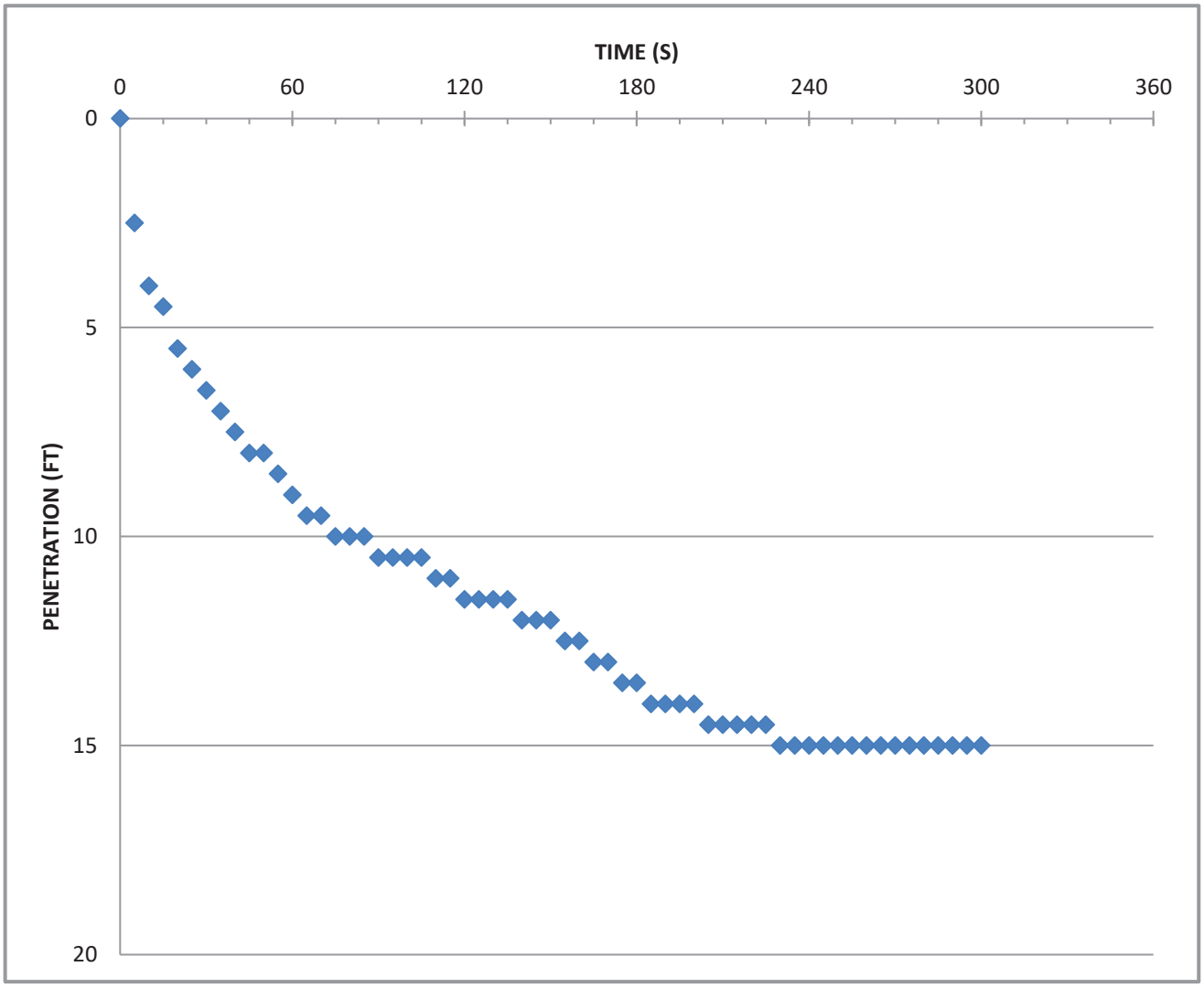
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

25 Jul 16

CORE ID:	C-23	NORTHING:	2248532
PENETRATION:	15.0	EASTING:	522839.74
RECOVERY:	12.0	WATER DEPTH:	7.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-11.00
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-26.00



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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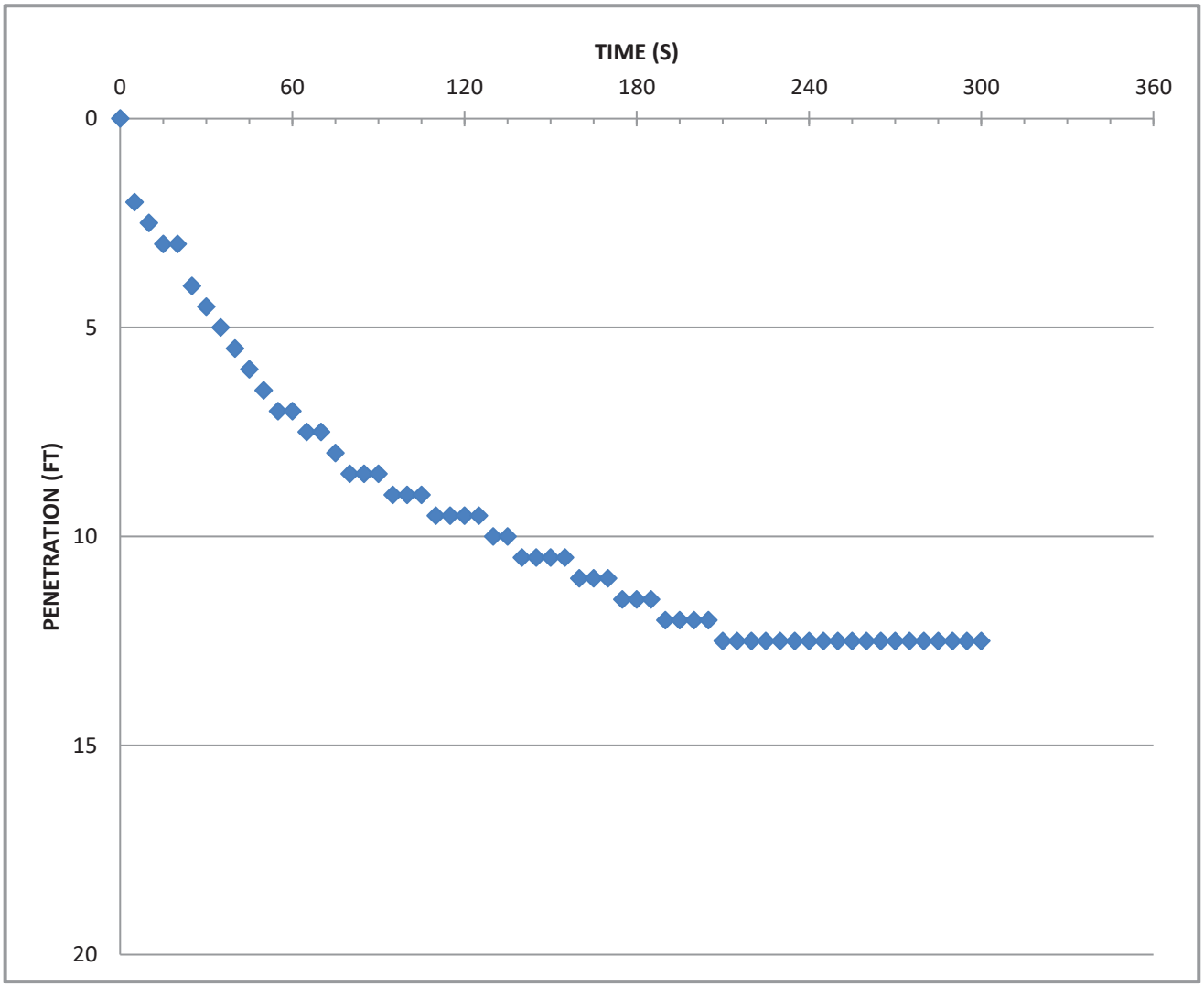
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

26 Jul 16

CORE ID:	C-24	NORTHING:	2249238
PENETRATION:	12.5	EASTING:	522793
RECOVERY:	10.2	WATER DEPTH:	9.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-13.50
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-26.00



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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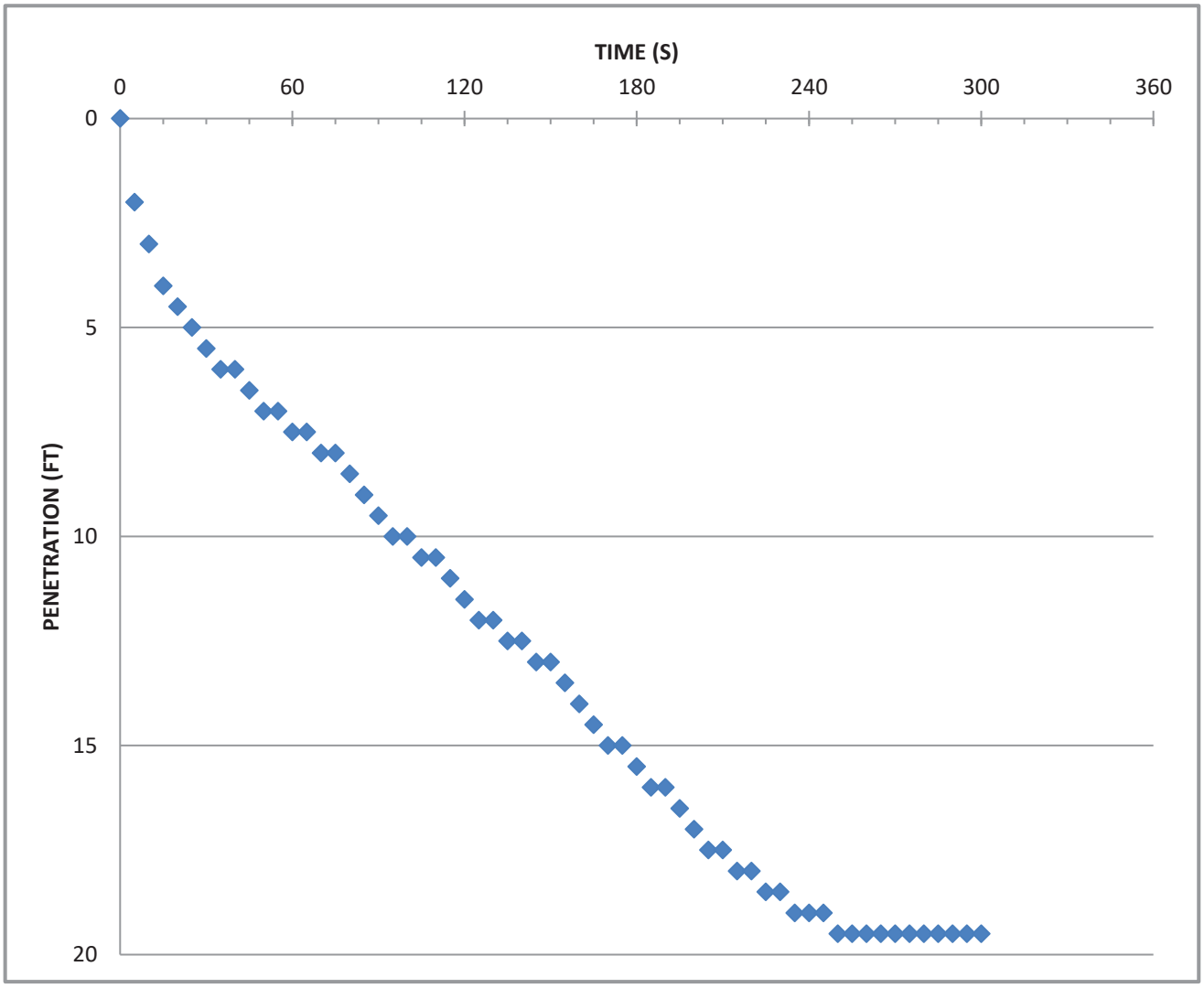
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

26 Jul 16

CORE ID:	C-25	NORTHING:	2248911
PENETRATION:	19.5	EASTING:	523171
RECOVERY:	9.2	WATER DEPTH:	7.3
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-10.14
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-29.64



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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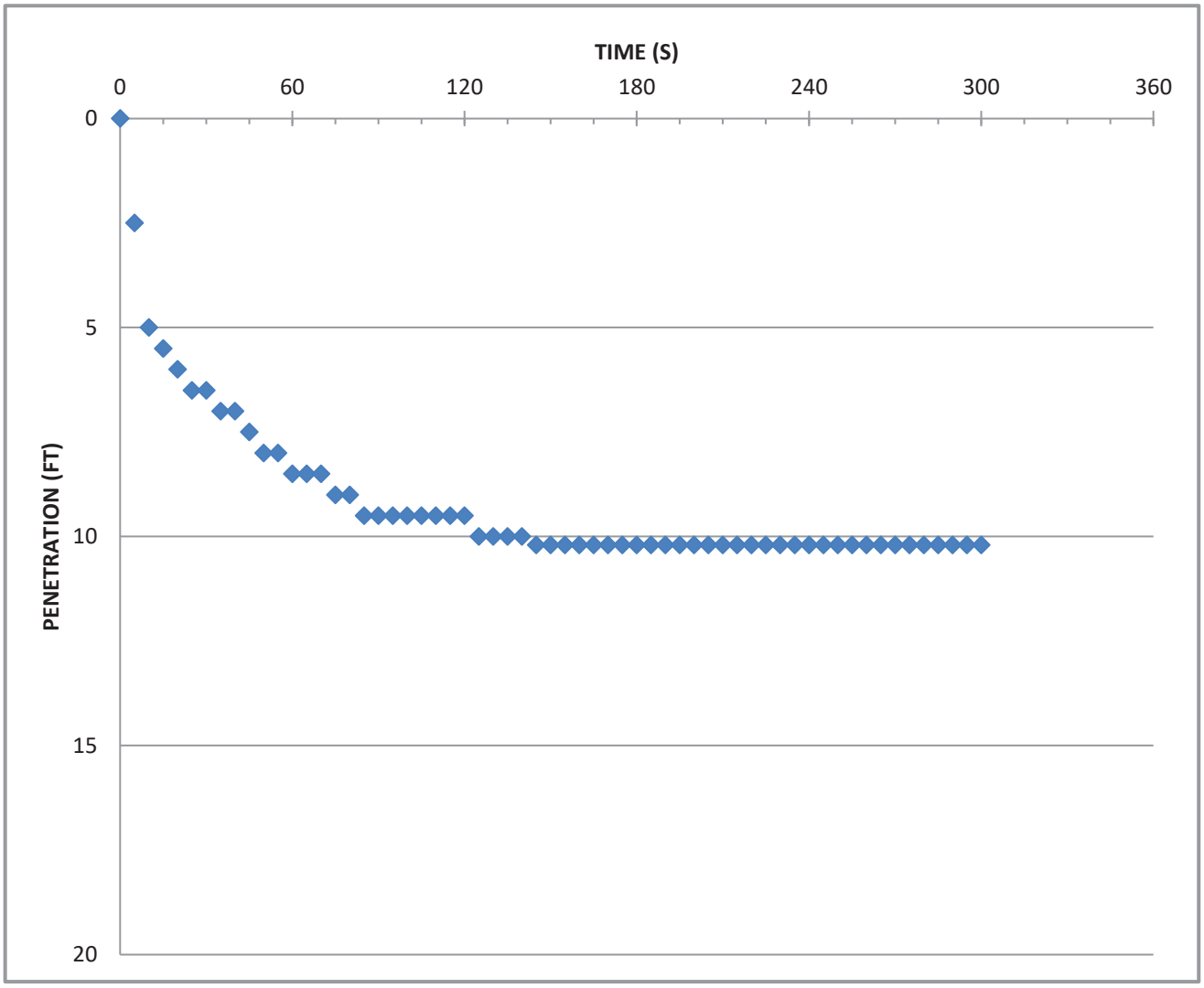
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

26 Jul 16

CORE ID:	C-26	**NORTHING:**	2249613.83
PENETRATION:	10.2	**EASTING:**	523117.01
RECOVERY:	9.1	**WATER DEPTH:**	9.8
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-14.01
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-24.21



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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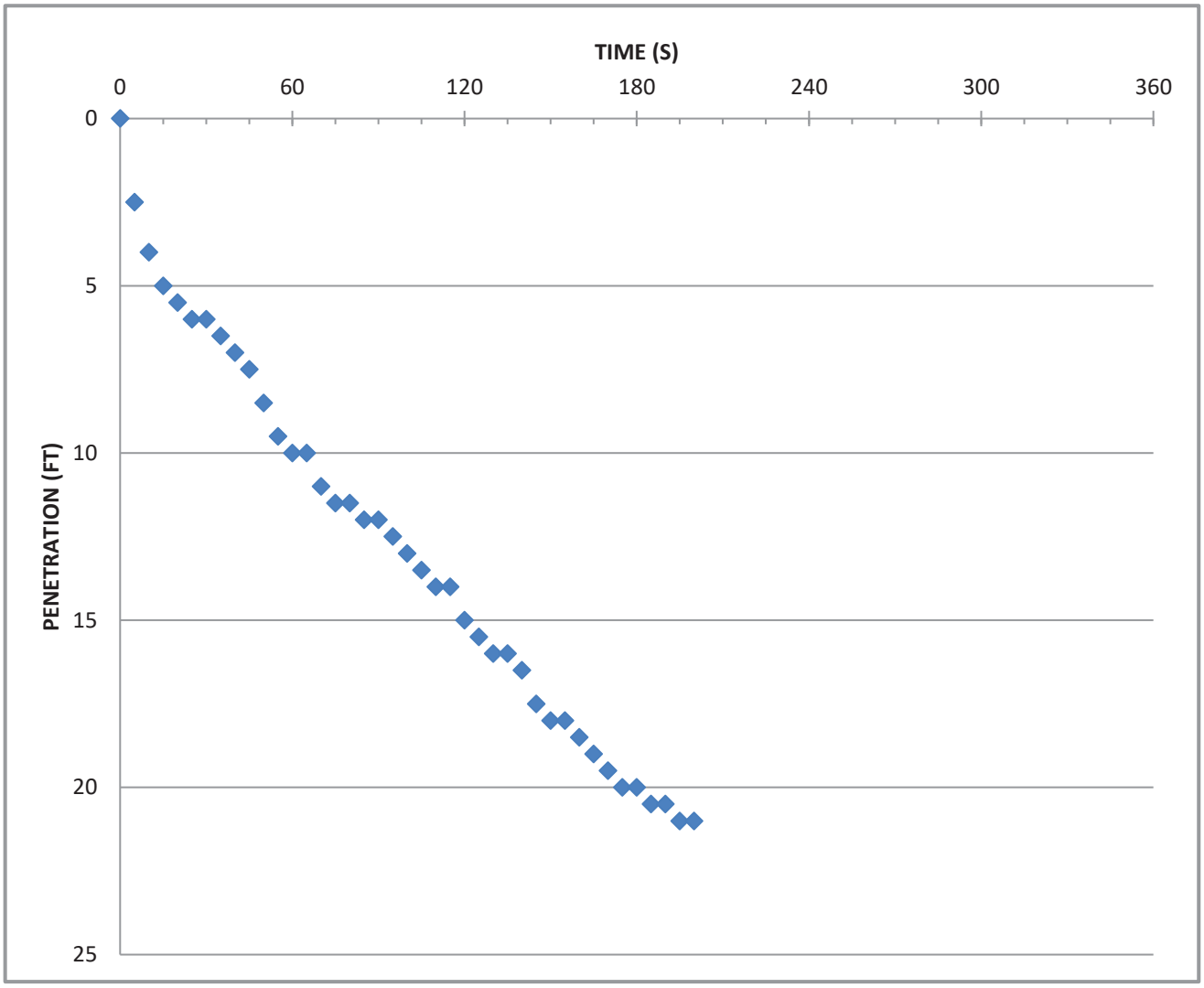
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-27	NORTHING:	2248465.27
PENETRATION:	21.0	EASTING:	528125.38
RECOVERY:	19.9	WATER DEPTH:	15.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-18.26
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-39.26



TOTAL RUN TIME: 200s

NOTES:

All measurements in feet.

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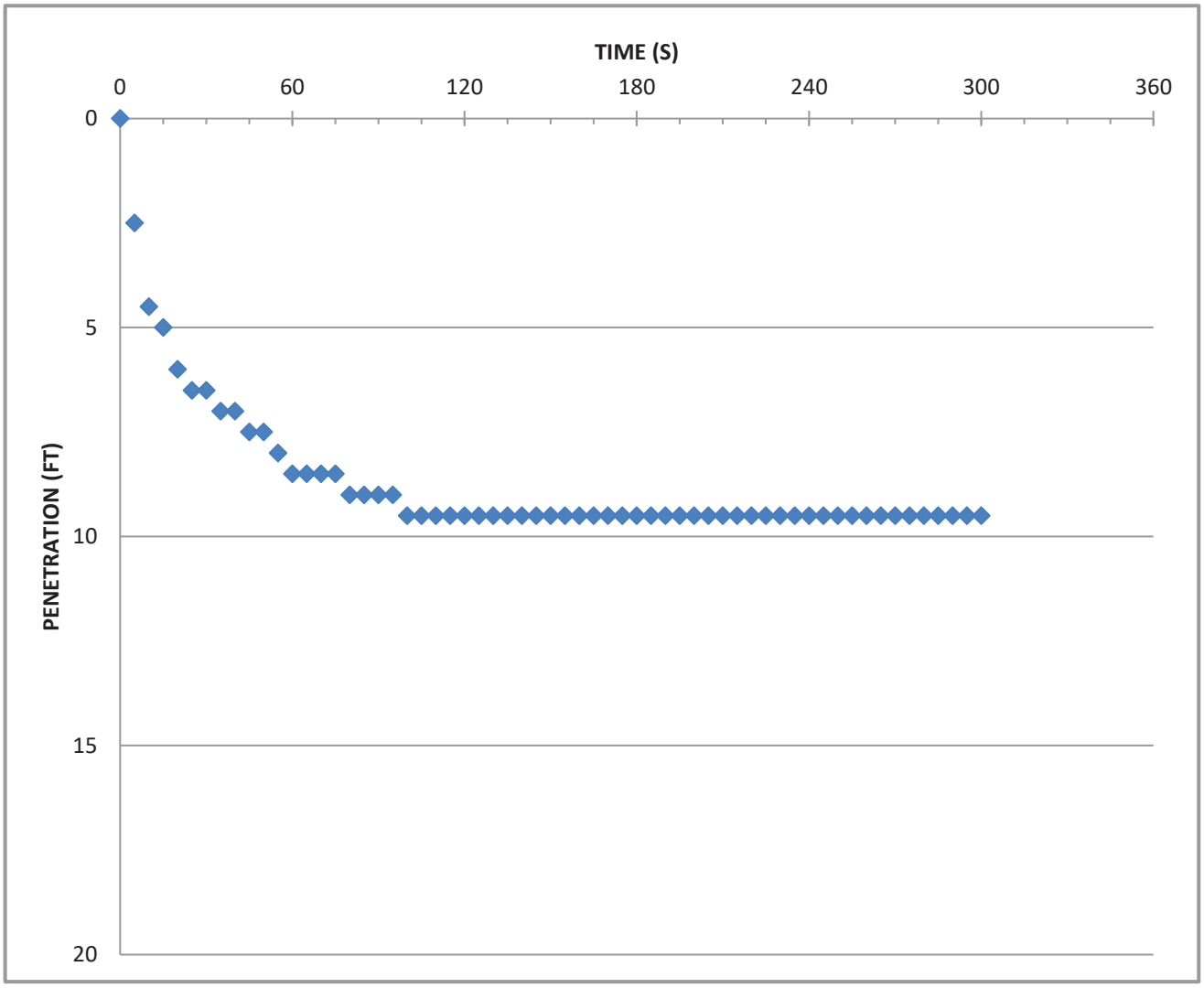
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

12 Jul 16

CORE ID:	C-28	**NORTHING:**	2245762.72
PENETRATION:	9.5	**EASTING:**	523753.2
RECOVERY:	8.7	**WATER DEPTH:**	7.2
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-7.74
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-17.24



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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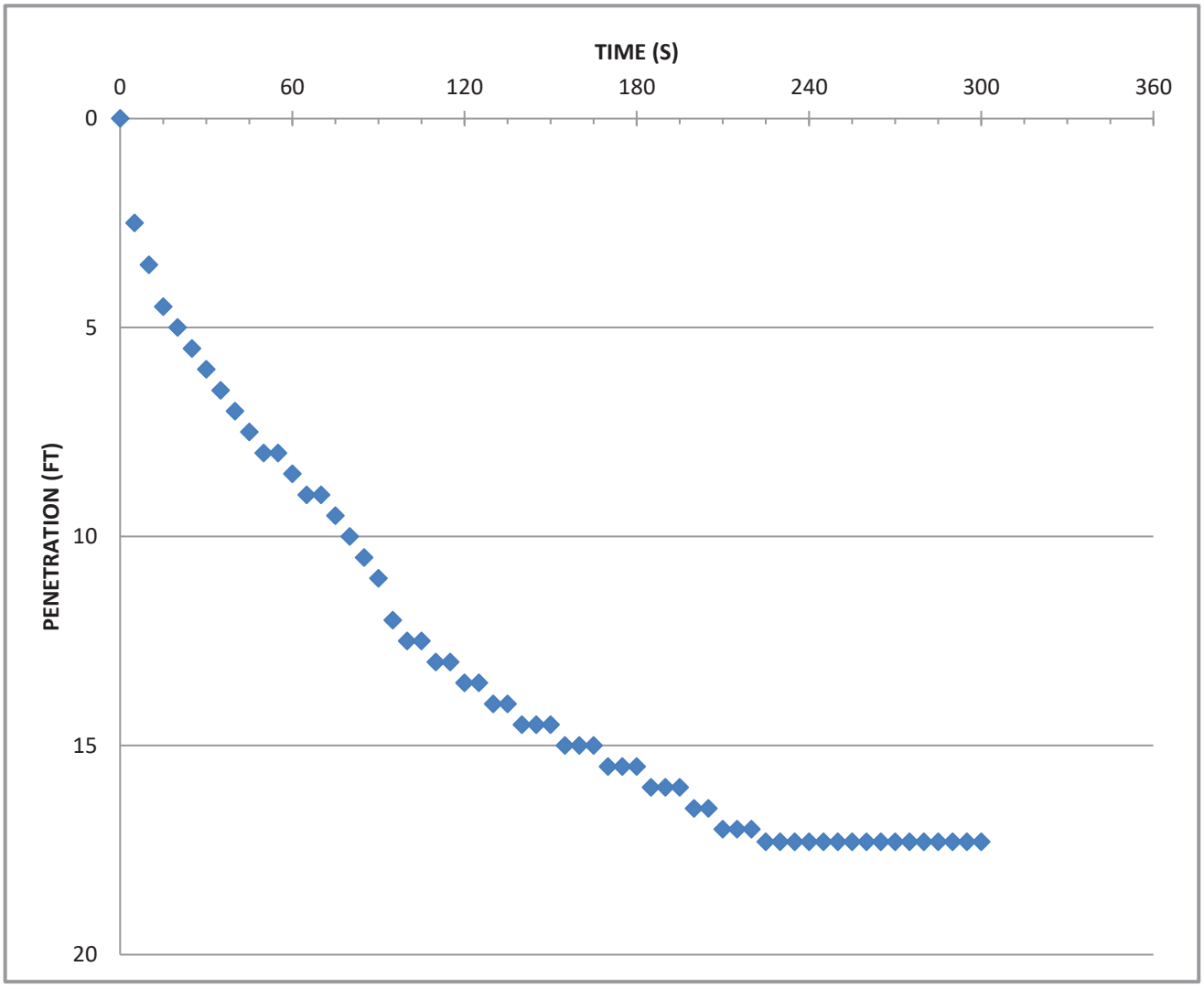
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

22 Aug 16

CORE ID:	C-29	NORTHING:	2246467
PENETRATION:	17.3	EASTING:	523705
RECOVERY:	14.5	WATER DEPTH:	3.3
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	NA
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	NA



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

NA = Elevation data not available; Florida Permanent Reference Network was not operational.

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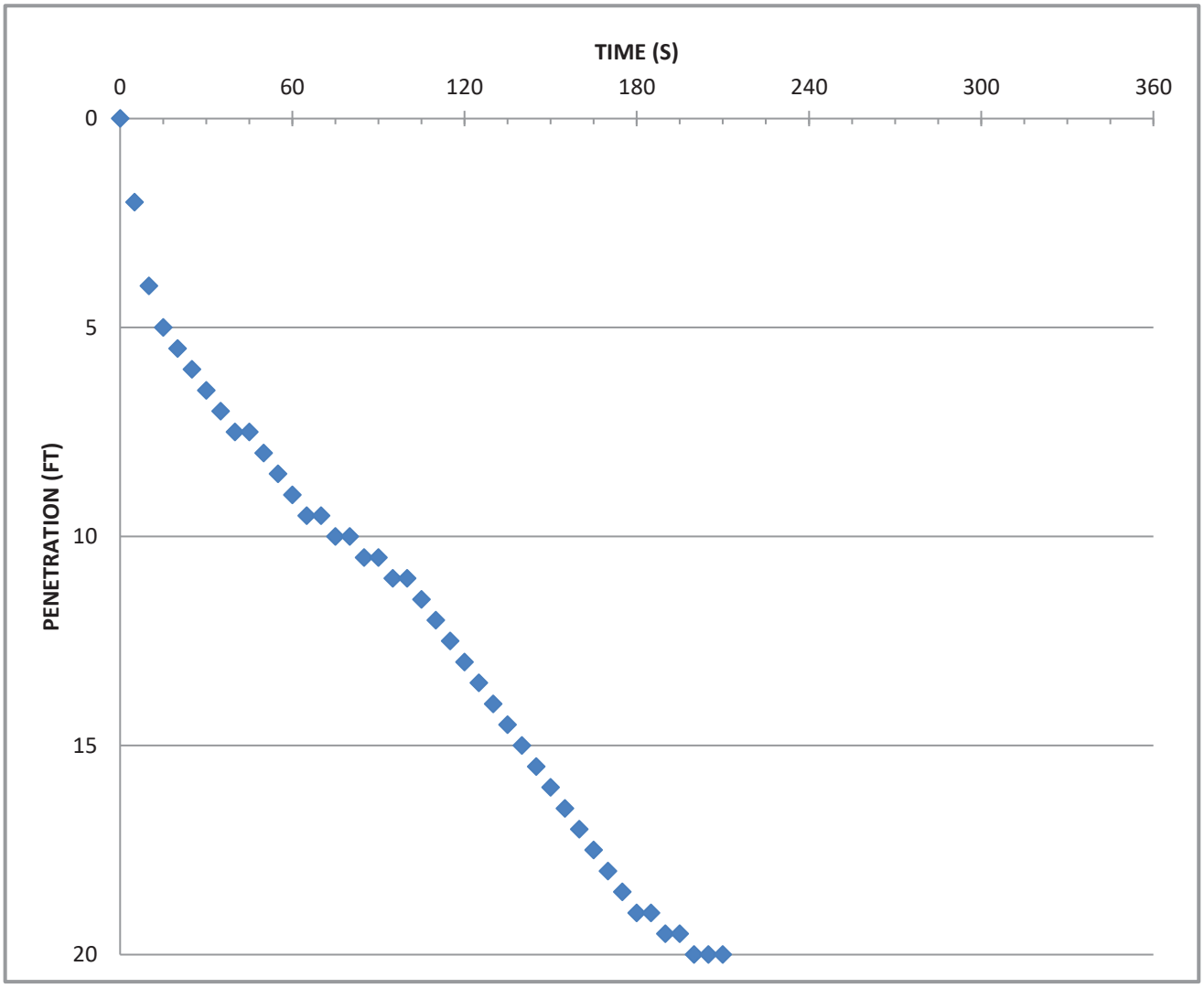
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

22 Aug 16

CORE ID:	C-30	NORTHING:	2247172
PENETRATION:	20.0	EASTING:	523653
RECOVERY:	15.1	WATER DEPTH:	10.3
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	NA
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	NA



TOTAL RUN TIME: 210s

NOTES:

All measurements in feet.

NA = Elevation data not available; Florida Permanent Reference Network was not operational.

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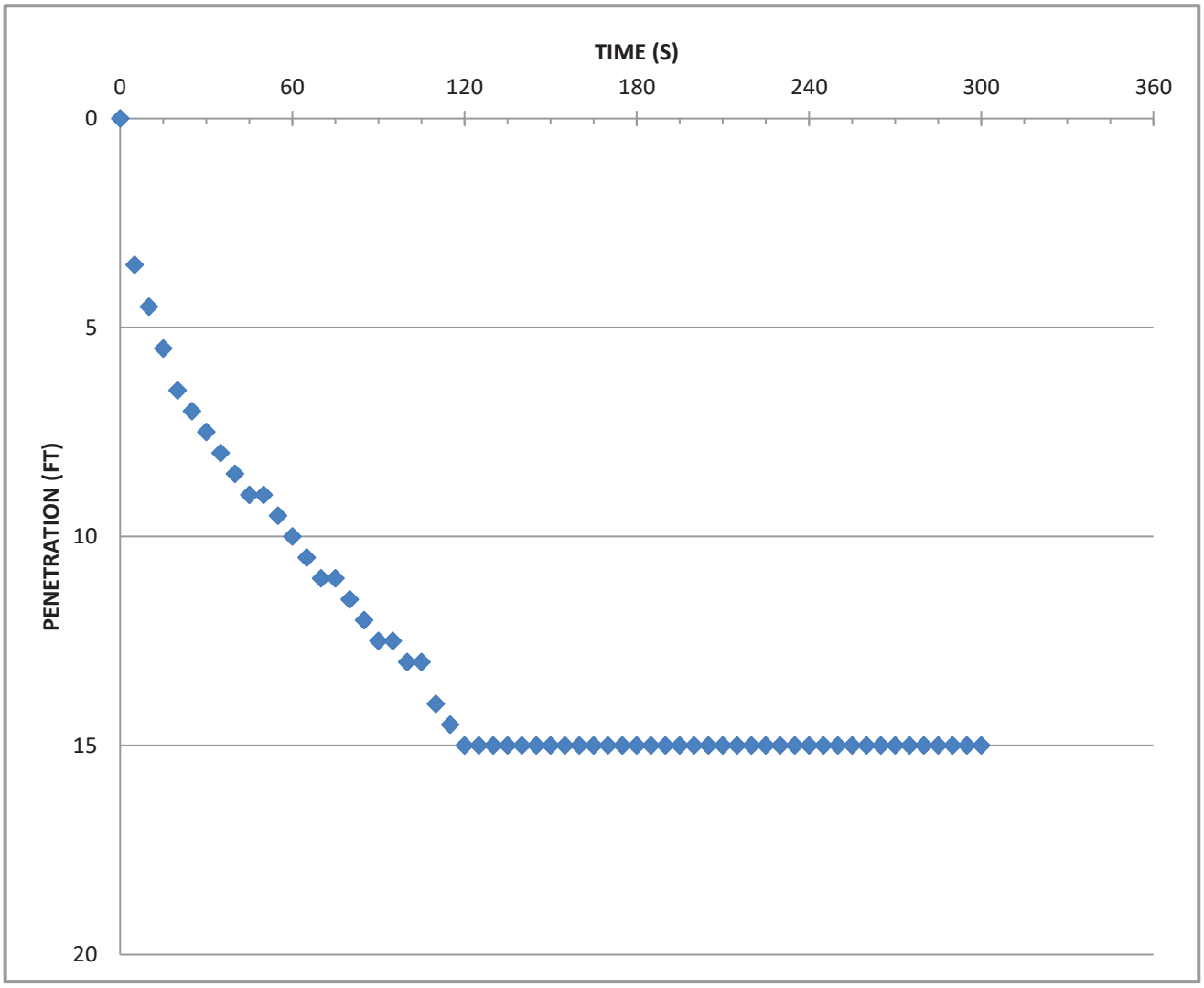
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

27 Jul 16

CORE ID:	C-31	NORTHING:	2247874
PENETRATION:	15.0	EASTING:	523600
RECOVERY:	13.8	WATER DEPTH:	5.6
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.53
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-24.53



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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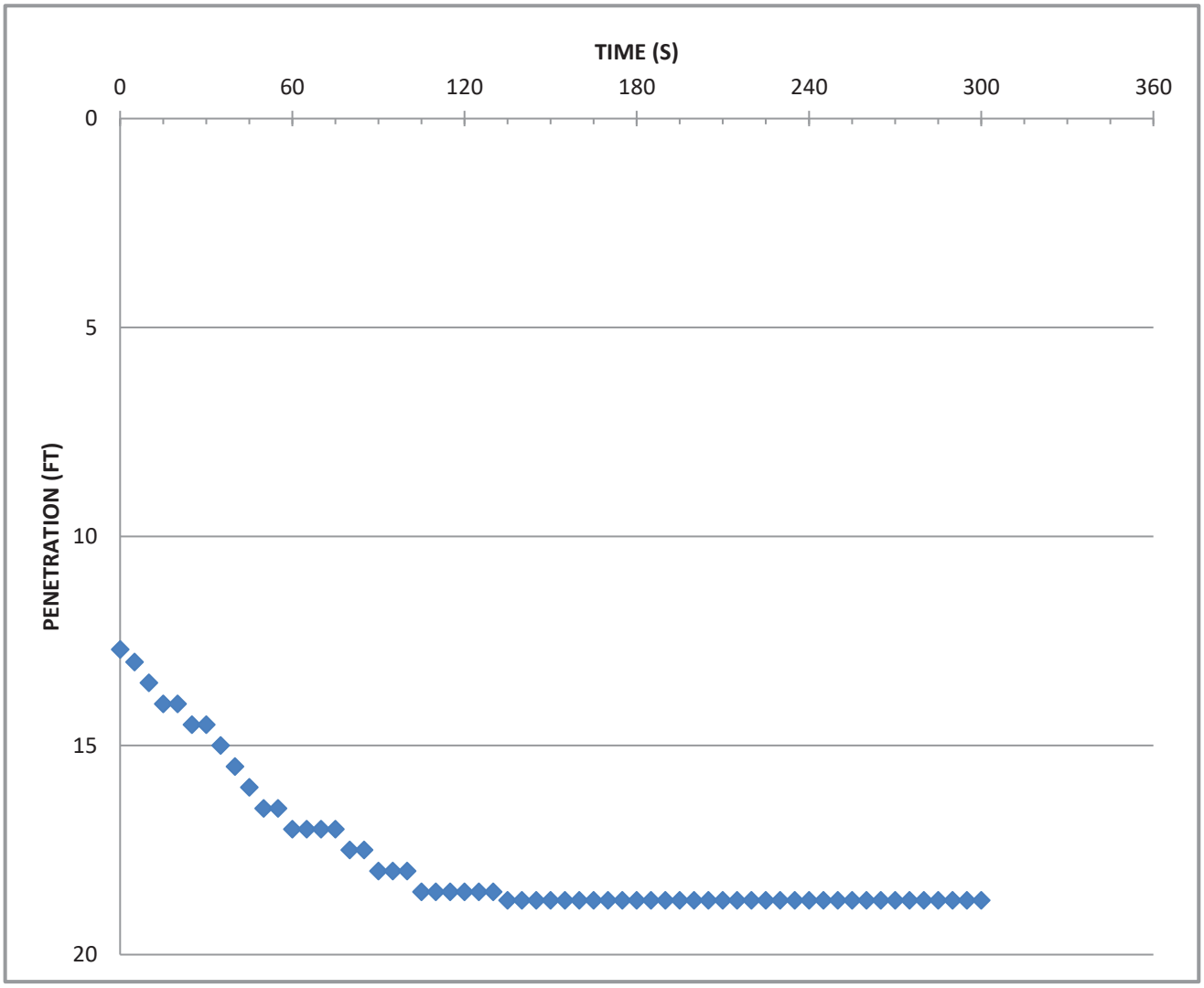
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

27 Jul 16

CORE ID:	C-31 Jet	NORTHING:	2247874
PENETRATION:	6.0	EASTING:	523600
RECOVERY:	3.7	WATER DEPTH:	5.6
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.53
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-28.23



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

Jetted to 12.7 feet below sediment surface; continued core run to 18.7 feet below sediment surface.

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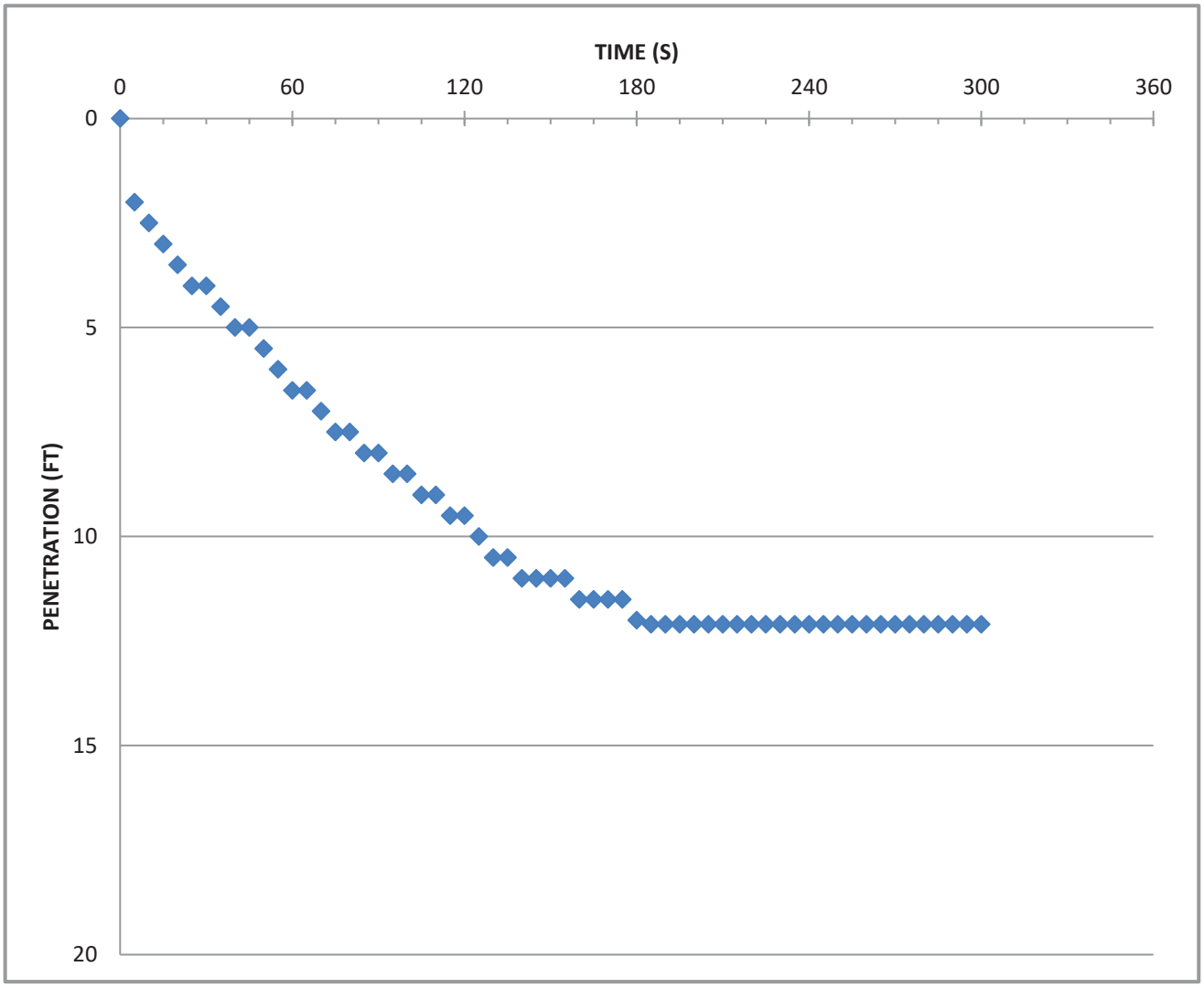
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

12 Jul 16

CORE ID:	C-32	**NORTHING:**	2248578.34
PENETRATION:	12.1	**EASTING:**	523543.32
RECOVERY:	10.5	**WATER DEPTH:**	9.1
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-12.15
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-24.25



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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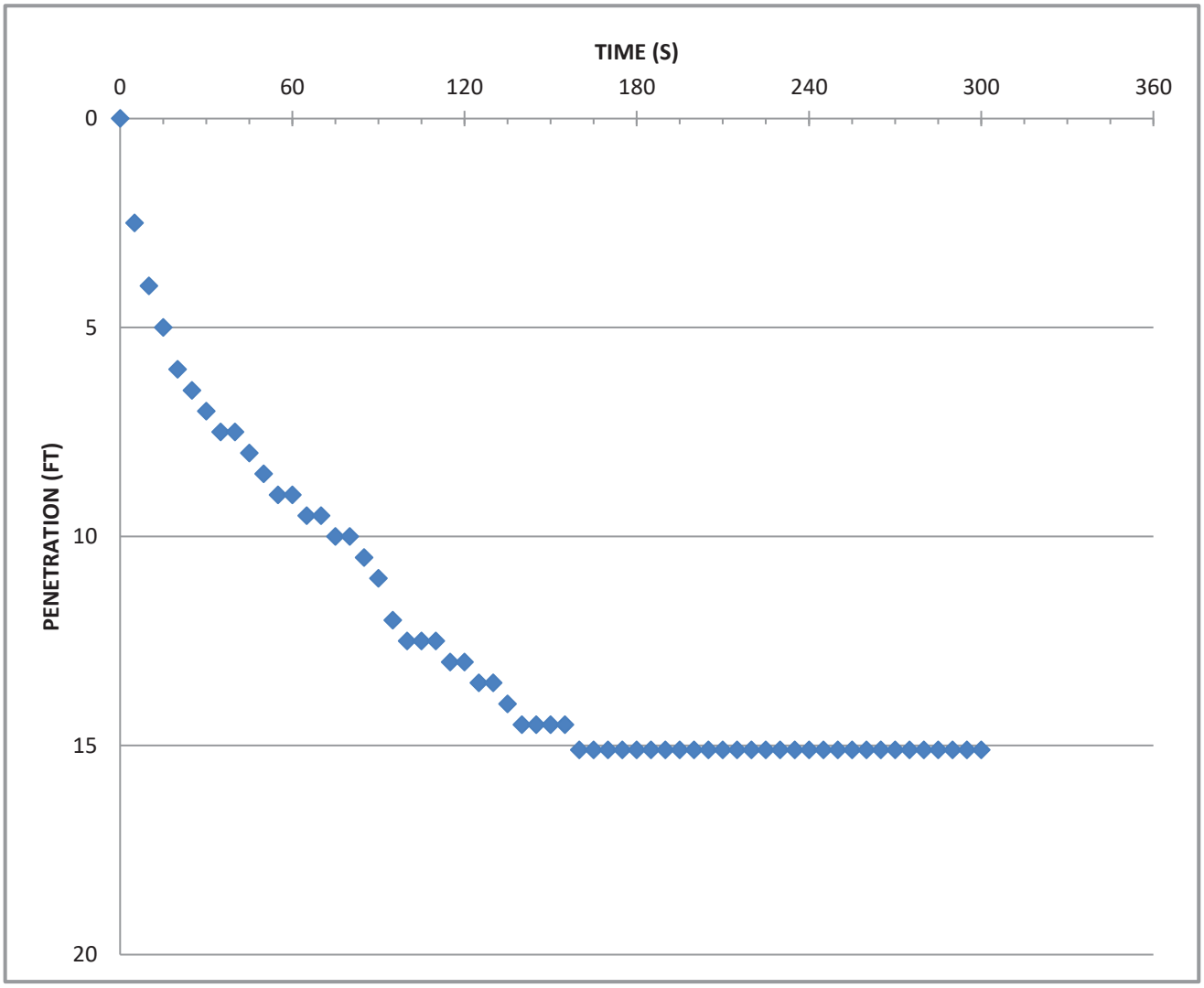
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

21 Feb 17

CORE ID:	C-33	NORTHING:	2247701.25
PENETRATION:	15.1	EASTING:	528159.99
RECOVERY:	12.5	WATER DEPTH:	12.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-14.17
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-29.25



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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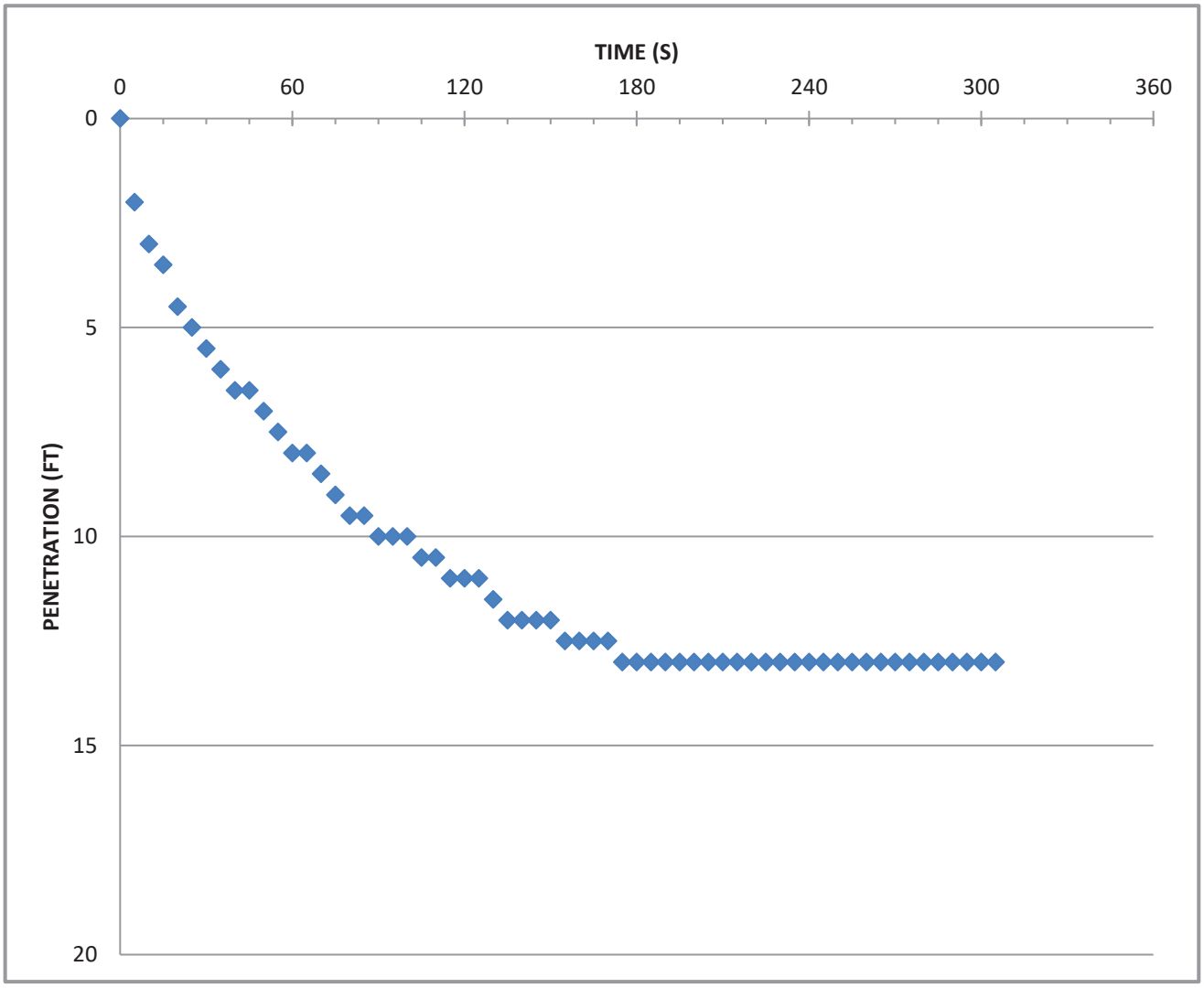
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-34	**NORTHING:**	2247006.89
PENETRATION:	13.0	**EASTING:**	527482.92
RECOVERY:	12.4	**WATER DEPTH:**	10.3
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-11.12
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-24.12



TOTAL RUN TIME: 305s

NOTES:

All measurements in feet.

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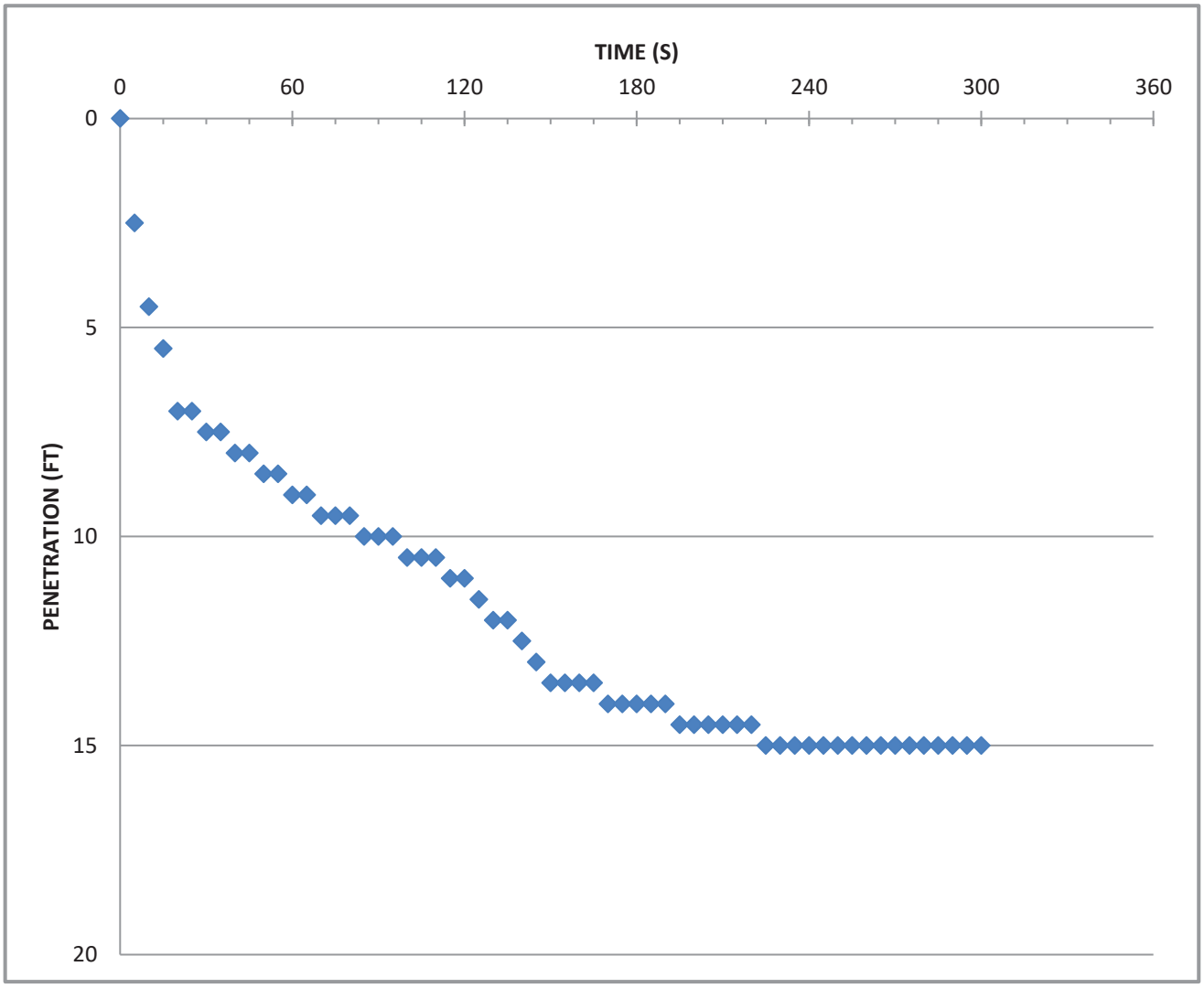
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-35	NORTHING:	2247788.21
PENETRATION:	15.0	EASTING:	522713.88
RECOVERY:	12.0	WATER DEPTH:	7.3
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-8.65
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-23.65



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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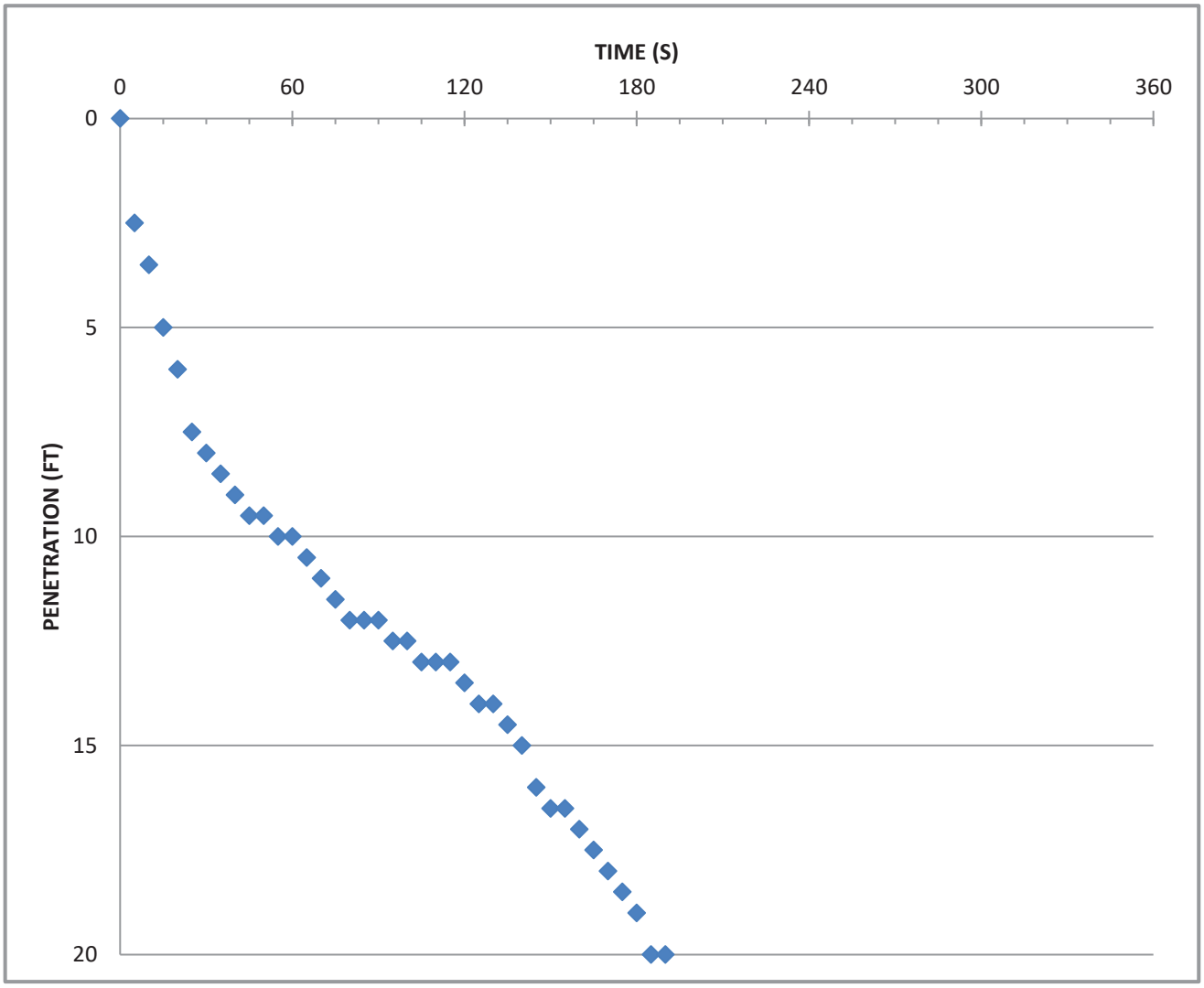
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

22 Aug 16

CORE ID:	C-36	NORTHING:	2246519
PENETRATION:	20.0	EASTING:	524411
RECOVERY:	19.0	WATER DEPTH:	11.2
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	NA
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	NA



TOTAL RUN TIME: 190s

NOTES:

All measurements in feet.

NA = Elevation data not available; Florida Permanent Reference Network was not operational.

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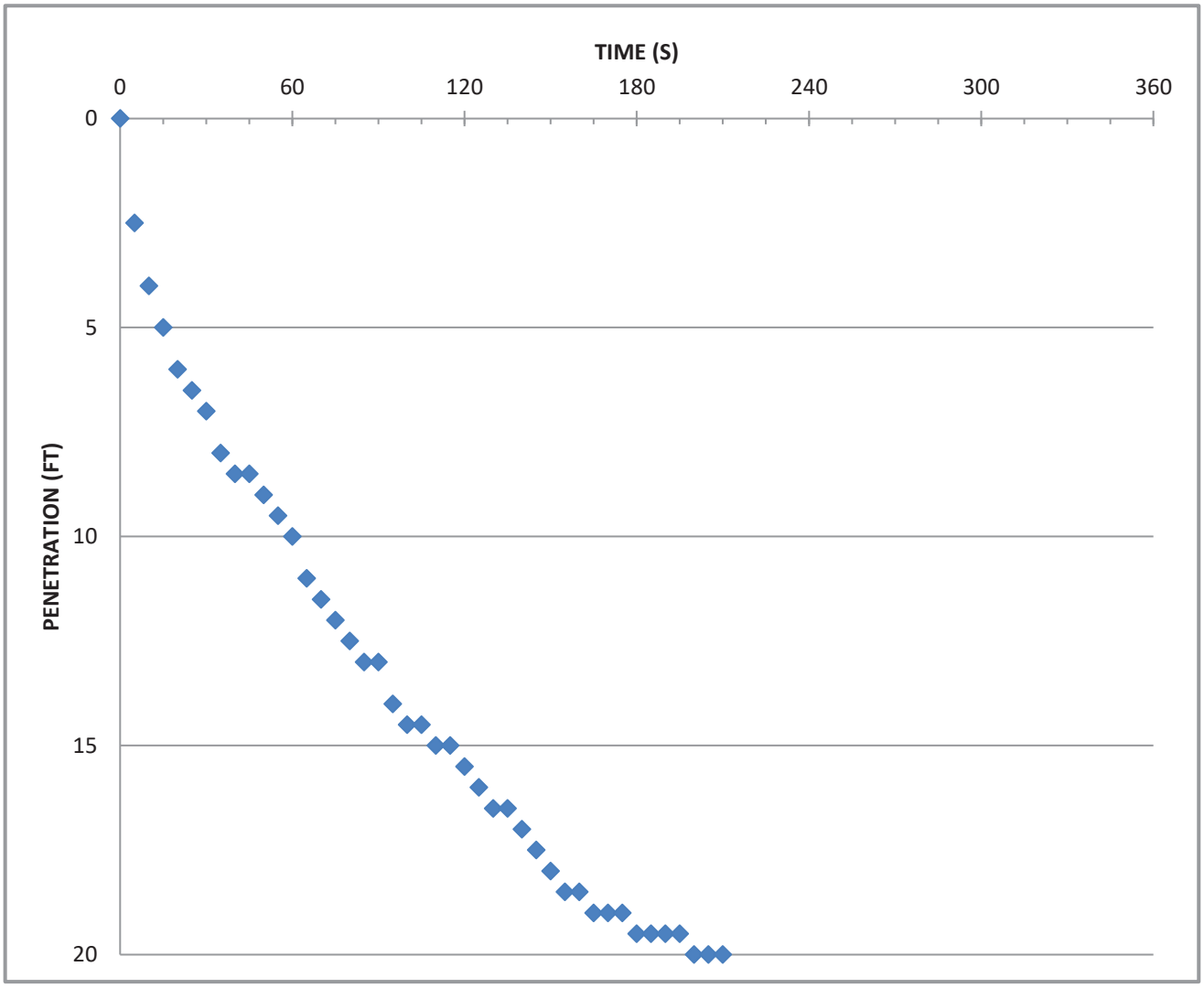
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

27 Jul 16

CORE ID:	C-37	NORTHING:	2247032
PENETRATION:	20.0	EASTING:	524261
RECOVERY:	16.2	WATER DEPTH:	6.2
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-5.11
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-25.11



TOTAL RUN TIME: 210s

NOTES:

All measurements in feet.

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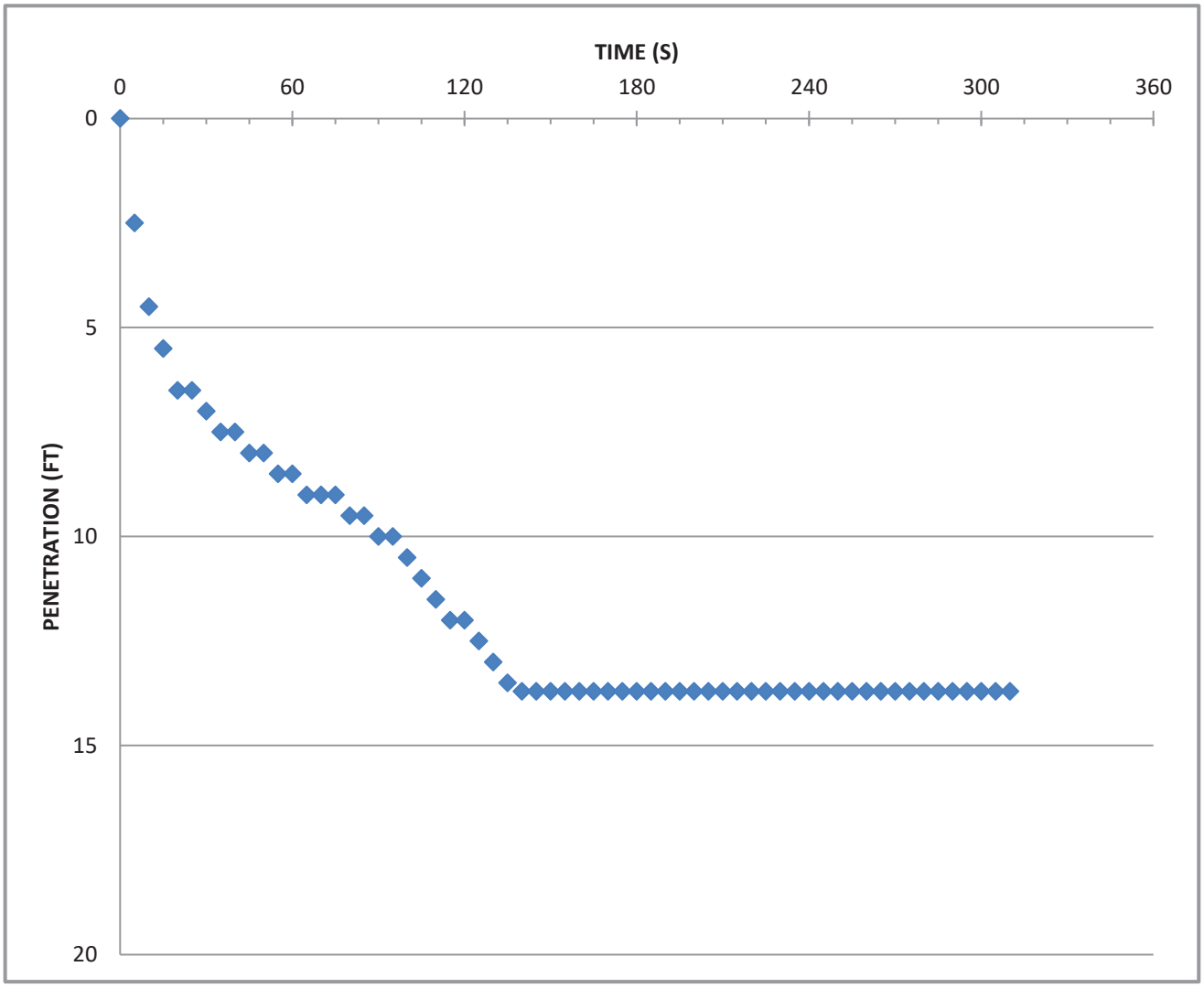
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

26 Jul 16

CORE ID:	C-38	NORTHING:	2247925
PENETRATION:	13.7	EASTING:	524310
RECOVERY:	11.2	WATER DEPTH:	12.4
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-10.77
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-24.47



TOTAL RUN TIME: 310s

NOTES:

All measurements in feet.

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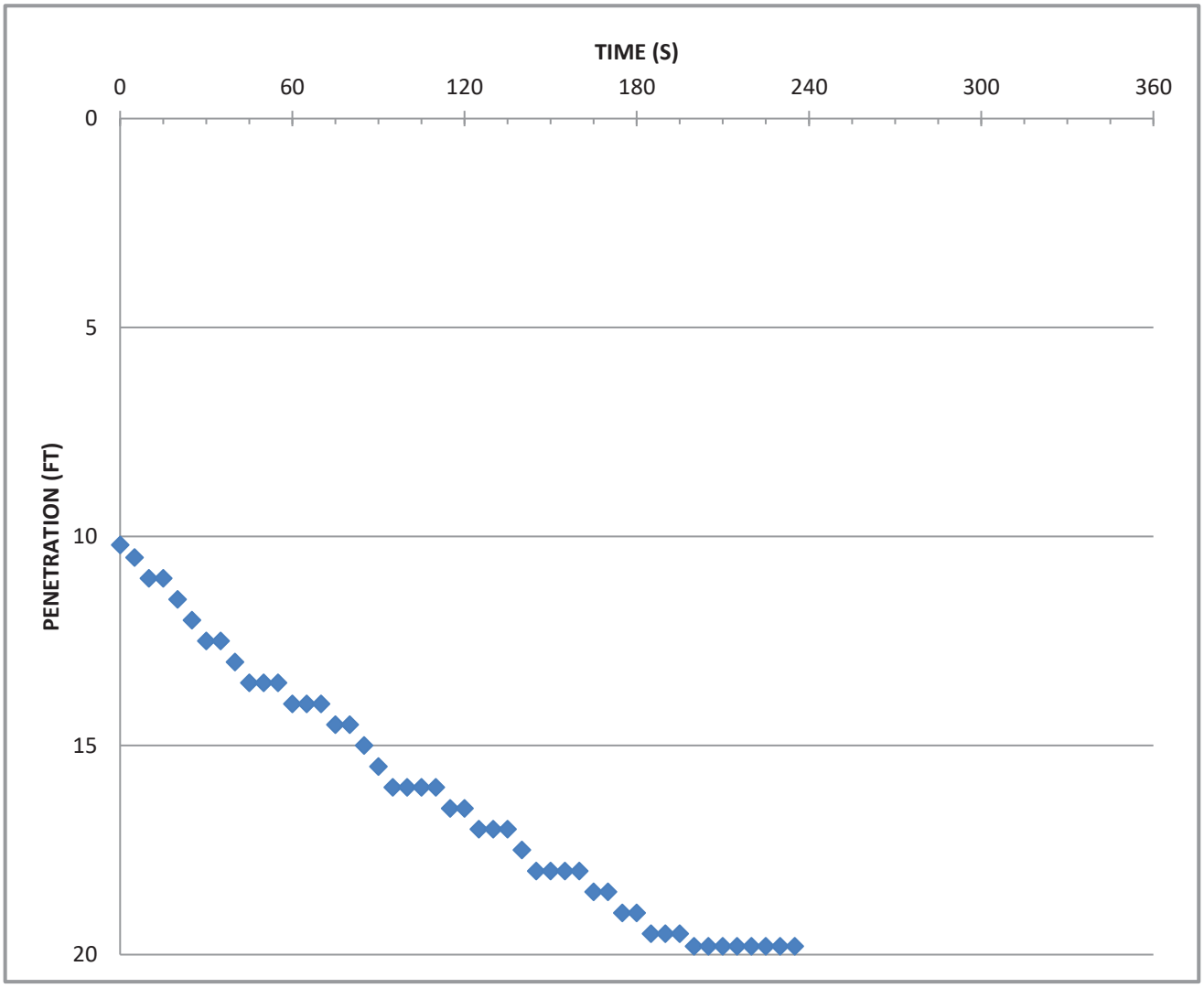
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

26 Jul 16

CORE ID:	C-38 Jet	NORTHING:	2247925
PENETRATION:	9.5	EASTING:	524310
RECOVERY:	7.0	WATER DEPTH:	12.4
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-10.77
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-30.57



TOTAL RUN TIME: 235s

NOTES:

All measurements in feet.
Jetted to 10.2 feet below sediment surface; continued core run to 19.7 feet below sediment surface.

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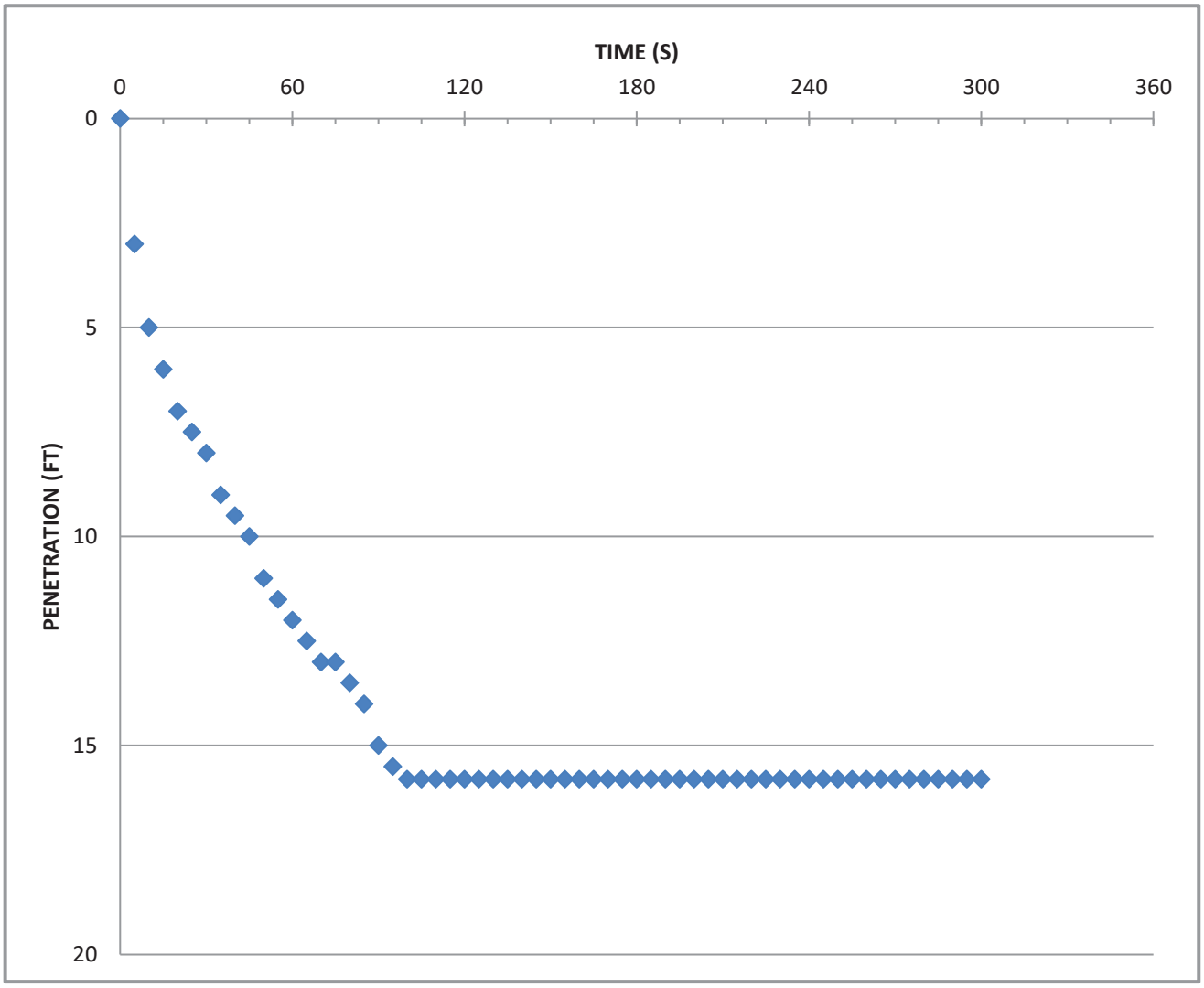
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

25 Jul 16

CORE ID:	C-39	NORTHING:	2248633
PENETRATION:	15.8	EASTING:	524250
RECOVERY:	13.5	WATER DEPTH:	14.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-15.85
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-32.70



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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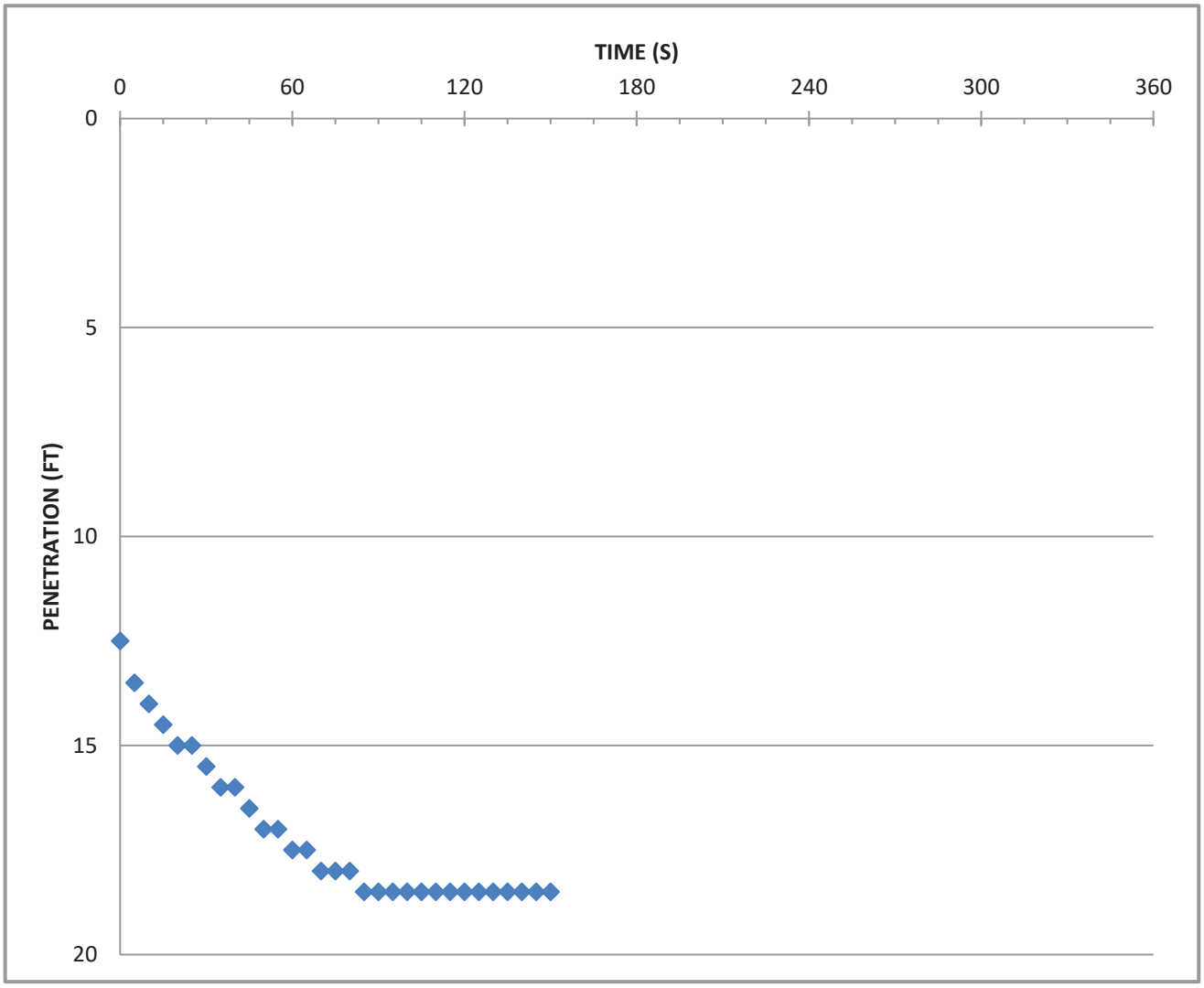
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

25 Jul 16

CORE ID:	C-39 Jet	NORTHING:	2248633
PENETRATION:	6.0	EASTING:	524250
RECOVERY:	5.3	WATER DEPTH:	14.8
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-15.85
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-35.85



TOTAL RUN TIME: 150s

NOTES:

All measurements in feet.

Jetted to 12.5 feet below sediment surface; continued core run to 18.5 feet below sediment surface.

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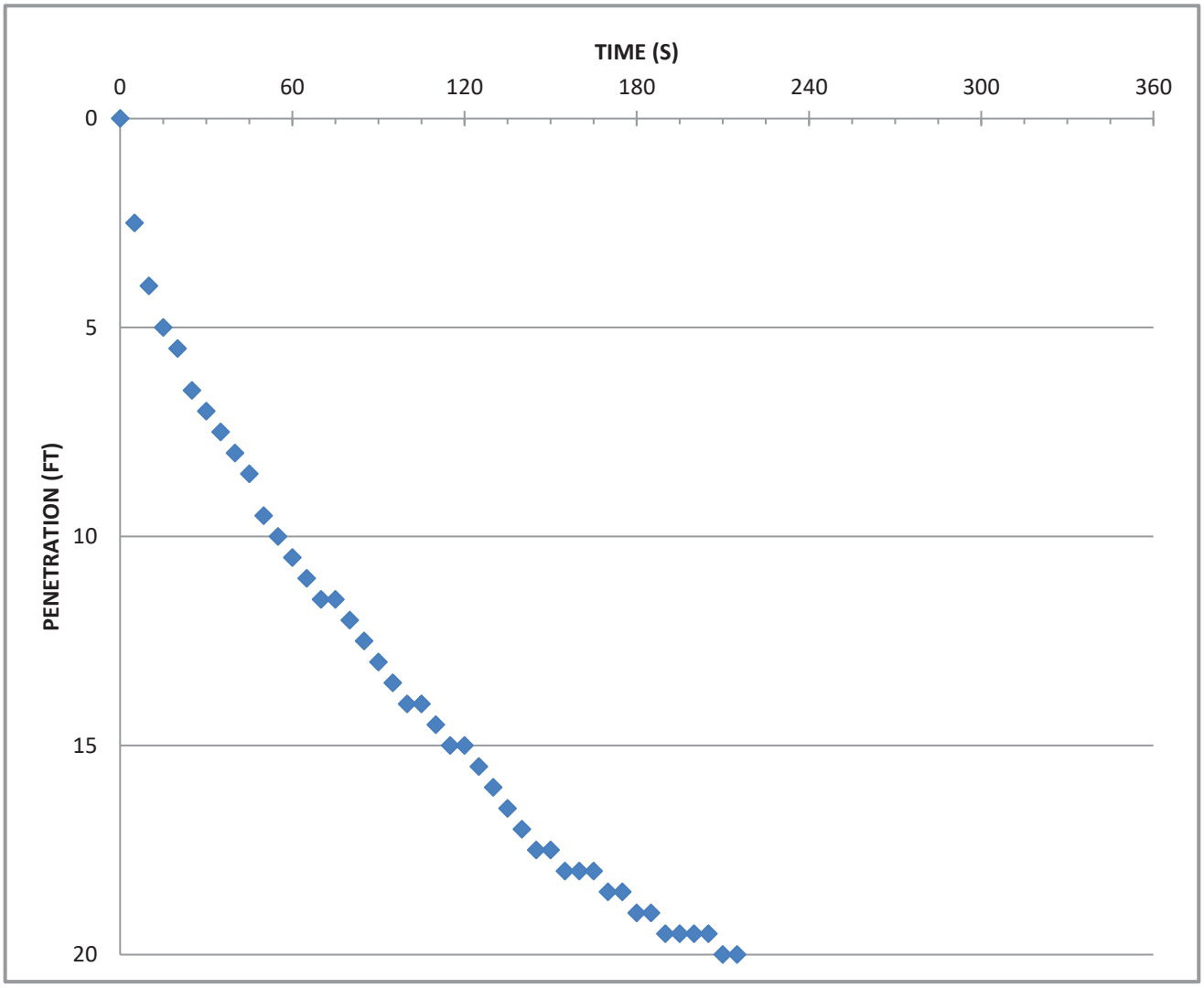
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-40	NORTHING:	2248170.63
PENETRATION:	20.0	EASTING:	523203.03
RECOVERY:	15.0	WATER DEPTH:	9.7
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-9.10
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-29.10



TOTAL RUN TIME: 215s

NOTES:

All measurements in feet.

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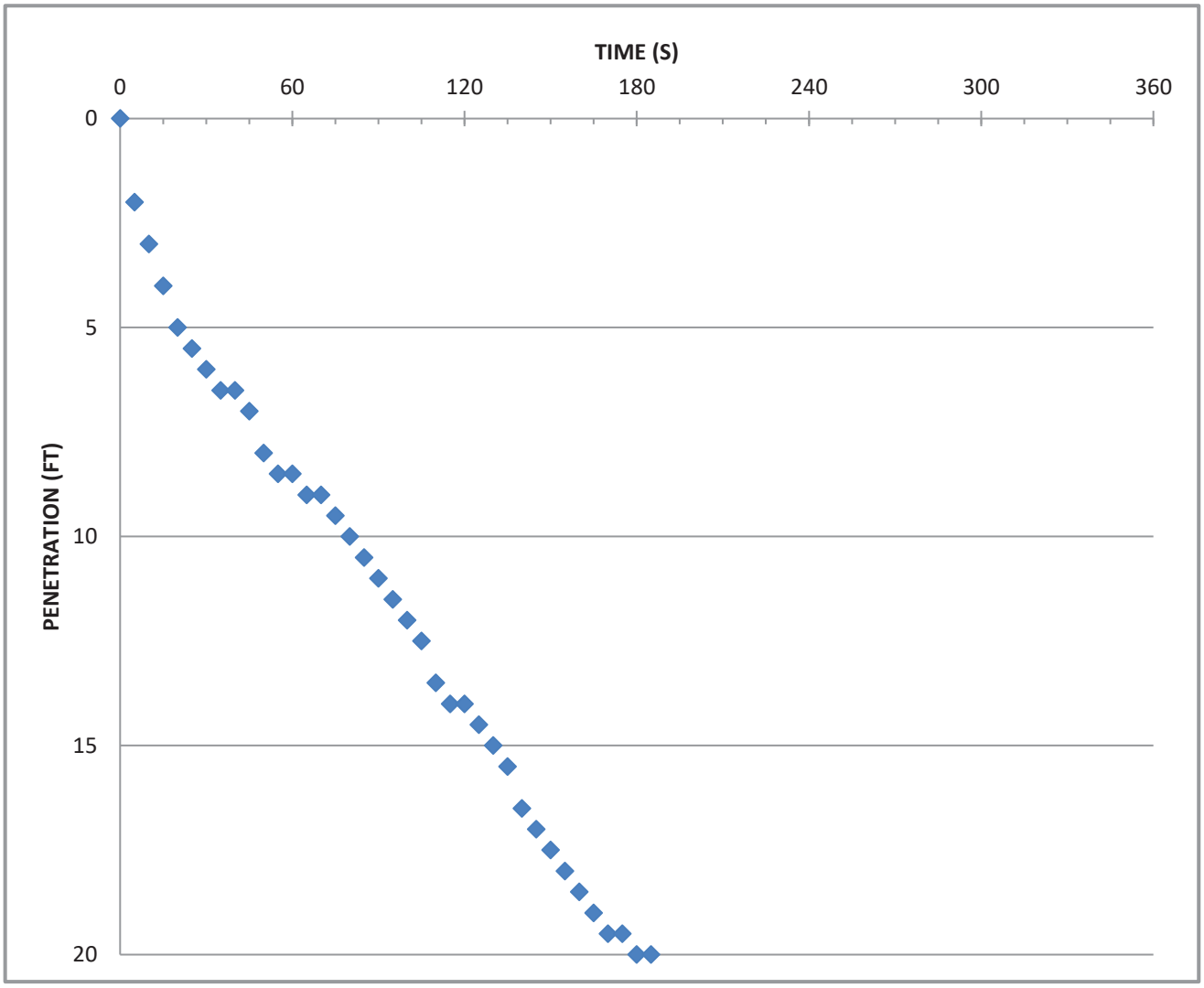
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-41	NORTHING:	2248825.16
PENETRATION:	20.0	EASTING:	522512.78
RECOVERY:	12.4	WATER DEPTH:	11.1
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-11.44
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-31.44



TOTAL RUN TIME: 185s

NOTES:

All measurements in feet.

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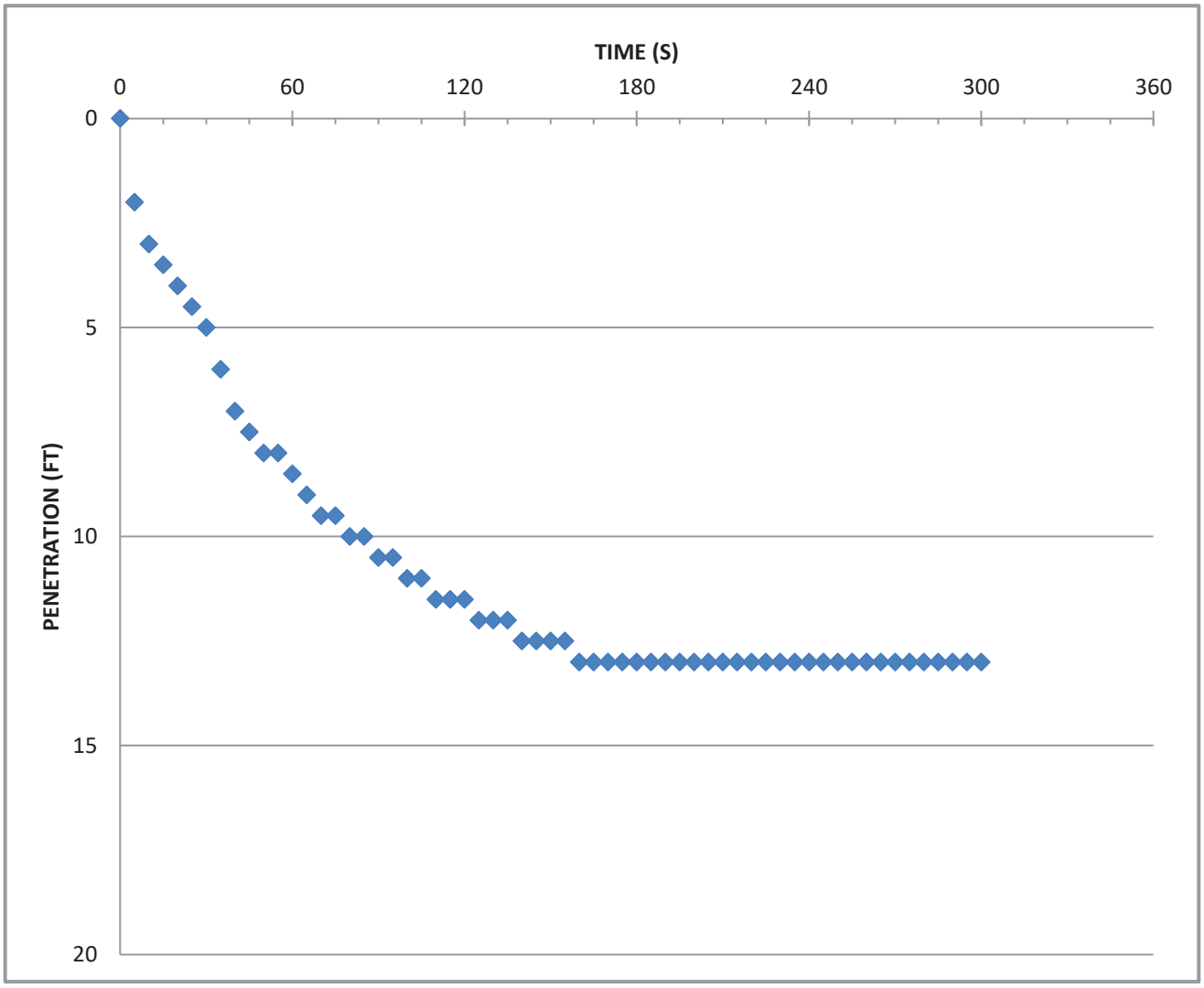
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

22 Aug 16

CORE ID:	C-42	NORTHING:	2246572
PENETRATION:	13.0	EASTING:	525116
RECOVERY:	10.6	WATER DEPTH:	3.5
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	NA
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	NA



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

NA = Elevation data not available; Florida Permanent Reference Network was not operational.

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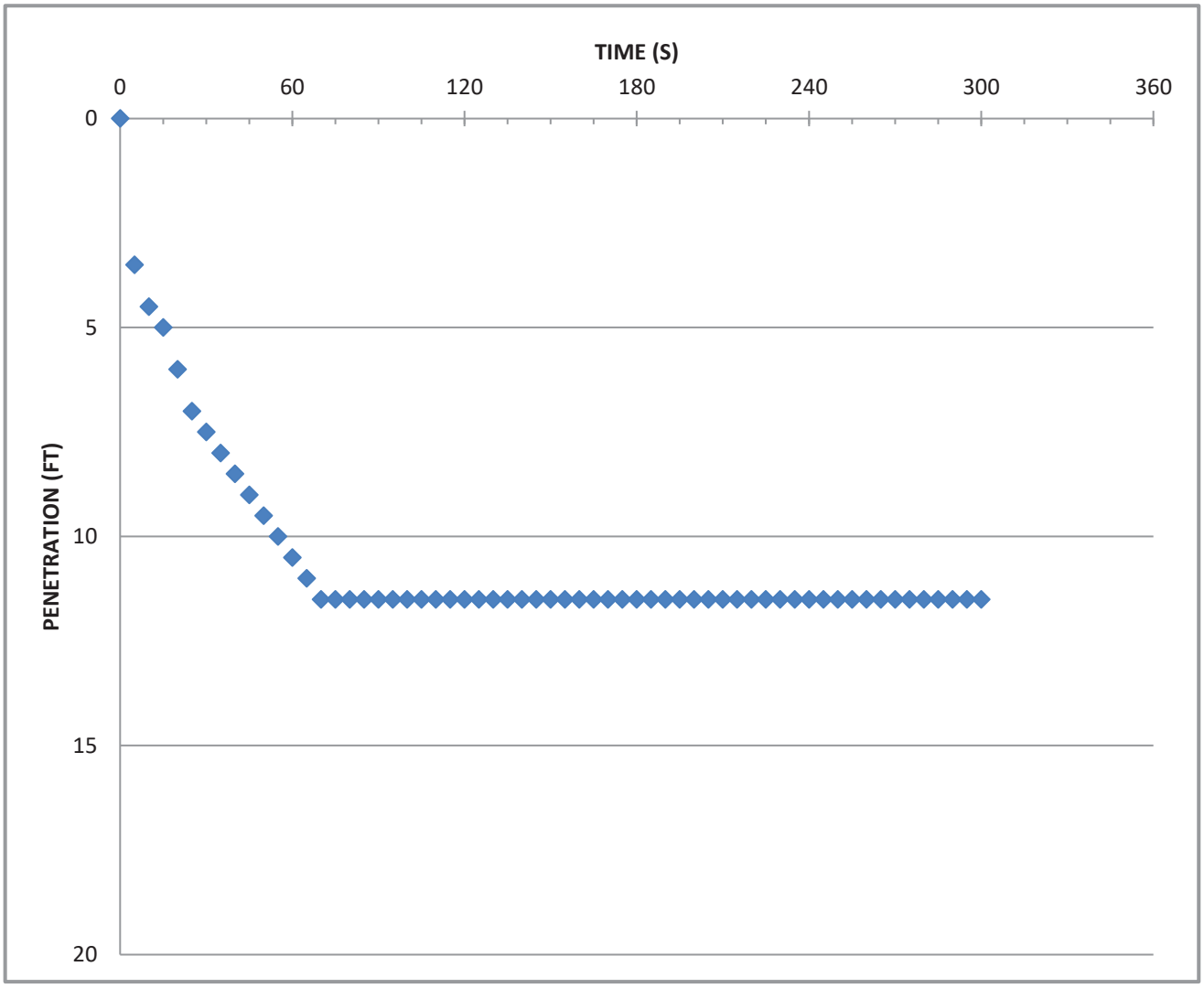
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

24 Jul 16

CORE ID:	C-43	NORTHING:	2247278
PENETRATION:	11.5	EASTING:	525069
RECOVERY:	10.0	WATER DEPTH:	12.9
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-10.75
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-22.75



TOTAL RUN TIME: 235s

NOTES:

All measurements in feet.

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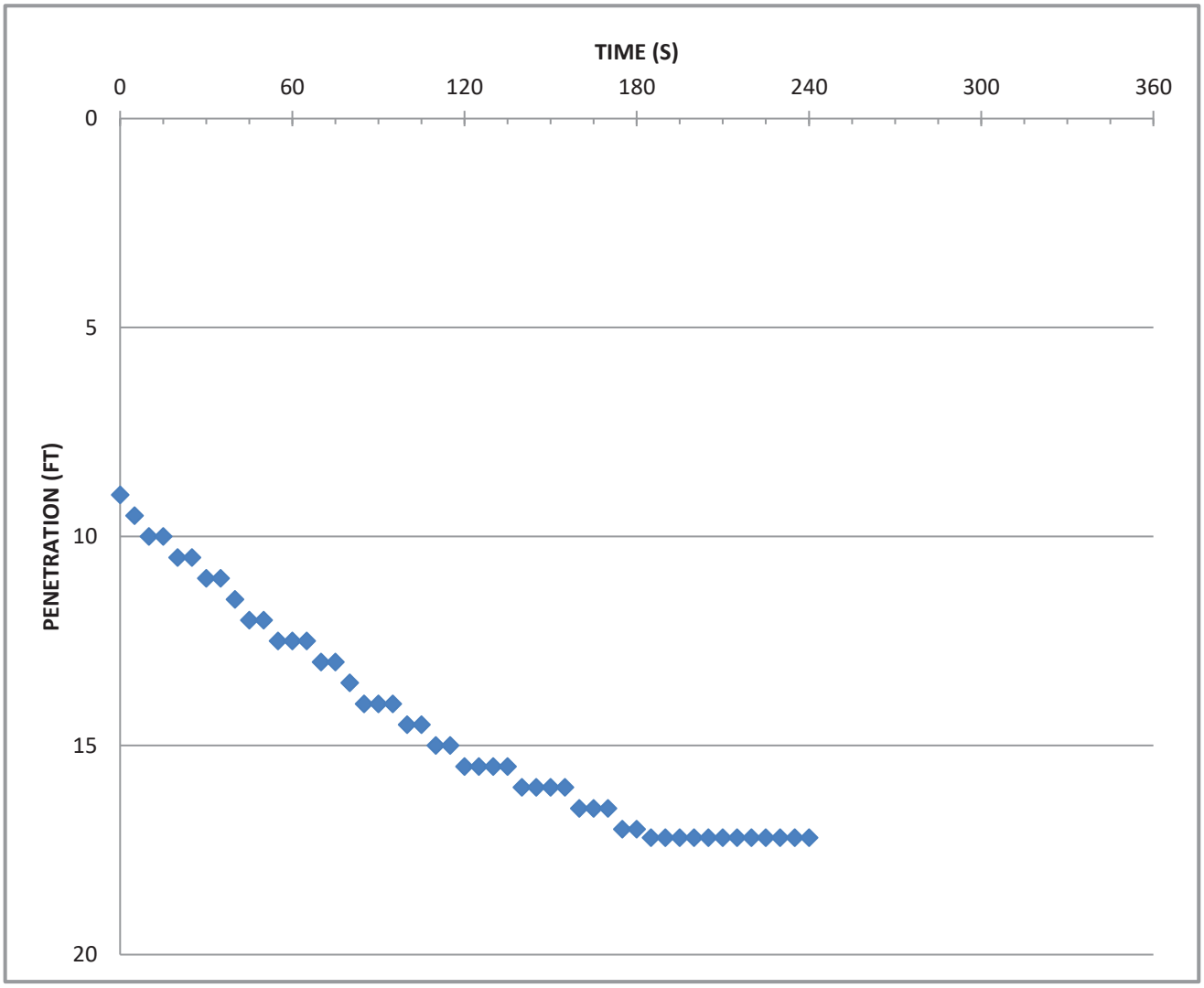
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

24 Jul 16

CORE ID:	C-43 JET	NORTHING:	2247278
PENETRATION:	8.2	EASTING:	525069
RECOVERY:	7.0	WATER DEPTH:	12.9
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-10.75
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-28.00



TOTAL RUN TIME: 240s

NOTES:

All measurements in feet.

Jetted to 9 feet below sediment surface; continued core run to 17.2 feet below sediment surface.

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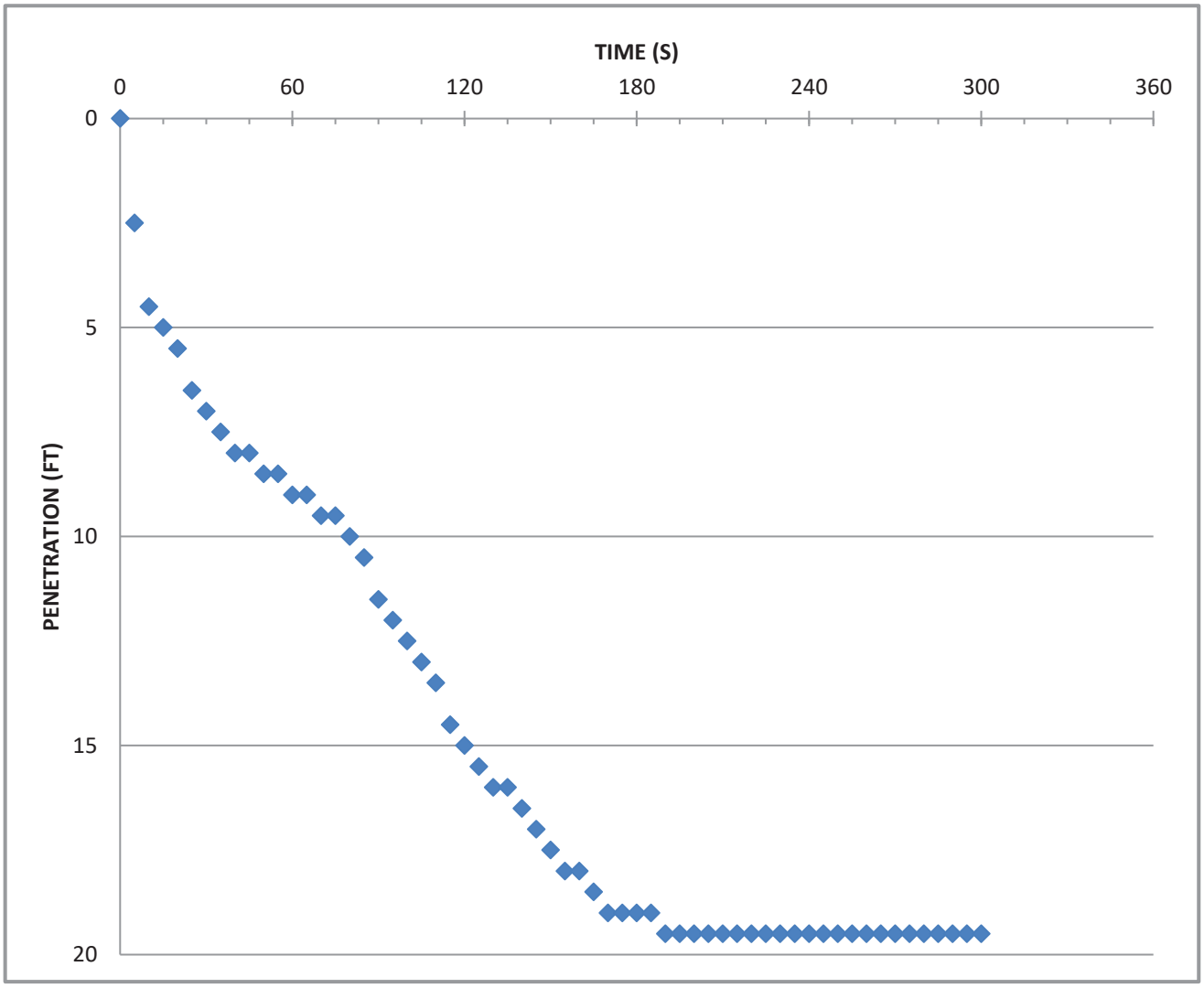
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

24 Jul 16

CORE ID:	C-44	NORTHING:	2248305
PENETRATION:	19.5	EASTING:	524635
RECOVERY:	16.1	WATER DEPTH:	14.0
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-13.09
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-32.59



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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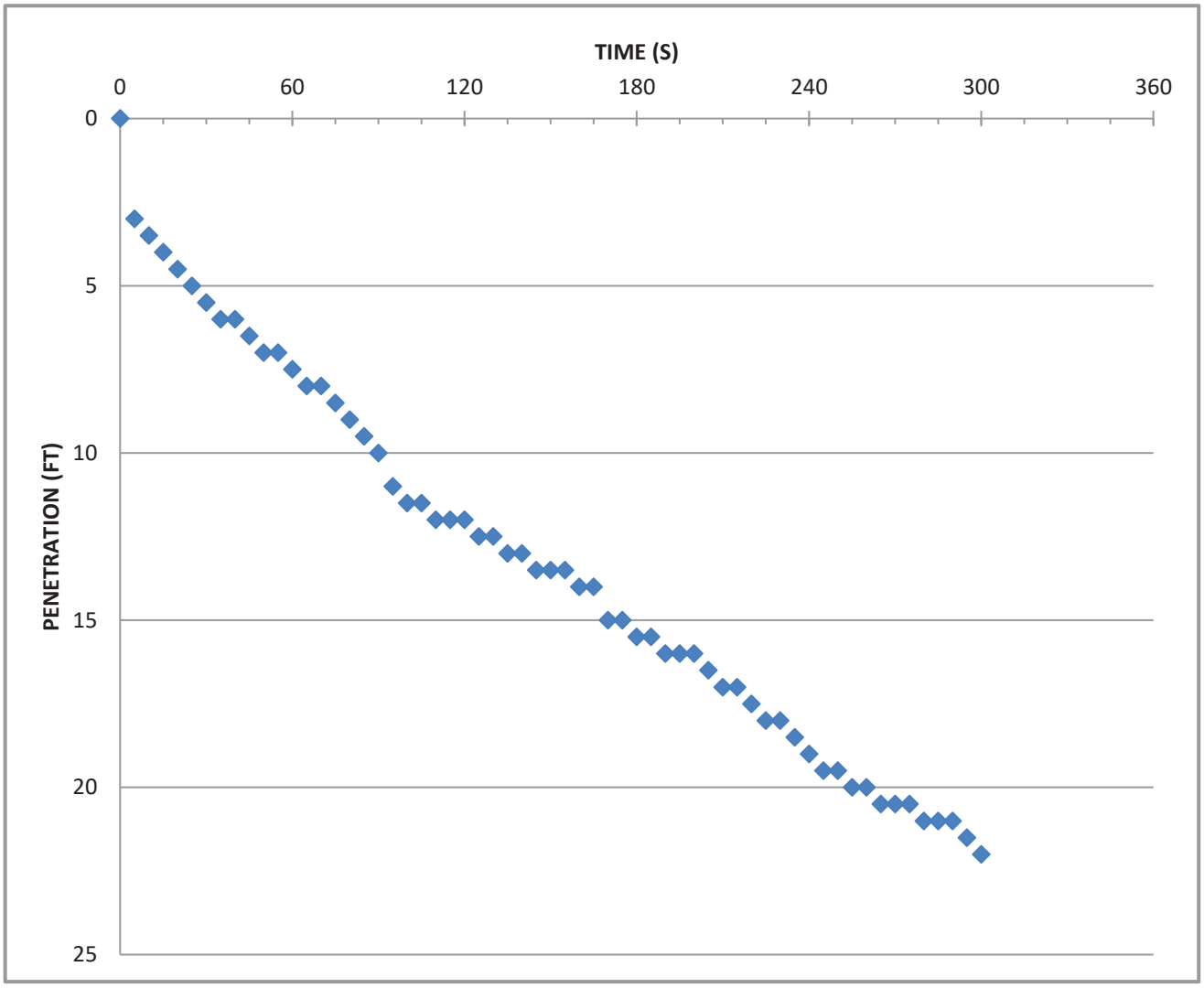
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

25 Jul 16

CORE ID:	C-45	NORTHING:	2249205
PENETRATION:	22.0	EASTING:	525090
RECOVERY:	21.8	WATER DEPTH:	19.6
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-21.02
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-43.02



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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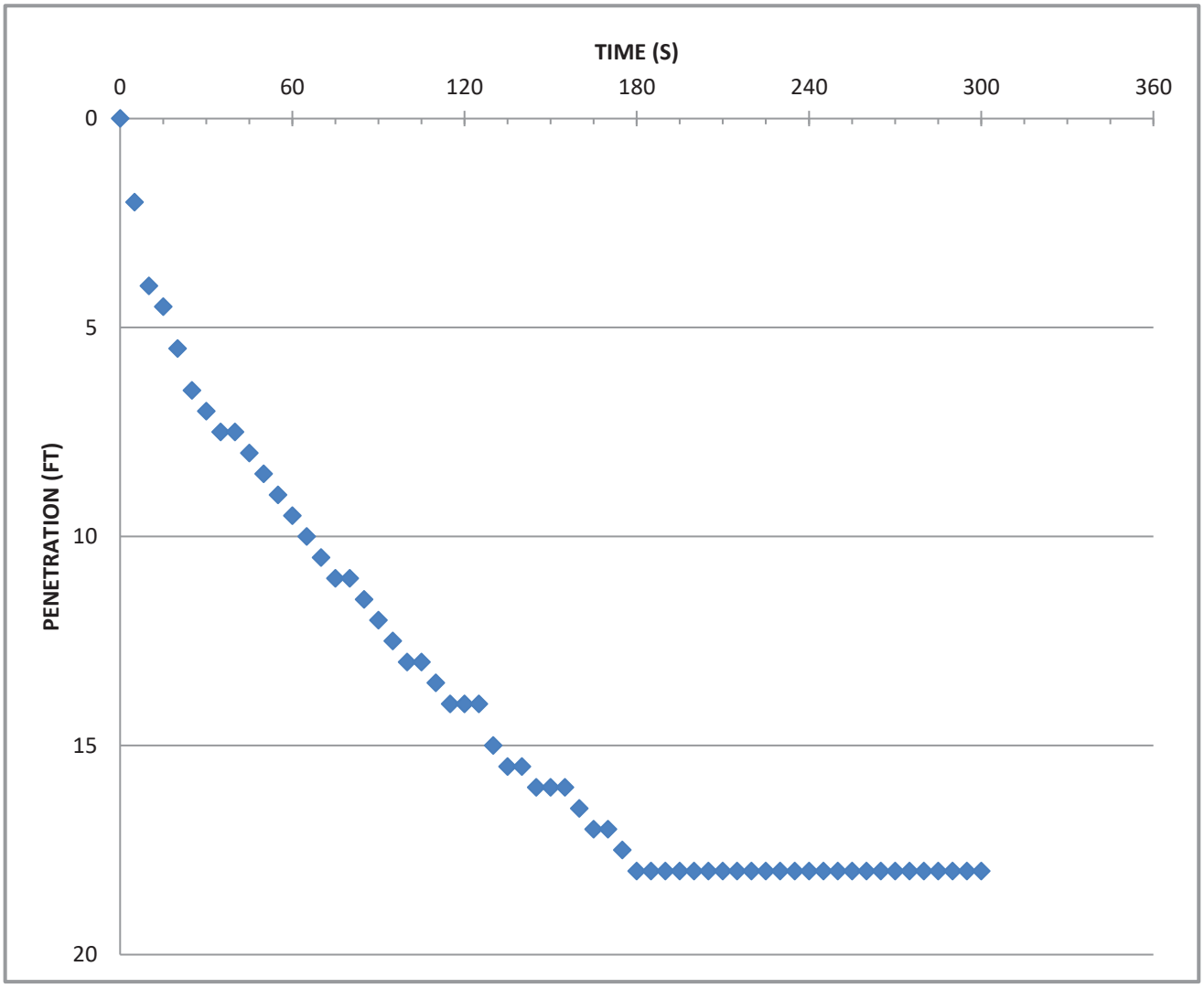
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-46	NORTHING:	2246630.23
PENETRATION:	18.0	EASTING:	525816.39
RECOVERY:	15.6	WATER DEPTH:	12.2
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-11.48
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-29.48



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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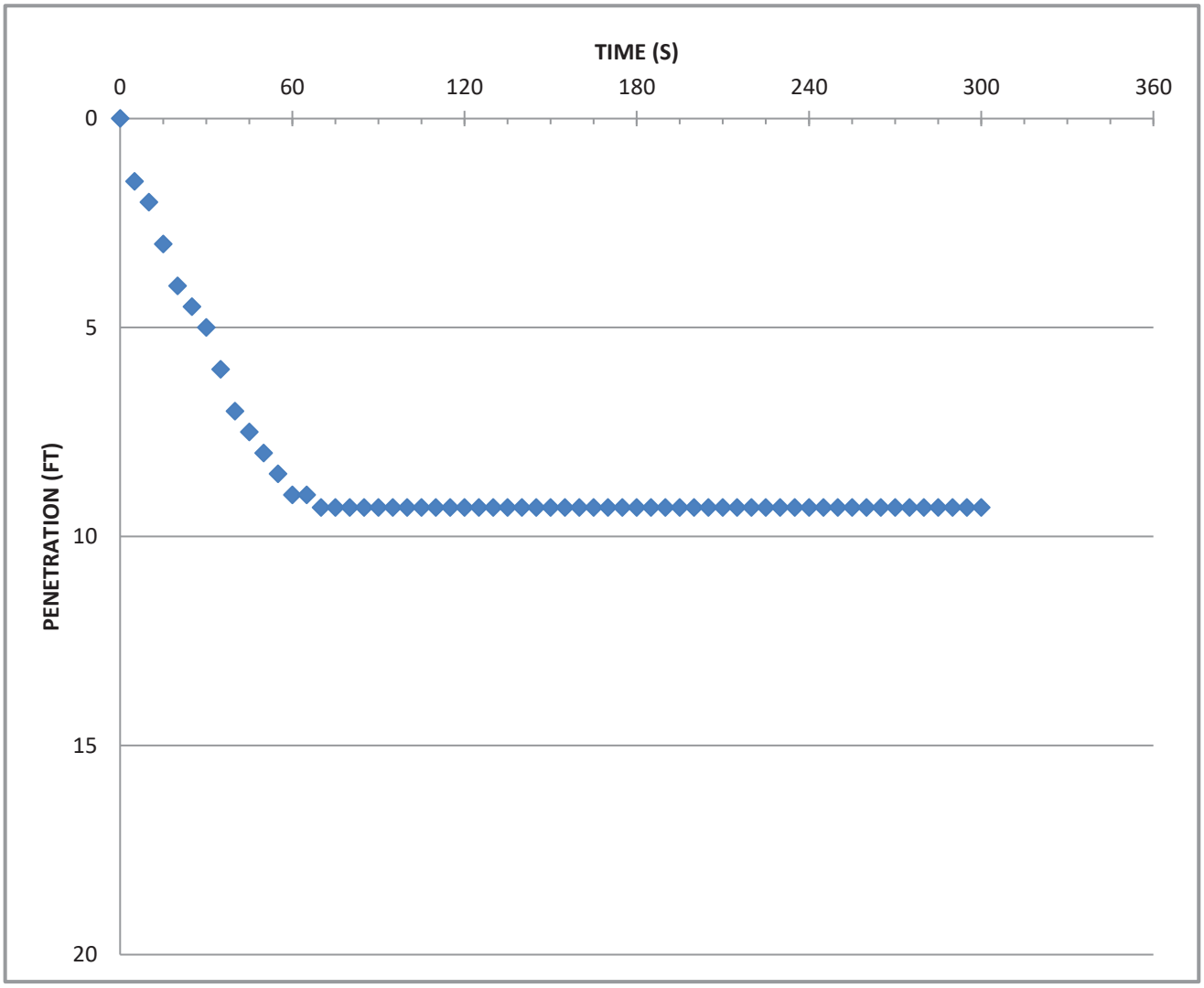
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

12 Jul 16

CORE ID:	C-47	NORTHING:	2247459.12
PENETRATION:	9.3	EASTING:	525880.2
RECOVERY:	8.7	WATER DEPTH:	11.3
HORIZONTAL DATUM:	NAD83	TOP OF CORE ELEVATION:	-11.06
VERTICAL DATUM:	NAVD88	TERMINATION ELEVATION:	-20.36



TOTAL RUN TIME: 180s

NOTES:

All measurements in feet.

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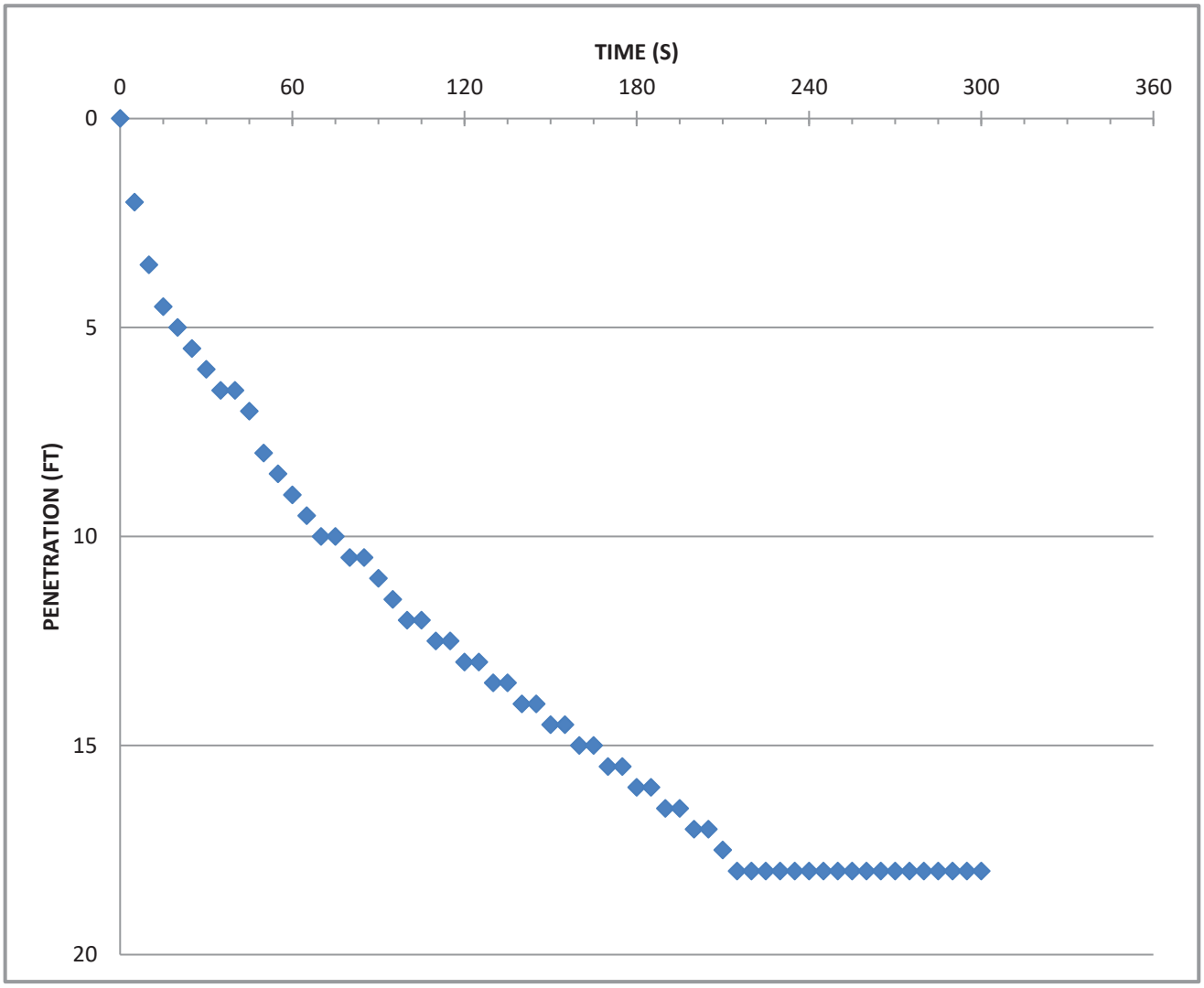
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

17 Mar 17

CORE ID:	C-48	**NORTHING:**	2249069.36
PENETRATION:	18.0	**EASTING:**	523700.5
RECOVERY:	14.3	**WATER DEPTH:**	13.5
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-15.16
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-33.16



TOTAL RUN TIME: 300s

NOTES:

All measurements in feet.

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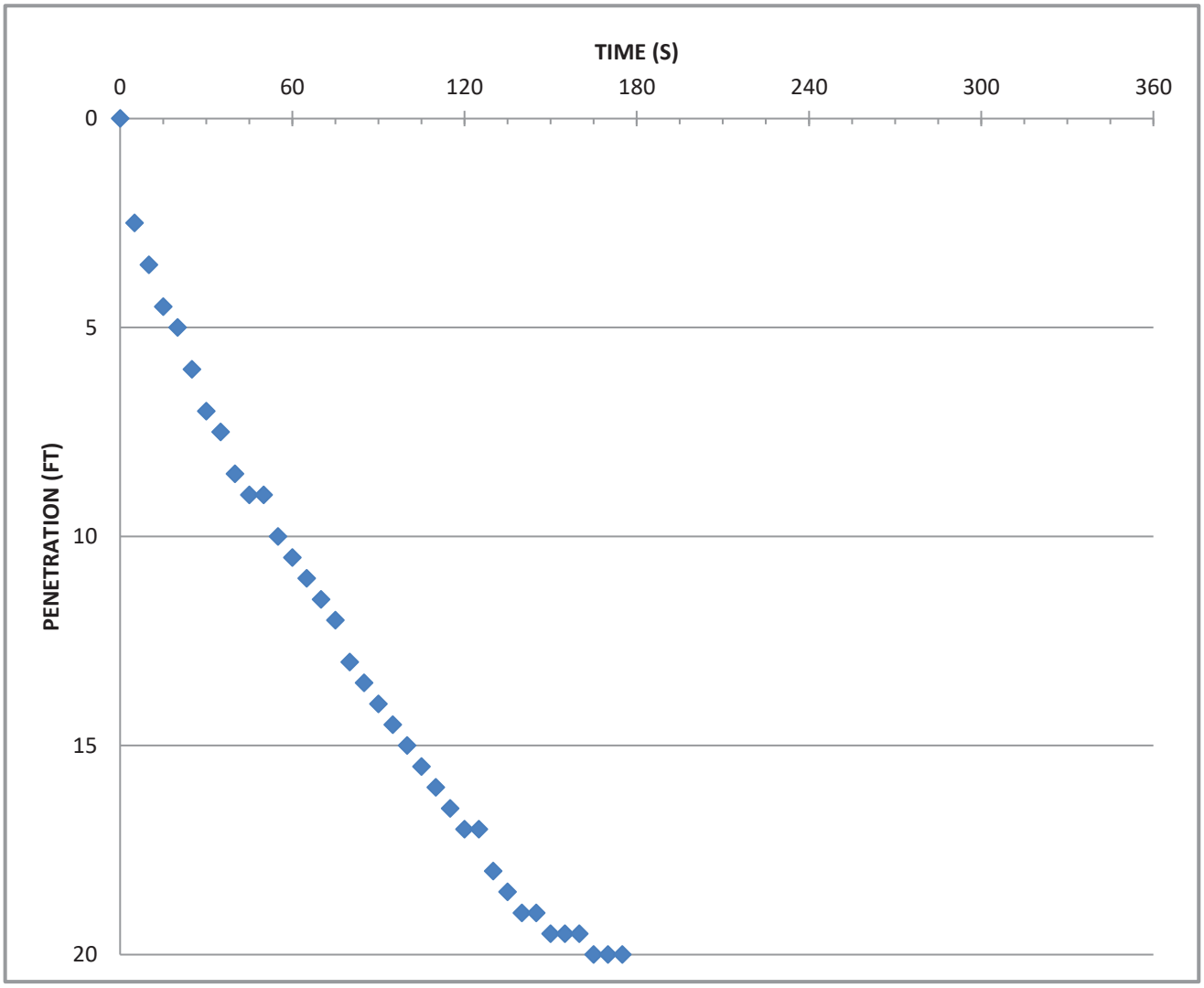
VIBRACORE PENETRATION REPORT

Nassau Sound (Amelia Island), FL

18 Mar 17

CORE ID:	C-49	**NORTHING:**	2246690.03
PENETRATION:	20.0	**EASTING:**	527152.48
RECOVERY:	17.0	**WATER DEPTH:**	10.1
HORIZONTAL DATUM:	NAD83	**TOP OF CORE ELEVATION:**	-10.16
VERTICAL DATUM:	NAVD88	**TERMINATION ELEVATION:**	-30.16



TOTAL RUN TIME: 175s

NOTES:

All measurements in feet.

Athena Technologies, Inc.
P.O. Box 68
McClellanville, SC 29458
843-887-3800
www.athenatechnologies.com

Appendix C:
Terracon Carbonate Content Summary

ATHENA TECHNOLOGIES, INC.

1293 Graham Farm Road, PO Box 68
McClellanville, South Carolina 29458
(843) 887-3800
www.athenatechnologies.com

Terracon
Consulting Engineers & Scientists

Carbonate Content Data

Project Name: Nassau Sound
Project Number: EQ175023
Date: 4/19/2017

Station No.	Sample No.	Depth Range, Feet	Tare No.	Beaker No.	Dry Sample Wt.		Percent Carbonate
					Before	After	
C-02-Comp		0-17.8	254	16	159.40	138.05	13.4
C-03-Comp		0-16.3	251	17	152.55	125.37	17.8
C-07-Comp		0-14.5	210	8	146.88	130.73	11.0
C-08-Comp		0-14.5	53	3	135.90	104.88	22.8
C-09-Comp		0-15	42	5	164.05	152.35	7.1
C-10-Comp		0-14.5	66	12	139.73	123.50	11.6
C-12-Comp		0-18	122	40	168.02	147.71	12.1
C-13-Comp		0-20.2	344	19	158.10	147.60	6.6
C-14-Comp		0-17.3	345	40	153.67	116.95	23.9
C-15-Comp		0-15	34	5	154.06	138.33	10.2
C-17-Comp		0-16.5	98	8	141.12	114.86	18.6
C-19-Comp		0-19	108	5	143.45	138.05	3.8
C-20-Comp		0-12.5	226	17	149.55	144.31	3.5
C-27-Comp		0-13.5	45	1	120.80	117.65	2.6
C-29-Comp		0-14.5	237	8	164.76	133.05	19.2
C-30-Comp		0-15.1	173	40	173.42	134.30	22.6
C-31-Comp		0-17.5	220	12	153.49	133.69	12.9
C-36-Comp		0-19	312	13	154.58	140.11	9.4
C-37-Comp		0-16.2	33	16	161.84	150.21	7.2
C-38-Comp		0-17.2	306	15	166.41	149.08	10.4
C-39-Comp		0-17.8	285	3	130.61	102.74	21.3
C-43-Comp		0-16.1	31	1	160.35	133.12	17.0
C-44-Comp		0-16.1	69	15	143.63	135.05	6.0
C-45-Comp		0-13	125	13	166.31	159.79	3.9

Tested By: CRM Sr.

Reviewed By: TES

Terracon
Consulting Engineers & Scientists

Carbonate Content Data

Project Name: Nassau Sound
Project Number: EQ175023
Date: 5/18/2017

Station No.	Sample No.	Depth Range, Feet	Tare No.	Beaker No.	Dry Sample Wt.		Percent Carbonate
					Before	After	
C-01	Comp	0-9.5	227	5	120.28	61.22	49.1
C-04	Comp	0-13	72	1	136.23	96.41	29.2
C-05	Comp	0-19.5	300	12	132.58	126.26	4.8
C-06	Comp	0-8.5	19	40	138.33	93.19	32.6
C-11	Comp	0-14.5	13	13	118.86	107.67	9.4
C-16	Comp	0-15	74	16	133.53	117.41	12.1
C-18	Comp	0-11	322	17	130.87	120.11	8.2
C-21	Comp	0-14.5	223	8	140.05	135.66	3.1
C-22	Comp	0-10	16	11	154.09	117.47	23.8
C-23	Comp	0-12	144	19	148.12	116.52	21.3
C-24	Comp	0-10	259	17	135.17	102.43	24.2
C-25	Comp	0-9	37	8	133.66	103.39	22.6
C-26	Comp	0-9	93	16	149.72	112.31	25.0
C-28	Comp	0-8.5	120	12	129.25	107.96	16.5
C-32	Comp	0-10.5	97	13	123.65	95.66	22.6
C-33	Comp	0-12.5	102	1	106.22	103.61	2.5
C-34	Comp	0-12	261	19	137.82	133.48	3.1
C-35	Comp	0-12	318	11	143.95	110.37	23.3
C-40	Comp	0-15	131	40	124.19	103.06	17.0
C-41	Comp	0-12.5	75	40	137.39	96.12	30.0
C-42	Comp	0-10.5	21	11	148.26	132.16	10.9
C-46	Comp	0-12	101	13	136.35	114.63	15.9
C-47	Comp	0-8.5	30	19	134.27	116.69	13.1
C-48	Comp	0-14	317	16	143.79	109.14	24.1
C-49	Comp	0-13.5	341	8	154.31	147.98	4.1

Tested By: CRM Sr.

Reviewed By: TES

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, JACKSONVILLE DISTRICT
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207

May 21, 2021

Regulatory Division
North Permits Branch
Jacksonville Permits Section
SAJ-2001-03870(SP-PRJ)

Mr. Andrew L. Wallace
South Amelia Island Shore
Stabilization Association, Inc. (SAISSA)
Amelia Island Management, Inc.
5440 First Coast Highway
Amelia Island, Florida 32034

And

Mr. Taco Pope
Nassau County, FL, Board of County Commissioners
Acting as Head of the South Amelia Island Shore
Stabilization Municipal Services Benefit Unit
96135 Nassau Place, Suite 1
Yulee, Florida 32097

And

Mr. Michael Foster
Division of Recreation and Parks
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, MS 500
Tallahassee, Florida 32399-3000

Dear Messrs. Wallace, Pope, and Foster:

The U.S. Army Corps of Engineers (Corps) is pleased to enclose the Department of the Army permit, which should be available at the construction site. Work may begin immediately but the Corps must be notified of:

a. The date of commencement of the work,

b. The dates of work suspensions and resumptions of work, if suspended over a week, and

c. The date of final completion.

This information should be mailed to the Enforcement Section of the Regulatory Division of the Jacksonville District at saj-rd-enforcement@usace.army.mil. The Enforcement Section is also responsible for inspections to determine whether Permittees have strictly adhered to permit conditions.

IT IS NOT LAWFUL TO DEVIATE FROM THE APPROVED PLANS ENCLOSED.

Sincerely,

BLAISDELL.MURIEL.M.1391064691

Digitally signed by BLAISDELL.MURIEL.M.1391064691
Date: 2021.05.21 22:02:40 -04'00'

for: Shawn H. Zinszer
Chief, Regulatory Division

Enclosures

cc:
Mr. Albert Browder, Olsen Associates, Inc., 2618 Herschel Street, Jacksonville, Florida 32259

CESAJ-RD-PE

DEPARTMENT OF THE ARMY PERMIT

Permittee: Mr. Andrew L. Wallace
South Amelia Island Shore Stabilization Association, Inc. (SAISSA)
Amelia Island Management, Inc.
5440 First Coast Highway
Amelia Island, Florida 32034

Mr. Taco Pope
Nassau County, Florida, Board of County Commissioners
Acting as Head of the South Amelia Island Shore Stabilization
Municipal Services Benefit Unit
96135 Nassau Place, Suite 1
Yulee, Florida 32097

Mr. Michael Foster
Division of Recreation and Parks
Florida Department of Environmental Protection (FDEP)
3900 Commonwealth Boulevard, MS 500
Tallahassee, Florida 32399-3000

Permit No: SAJ-2001-03870(SP-PRJ)

Issuing Office: U.S. Army Engineer District, Jacksonville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U.S. Army Corps of Engineers (Corps) having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The Permittee is granted a 15-year authorization to perform a beach restoration and maintenance project along South Amelia Island. The project consists of the placement of 2.2 million cubic yards of sand along the southern 3.6 miles of shoreline of Amelia Island from Florida Department of Environmental Protection R-monument R-59 southward to R-79. The project includes dune features along the landward limits of the project area. The dunes will be maintained through sand placement, dune vegetation, and sand fencing as need. The borrow area for the beach restoration is located in the adjacent Nassau Sound. The applicant proposes to use a hydraulic cutterhead/pipeline for the dredge. The primary borrow area lies within the ebb shoal complex located offshore of the southern and southeastern areas of Amelia

Island. The primary borrow area is intended to mimic the natural tidal channel alignments through the inlet. This borrow area is approximately 194 acres in size. The primary borrow area is expected to shoal in over time and is expected to be available for re-dredging within the requested 15-year time frame. The applicant also proposes a supplemental borrow area located along the northeastern edges of the Nassau Sound ebb shoal. This dredge area would be used if additional sand is needed for the project or if maintenance is needed following a significant storm event. The supplemental borrow area is 139 acres in size. The initial proposed beach nourishment would include the placement of 2,200,000 cubic yards of material on the beach by pipeline and then graded with backhoes. The beach nourishment events would take place over a 15-year period as needed due to storm events and erosion. The maximum dredge amount that the applicant proposed is 5,530,000 cubic yards of material. The work described above is to be completed in accordance with the 15 pages of drawings and 8 attachments affixed at the end of this permit instrument.

Project Location: The project would affect waters of the United States associated with the Atlantic Ocean and Nassau Sound. The project site is located along the shoreline of South Amelia Island and extends 3.6 miles between Florida Department of Environmental Protection R-monuments R-59 and R-79, in Sections 1, 6, 18, 22, 38, and 39, Townships 1 and 2 South, Ranges 28 and 29 East, Amelia Island, Nassau County, Florida.

Directions to site: Traveling from downtown Jacksonville take Interstate 95 (I-95) traveling north to State Road 105 (SR-105)/Heckscher Drive and turn east onto SR-105/Heckscher Drive. SR-105/Heckscher Drive transitions to SR- A1A, continue to follow SR-A1A across Nassau Sound. The south end of the project site is located just northeast of the Nassau Sound bridge at the south end of Amelia Island State Park and the project extends 3.6 miles north.

Approximate Central Coordinates:

Northern End of the Project Site: Latitude 30.5688°
Longitude -81.4430°

Southern End of the Project Site: Latitude 30.5170°
Longitude -81.4350°

Permit Conditions

General Conditions:

1. The time limit for completing the work authorized ends on **May 21, 2036**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature and the mailing address of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. Reporting Address: The Permittee shall submit all reports, notifications, documentation and correspondence required by the general and special conditions of this permit to either (not both) of the following addresses:

a. For electronic mail (preferred): SAJ-RD-Enforcement@usace.army.mil (not to exceed 15 MB).

b. For standard mail: U.S. Army Corps of Engineers, Regulatory Division, Enforcement Section, P.O. Box 4970, Jacksonville, FL 32232-0019.
The Permittee shall reference this permit number, SAJ-2001-03870(SP-PRJ), on all submittals.

2. Commencement Notification: Within 10 days from the date of initiating the work authorized by this permit the Permittee shall complete and submit the enclosed "Commencement Notification" Form.

3. Points of Contact: The Permittee shall provide a list of all points of contact associated with the project within 10 days from initiation of work to the address identified in Reporting Address Special Condition. The list should include area of responsibility and contact information for each point of contact.

4. Statewide Programmatic Biological Opinion (SPBO): The Permittee provided information to the U. S. Fish and Wildlife Service (FWS) for review. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the SPBO dated March 13, 2015, and agreed to follow the measures included to minimize impacts to Loggerhead sea turtle, Green sea turtle, Leatherback sea turtle, Hawksbill sea turtle, Kemp's Ridley sea turtle, and Manatee. The FWS provided concurrence the maintenance dredging activities and sand placement activities are consistent with the SPBO provide the Permittee follows the term and conditions of the enclosed SPBO.

5. Programmatic Piping Plover Biological Opinion (P3BO): The Permittee provided information to the U. S. Fish and Wildlife Service (FWS) for review. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the P3BO dated May 22, 2013, and agreed to follow the measures included to minimize impacts to the Rufa Red Knot and Piping Plover. The FWS provided concurrence that the sand placement activities are consistent with the P3BO with the Permittee follows the term and conditions of the enclosed P3BO.

6. South Atlantic Regional Biological Opinion (SARBO) 2020: The Permittee is responsible for complying with the South Atlantic Regional Biological Opinion (SARBO) 2020:

Reporting requirements:

a. Commencement Notification: At least 45 days prior to the date of initiating the work authorized by this permit, the Permittee shall complete and submit the enclosed "Commencement Notification" form to SAJ-RD-Enforcement@usace.army.mil and RD.SARBO.GRBO@usace.army.mil. Upon receipt of the notification email, the Corps will provide a list of the Corps primary points of contact for reporting species take/incidents. If the permit authorizes multiple work events, the Permittee must submit the SARBO Pre-Construction Notification 45 days prior to each event. In addition to the Commencement Notification form, the Permittee will include the following in the email:

i. A statement indicating the Permittee has reviewed the completed Pre-Construction Notification form located in attachment 6 of this permit. The Permittee will also include any changes or updates to that form in the body of the email.

ii. If relocation trawling is proposed include when trawling will begin, expected project length, and notify the Corps when it is completed.

b. Take Reporting: All lethal and nonlethal take associated with a project covered under SARBO will be reported within 24 hours. Project details related to take will be reported by completing "SARBO Take Reporting" form attachment 7 and sent to the following emails: RD.SARBO.GRBO@usace.army.mil and SERODredge@noaa.gov.

c. North Atlantic right whale: All observations of North Atlantic right whales observed while completing the authorized work be reported within 24 hours of the observation. The process to report a North Atlantic right whale observation is outlined in the North Atlantic Right Whale Plan (SARBO Appendix F) and applies to all work covered under SARBO.

d. Other Reporting: Any reporting requirements outlined in the PDCs including surveys conducted under the Coral PDCs (SARBO Appendix C), surveys conducted under the Johnson's seagrass PDCs (SARBO Appendix D), and PSO responsibilities outlined in SARBO Appendix H shall be emailed to RD.SARBO.GRBO@usace.army.mil.

e. Relocation Trawling: At least 48 hours prior to the start of relocation trawling, notify the Corps by email at RD.SARBO.GRBO@usace.army.mil if the project will be using relocation trawling. The email should contain when trawling will begin, expected project length, and when it is complete.

f. Post-Construction Reporting: Within 30 days of completing the work authorized by this permit, the Permittee shall submit a completed "SARBO Post-Construction Notification" form attachment 6, to RD.SARBO.GRBO@usace.army.mil.
South Atlantic Regional Biological Opinion: The authorized work is approved under the current National Marine Fisheries Service (NMFS) South Atlantic Regional Biological Opinion (SARBO) and its references, which can be viewed on the following website in the folder titled Information:
https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast

Note – Please use an alternate browser in the event you have trouble opening the above website.

The Permittee is responsible for obtaining and complying with the SARBO. If the Permittee is unable to view the SARBO at this website, the Permittee shall contact the Corps to receive a copy of the SARBO. The Permittee shall implement all reasonable and prudent measures and terms and conditions identified in the SARBO. NMFS has issued the SARBO to the Corps for projects that limit the take of listed turtles, whales, sturgeon, sawfish, and any other species listed in the SARBO. Authorization under this permit is conditional upon compliance with all the mandatory terms and conditions associated with the SARBO, which terms and conditions are incorporated by reference in this permit. The mandatory terms and conditions include adherence to the Project Design Criteria (PDC) applicable to the authorized project. Failure to comply with the terms and conditions associated with the SARBO, where a take of the listed species occurs, would constitute noncompliance with this permit. Failure to comply with this permit will be the basis for suspension and revocation of this permit and may be the basis for other enforcement action. NMFS has directed that this SARBO issued to the Corps serve as the formal consultation for all projects in the area covered by the SARBO; however, where the terms and conditions of the SARBO differ from the special conditions of this permit, the special conditions of this permit will take precedence as the more stringent condition.

Incidental Take Statement: This permit does not authorize the Permittee to take an endangered species, in particular sea turtles, sturgeon, whales, or any other endangered species listed in the SARBO. The SARBO includes an Incidental Take Statement (ITS) issued to the Corps. The Permittee understands and agrees that, even where it is in full compliance with the terms and conditions of the SARBO ITS and this permit, incidental take by the Permittee or other hopper dredging operations within the area covered by the SARBO may result in suspension or modification of this permit by the Corps. The amount of incidental take that will trigger suspension, and the need for any such suspension, shall be determined at the discretion of the Corps. The Permittee

understands and agrees on behalf of itself, its agents, contractors, and other representatives, no claim, legal action in equity or for damages, adjustment, or other entitlement against the Corps shall arise as a result of such suspension or related action.

Project timing: The USACE and/or BOEM will determine project timing and necessary minimization measures to reduce the risk of take of ESA-listed species through the Risk Based Adaptive Management process outlined in the SARBO Section 2.9.2.2 and Appendix J. Additional timing requirements apply within the range of certain species, as outlined in the North Atlantic Right Whale Conservation Plan (Appendix F) and sturgeon PDCs (SARBO Appendix E). The Permittee is responsible for coordinating with the Corps using email address RD.SARBO.GRBO@usace.army.mil when initial project planning begins to ensure project timing and minimization measures are considered.

7. Eastern Indigo Snake Protection Measures and Inspection: Permittee shall comply with the enclosed U.S. Fish and Wildlife Service's "Standard Protection Measures for the Eastern Indigo Snake" dated August 12, 2013. All gopher tortoise burrows, active or inactive, shall be evacuated prior to site manipulation in the vicinity of the burrow. If excavating potentially occupied burrows, active or inactive, individuals must first obtain state authorization via a Florida Fish and Wildlife Conservation Commission (FWC) Authorized Gopher Tortoise Agent permit. The excavation method selected shall minimize the potential for injury of an indigo snake. The Permittee shall follow the excavation guidance provided in the most current FWC Gopher Tortoise Permitting Guidelines found at http://myfwc.com/gophertortoise. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Holes, cavities, and snake refugia other than gopher tortoise burrows shall be inspected each morning before planned site manipulation of a particular area, and if occupied by an indigo snake, no work shall commence until the snake has vacated the vicinity of the proposed work.

8. Fill Material: The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, debris, automotive parts, asphalt, construction materials, concrete block with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts in accordance with Section 307 of the Clean Water Act.

9. As-Built Certification: Within 60 days of completion of the work authorized by this permit, the Permittee shall submit as-built drawings of the authorized work and complete and submit the enclosed "As-Built Certification By Professional Engineer" form to the Corps. The as-built drawings shall be signed and sealed by a registered professional engineer and include the following:

a. A plan view drawing of the location of the authorized work footprint, as shown on the permit drawings, with transparent overlay of the work as constructed in the same scale as the permit drawings on 8½-inch by 11-inch sheets. The plan view drawing should show all "earth disturbance," including wetland impacts and water management structures.

b. A list of any deviations between the work authorized by this permit and the work as constructed. In the event that the completed work deviates, in any manner, from the authorized work, describe on the attached “As-Built Certification By Professional Engineer” form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or “As-Built Certification By Professional Engineer” form does not constitute approval of any deviations by the Corps.

c. Include the Department of the Army permit number on all sheets submitted.

10. Notice of Permit: The Permittee shall complete and record the enclosed “Notice of Department of the Army Authorization” form with the Clerk of the Circuit Court, Registrar of Deeds or other appropriate official charged with the responsibility of maintaining records of title to or interest in real property within the county of the authorized activity. Within 90 days from the effective date of this permit, the Permittee shall provide a copy of the recorded Notice of Permit to the Corps clearly showing a stamp from the appropriate official indicating the book and page at which the Notice of Permit is recorded and the date of recording.

11. Historic Resources: The Permittee shall maintain a 50 meter protective buffer around the cluster of anomalies identified in the Cultural Resource Assessment that was performed between February and March of 2019, there will be no ground disturbing activities in the 50 meter protective buffer area.

12. Cultural Resources/Historic Properties:

a. No structure or work shall adversely affect impact or disturb properties listed in the *National Register of Historic Places* (NRHP) or those eligible for inclusion in the NRHP.

b. If during the ground disturbing activities and construction work within the permit area, there are archaeological/cultural materials encountered which were not the subject of a previous cultural resources assessment survey (and which shall include, but not be limited to: pottery, modified shell, flora, fauna, human remains, ceramics,

stone tools or metal implements, dugout canoes, evidence of structures or any other physical remains that could be associated with Native American cultures or early colonial or American settlement), the Permittee shall immediately stop all work and ground-disturbing activities within a 100-meter diameter of the discovery and notify the Corps within the same business day (8 hours). The Corps shall then notify the Florida State Historic Preservation Officer (SHPO) and the appropriate Tribal Historic Preservation Officer(s) (THPO(s)) to assess the significance of the discovery and devise appropriate actions.

c. Additional cultural resources assessments may be required of the permit area in the case of unanticipated discoveries as referenced in accordance with the above Special Condition; and if deemed necessary by the SHPO, THPO(s), or Corps, in accordance with 36 CFR 800 or 33 CFR 325, Appendix C (5). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume on non-federal lands without written authorization from the SHPO for finds under his or her jurisdiction, and from the Corps.

d. In the unlikely event that unmarked human remains are identified on non-federal lands, they will be treated in accordance with Section 872.05 Florida Statutes. All work and ground disturbing activities within a 100-meter diameter of the unmarked human remains shall immediately cease and the Permittee shall immediately notify the medical examiner, Corps, and State Archeologist within the same business day (8-hours). The Corps shall then notify the appropriate SHPO and THPO(s). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume without written authorization from the State Archeologist and from the Corps.

13. Agency Changes/Approvals: Should any other agency require and/or approve changes to the work authorized or obligated by this permit, the Permittee is advised that a modification to this permit instrument is required prior to initiation of those changes. It is the Permittee's responsibility to request a modification of this permit from the Jacksonville Permits Section. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for the modification of this permit.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344)

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413)

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Wallace — May 5, 2021
(PERMITTEE) (DATE)

Andrew L. Wallace, President SAISSA
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(DISTRICT ENGINEER) (DATE)
Andrew D. Kelly, Jr.
Colonel, U.S. Army
District Commander

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) (DATE)

5/13/21

Tara E. Pope, AICP
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(DISTRICT ENGINEER) (DATE)
Andrew D. Kelly, Jr.
Colonel, U.S. Army
District Commander

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Michael W. Foster Jr. Digitally signed by Michael W. Foster Jr. Date: 2021.05.17 10:44:13 -04'00'

(PERMITTEE) (DATE) May 17, 2021

Michael W. Foster Jr., P.E.
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

BLAISDELL.MURIEL.M.1391064691 Digitally signed by BLAISDELL.MURIEL.M.1391064691 Date: 2021.05.21 21:56:54 -04'00'

for: (DISTRICT ENGINEER) (DATE) May 21, 2021
Andrew D. Kelly, Jr.
Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____ _____
(TRANSFEREE-SIGNATURE) (DATE)

_____
(NAME-PRINTED)

_____
(ADDRESS)

_____
(CITY, STATE, AND ZIP CODE)

Attachments to Department of the Army Permit Number SAJ-2001-03870

1. PERMIT DRAWINGS: 15 pages

2. WATER QUALITY CERTIFICATION: Specific Conditions of the water quality permit/certification in accordance with General Condition number 5 on page 2 of this DA permit. 31 pages.

3. EASTERN INDIGO SNAKE CONDITIONS: 6 pages

4. P3BO May 22, 2013: 64 pages

5. SPBO March 13, 2015: 242 pages

6. SARBO Pre and Post Construction Reporting: 2 pages

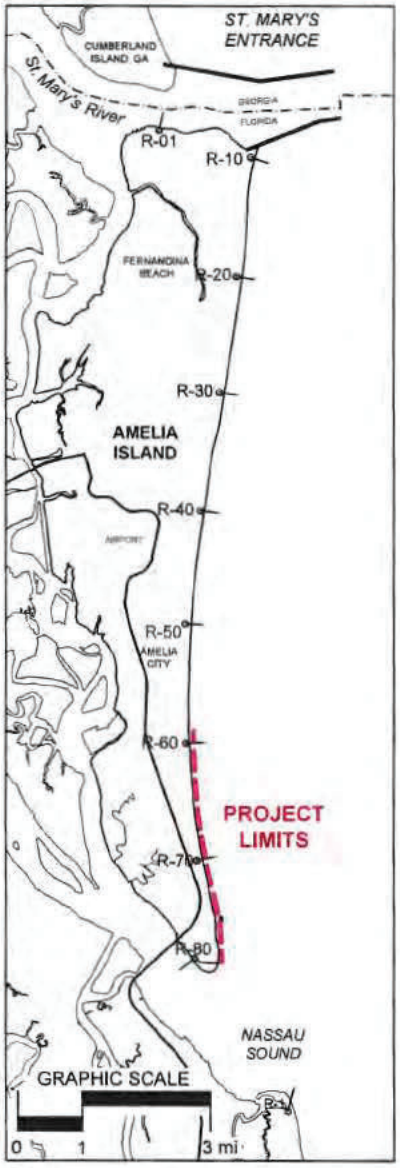
7. SARBO Take Reporting: 1 page

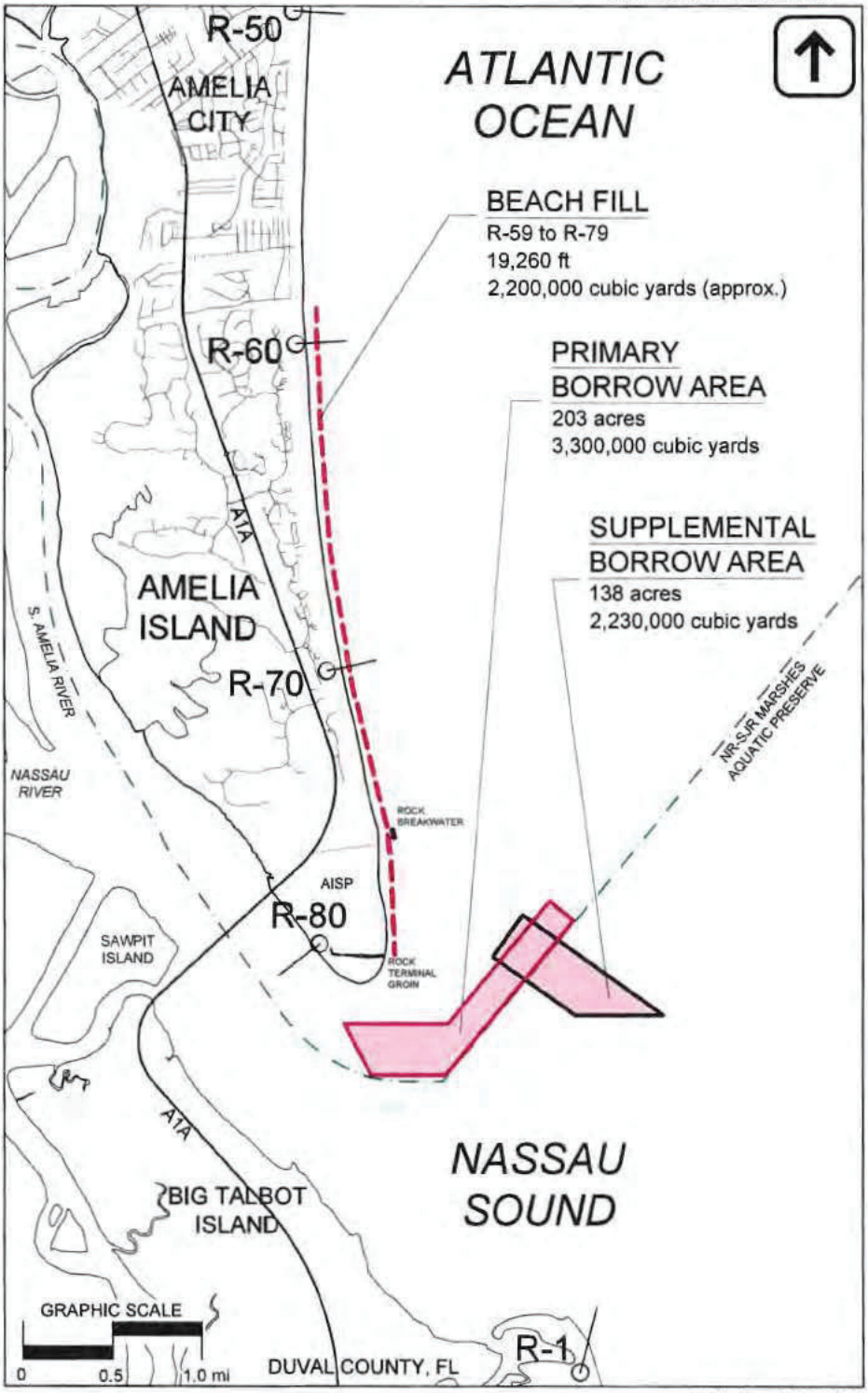
8. AS-BUILT CERTIFICATION FORM: 2 pages

9. RECORD PERMIT FORM: 2 pages

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION





NOTES:

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PROJECT SITE LOCATION

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 1 OF 15

NASSAU COUNTY, FL

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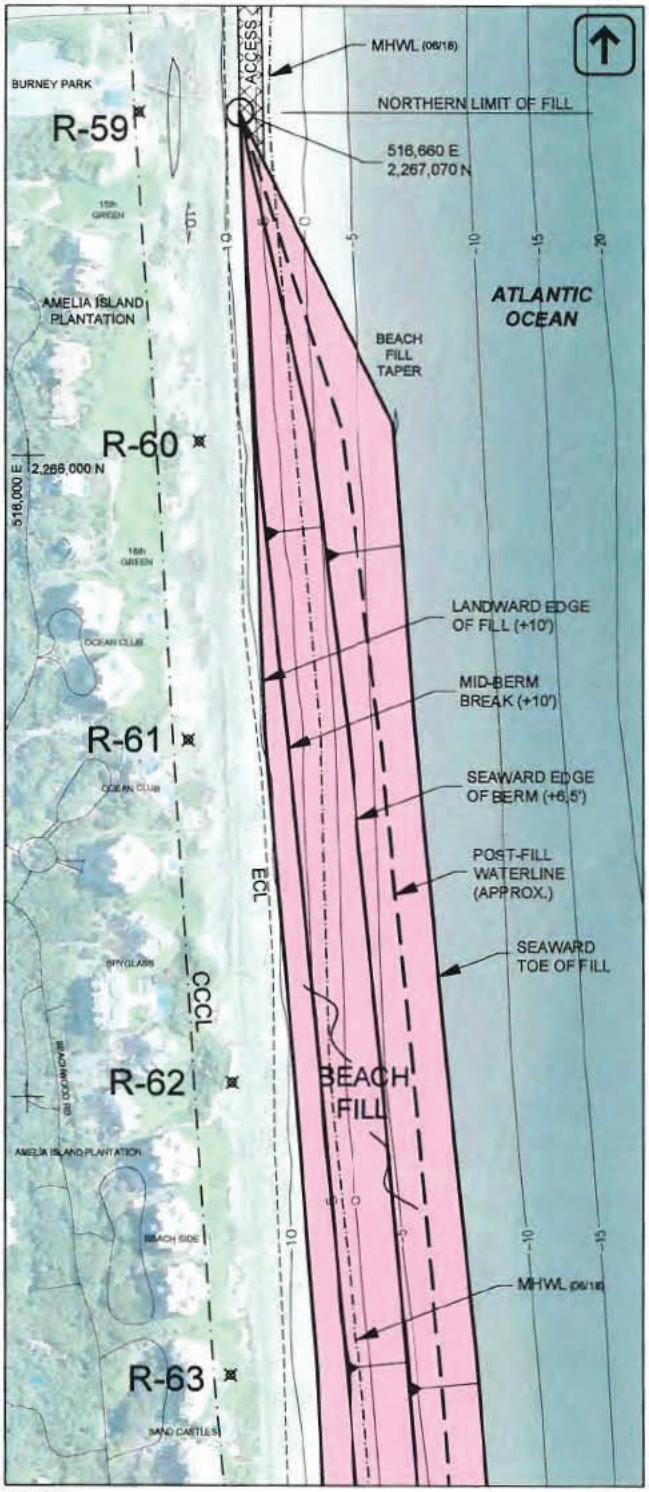

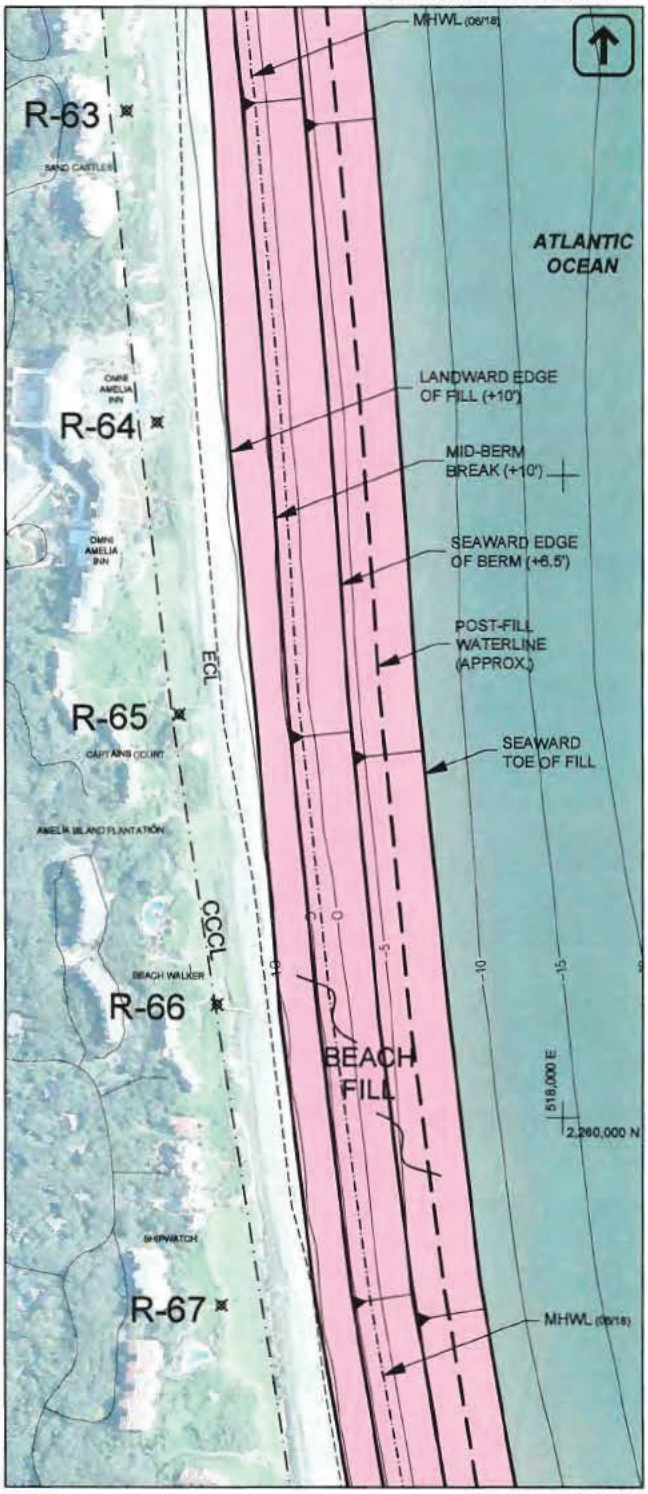

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
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(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

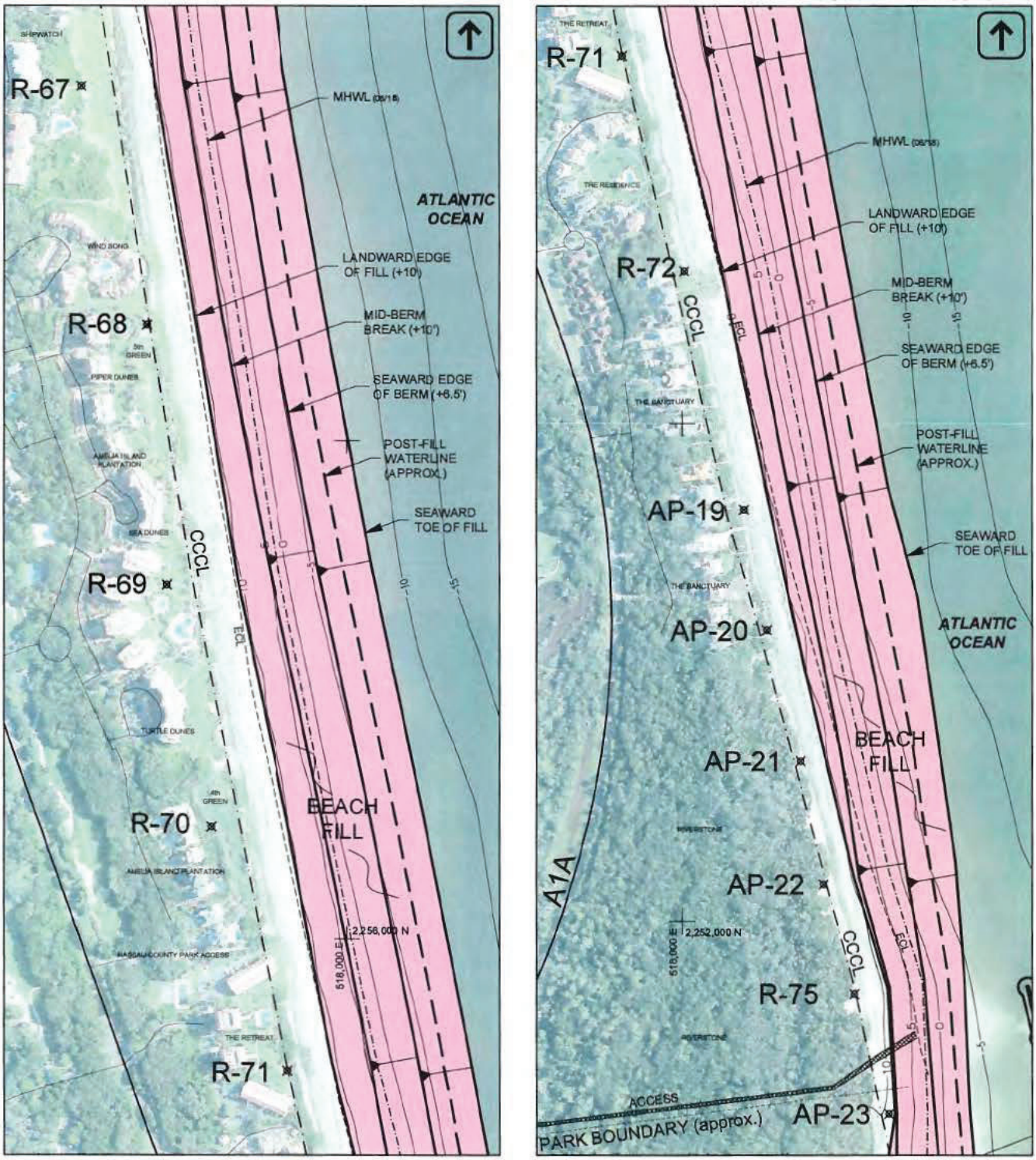
BEACH FILL PLANVIEW

Albert E. Browder, P.E. FL #57403
14 Dec 18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 2 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

Latitude: 30° 33.0' N
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Sect: 1, 6, 38, 39
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olsen associates, inc.
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL
PLANVIEW

ALBERT EDWARD BROWDER LICENSE No. 57403
STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec 18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 3 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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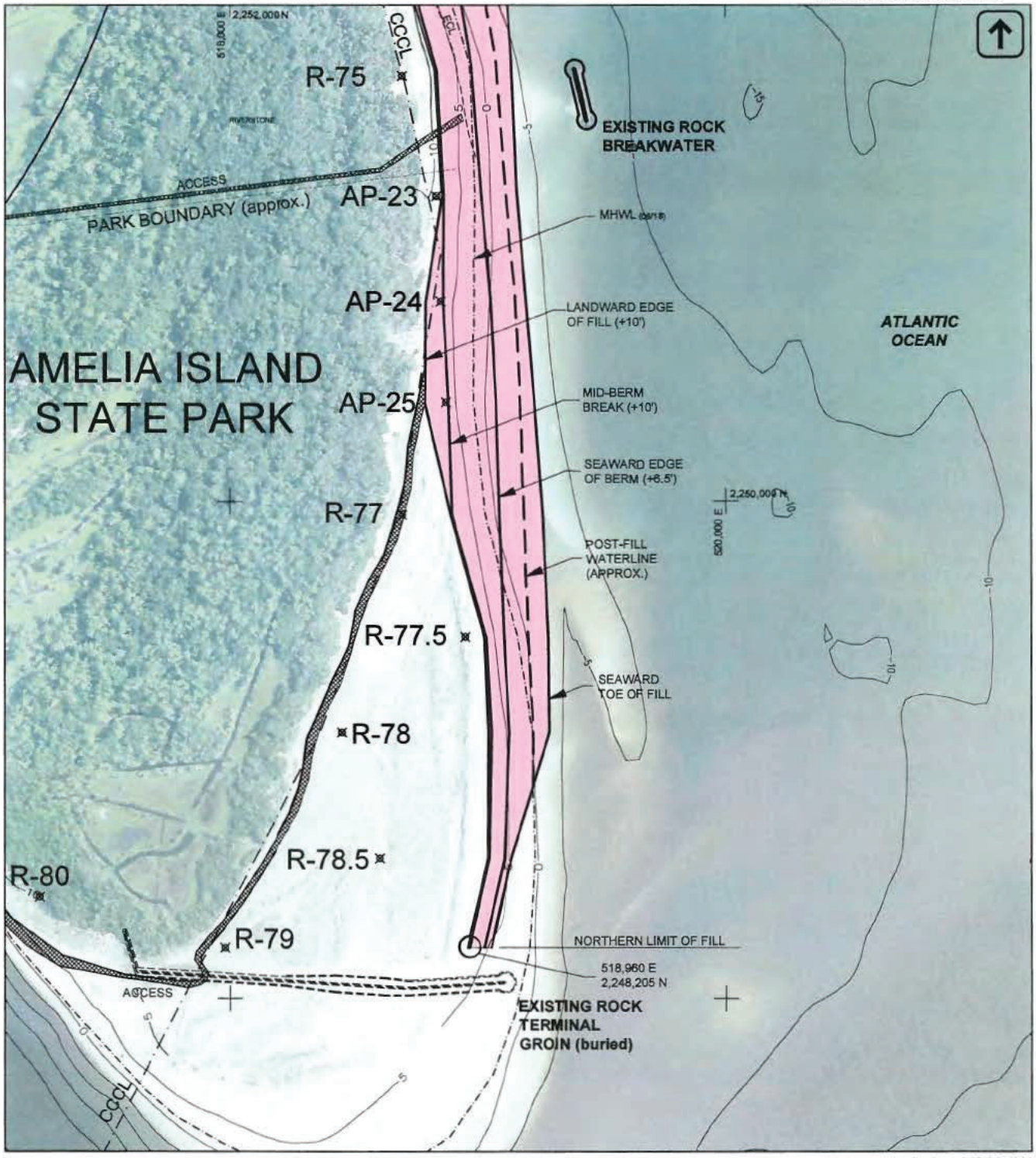

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018; AERIALS: JUNE 2018

GRAPHIC SCALE
0 300 600 FT

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ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec 18

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COA 00003491

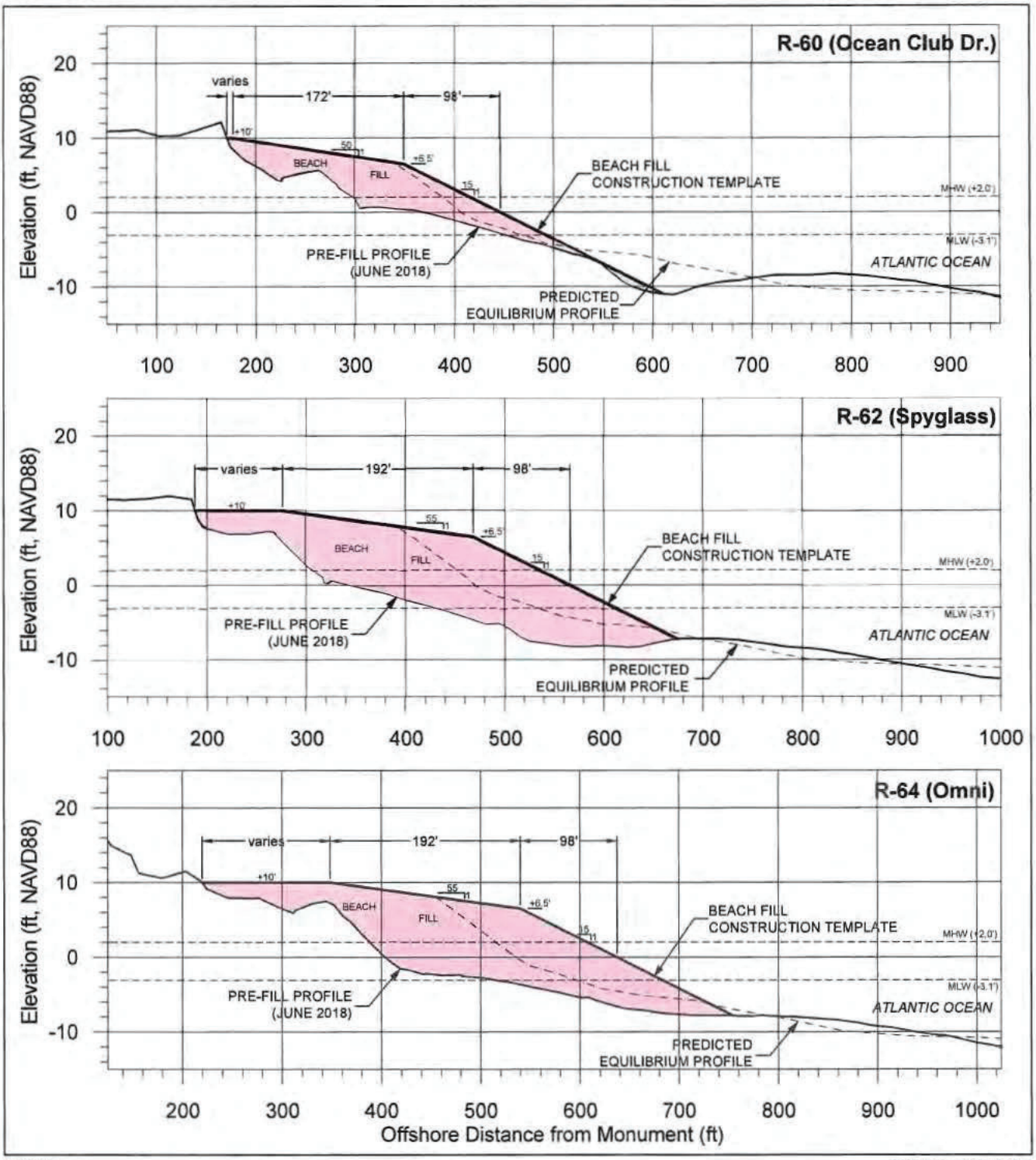
AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL PLANVIEW

DATE: 12/14/2018
DRAWN BY: ML
SHEET 4 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
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olsen associates, inc.
2618 Herschel St.
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(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

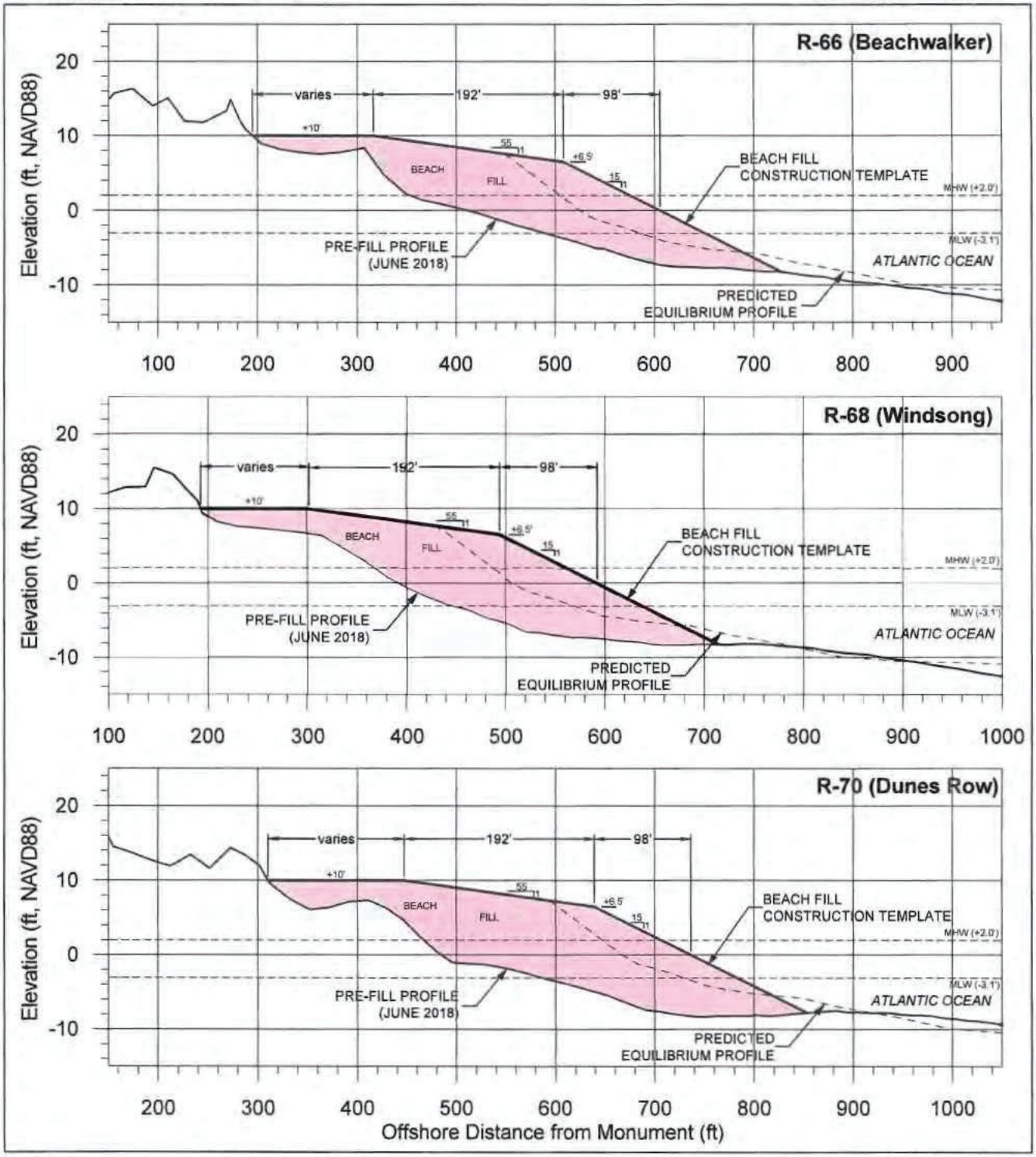
ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403
14 Dec 18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 5 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
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ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
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COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 6 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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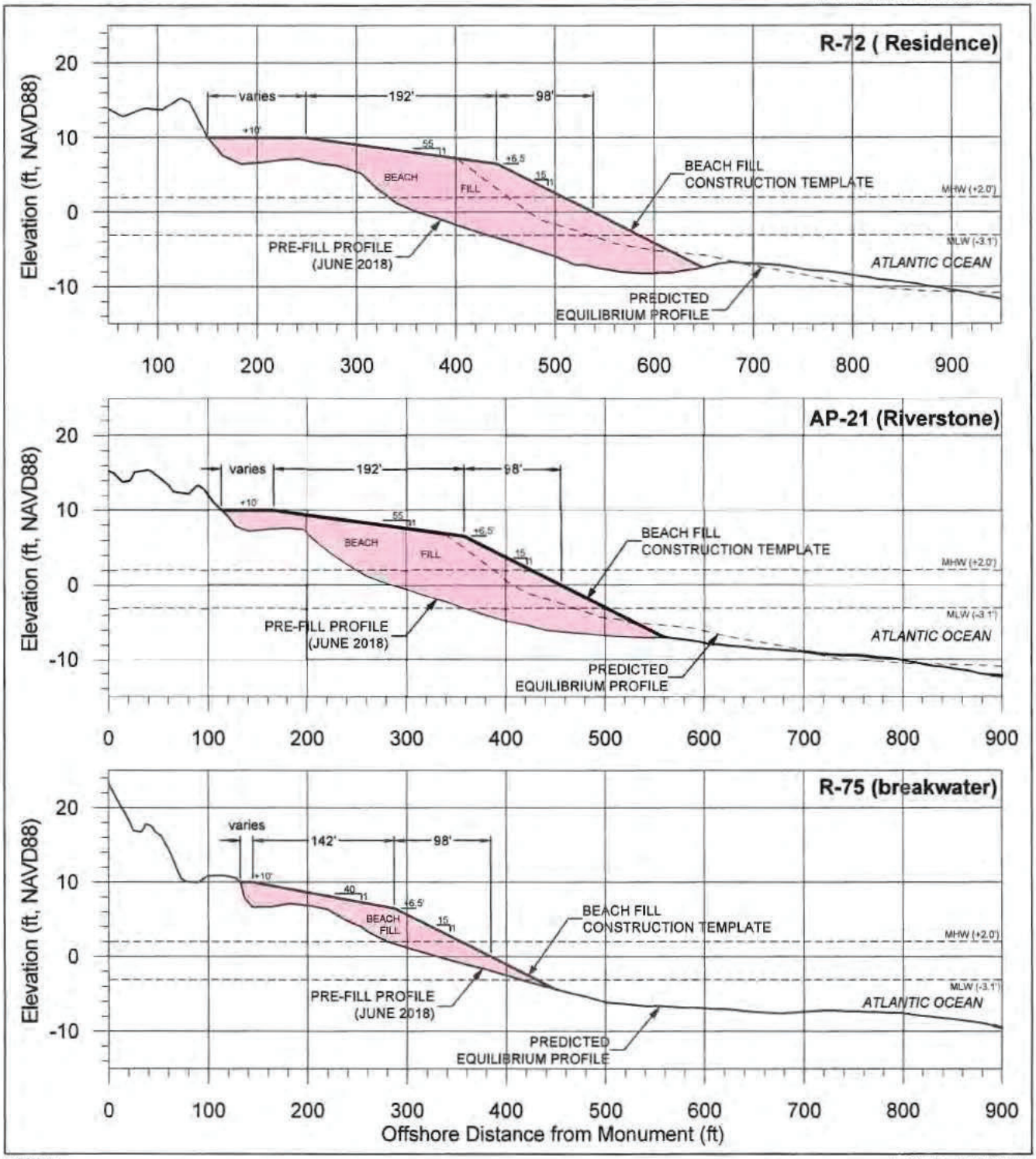

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER
Albert E. Browder, P.E. FL #57403
14 Dec '18

olsen associates, inc.
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(FAX) 384-7368
COA 00003491

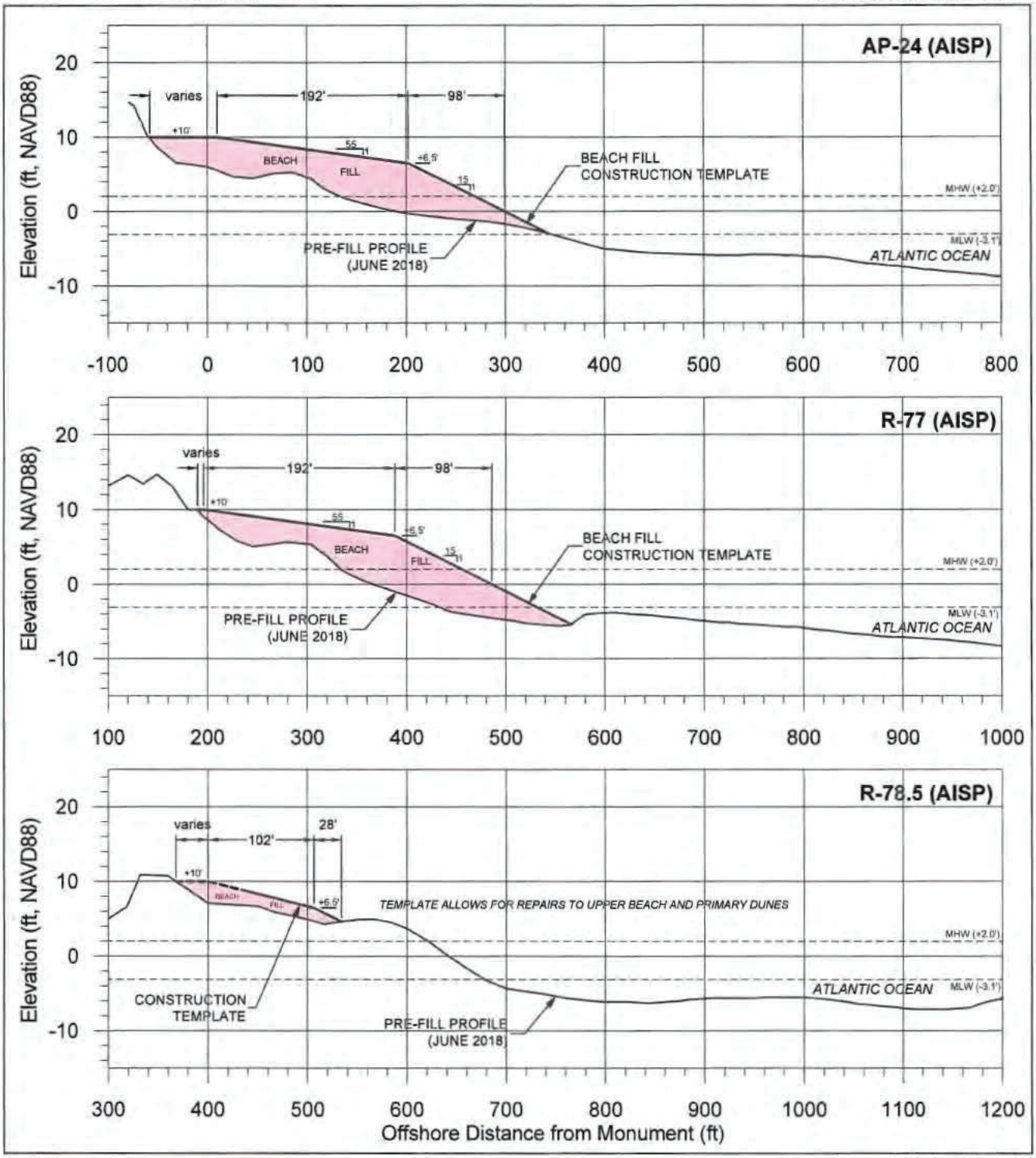
AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 7 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) Landward limit of fill to avoid significant existing dune vegetation

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL SECTIONS

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 8 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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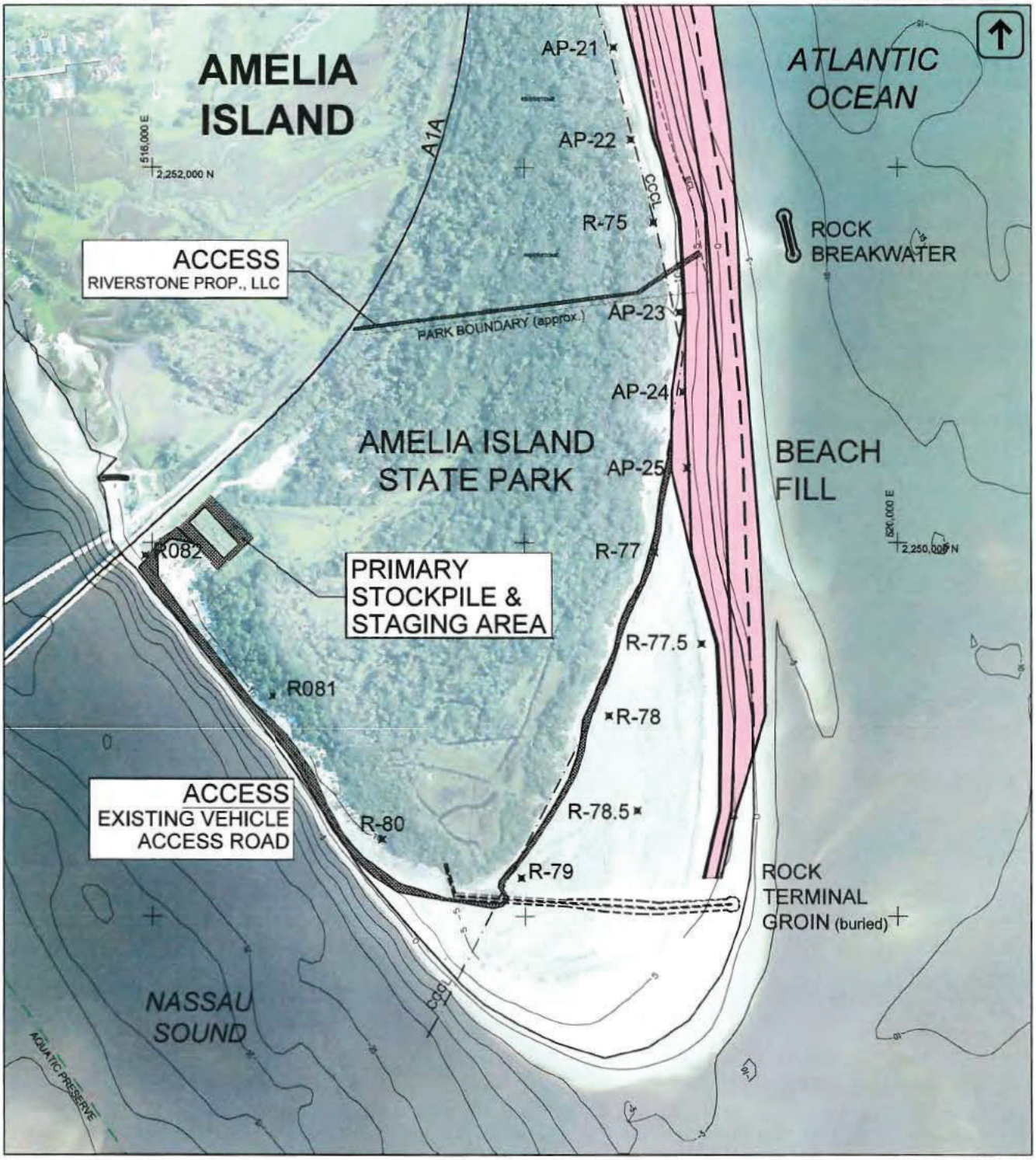


NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 400 800 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BEACH FILL
SOUTH ACCESS

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec '18

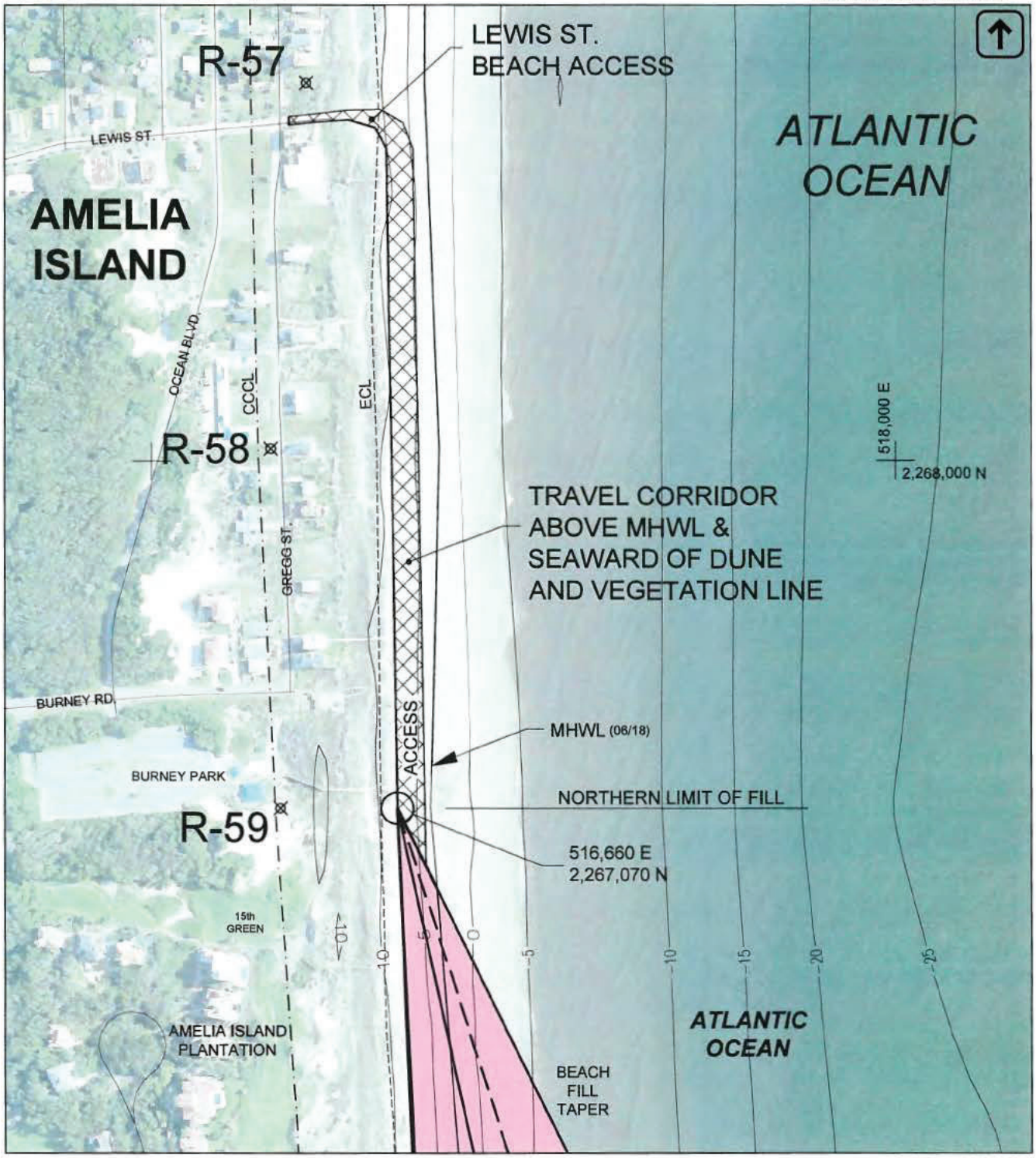
DATE: 12/14/2018

DRAWN BY: ML

SHEET 9 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 200 400 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

DATE	APPR	REVISION	DATE	APPR	REVISION

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

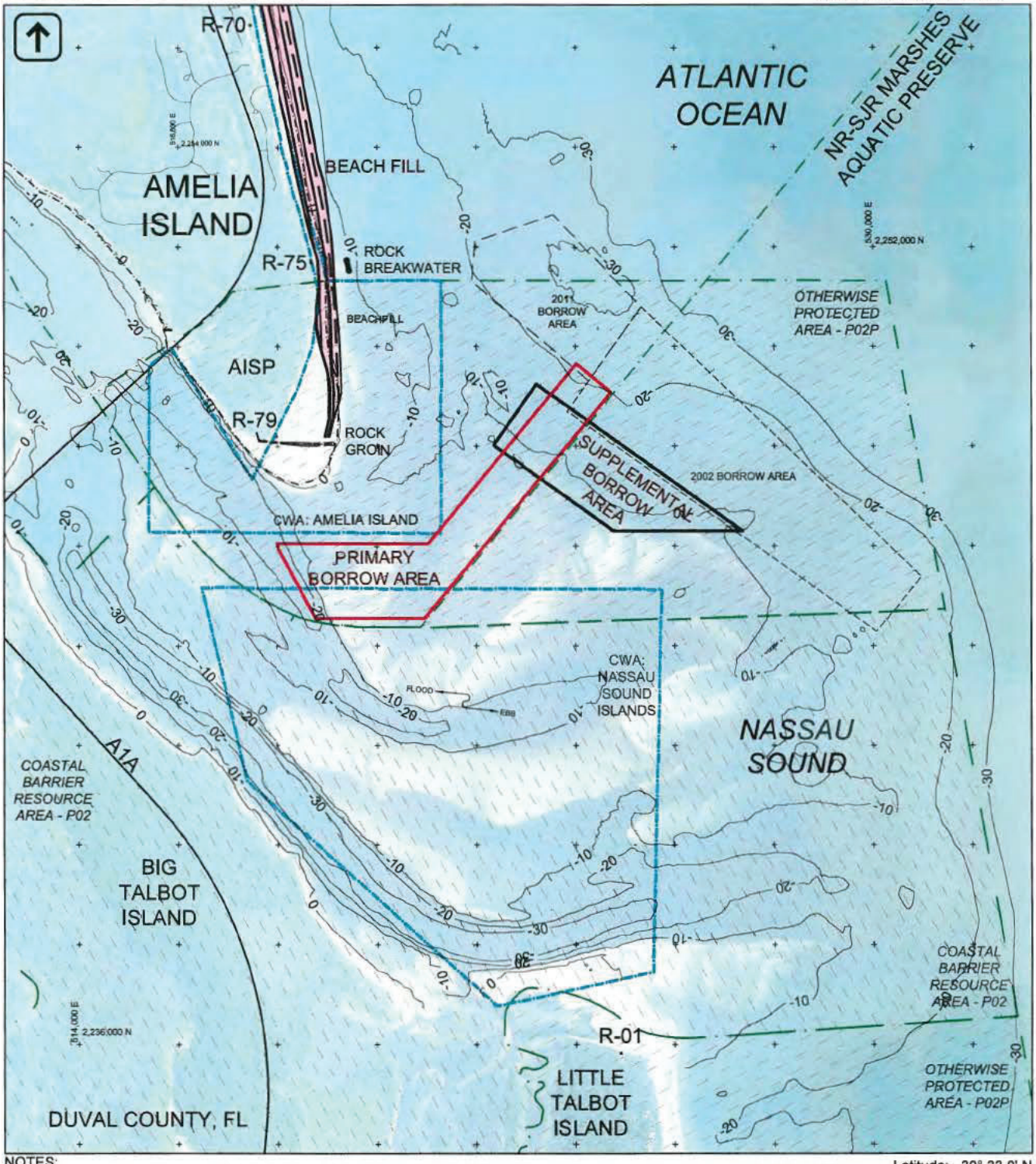
BEACH FILL
NORTH ACCESS

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 10 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018 AERIALS: JUNE 2018

GRAPHIC SCALE
0 1,000 3,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
Range: 28 E

DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403
Albert E. Browder, P.E. FL #57403
STATE OF FLORIDA PROFESSIONAL ENGINEER
14 Dec '18

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

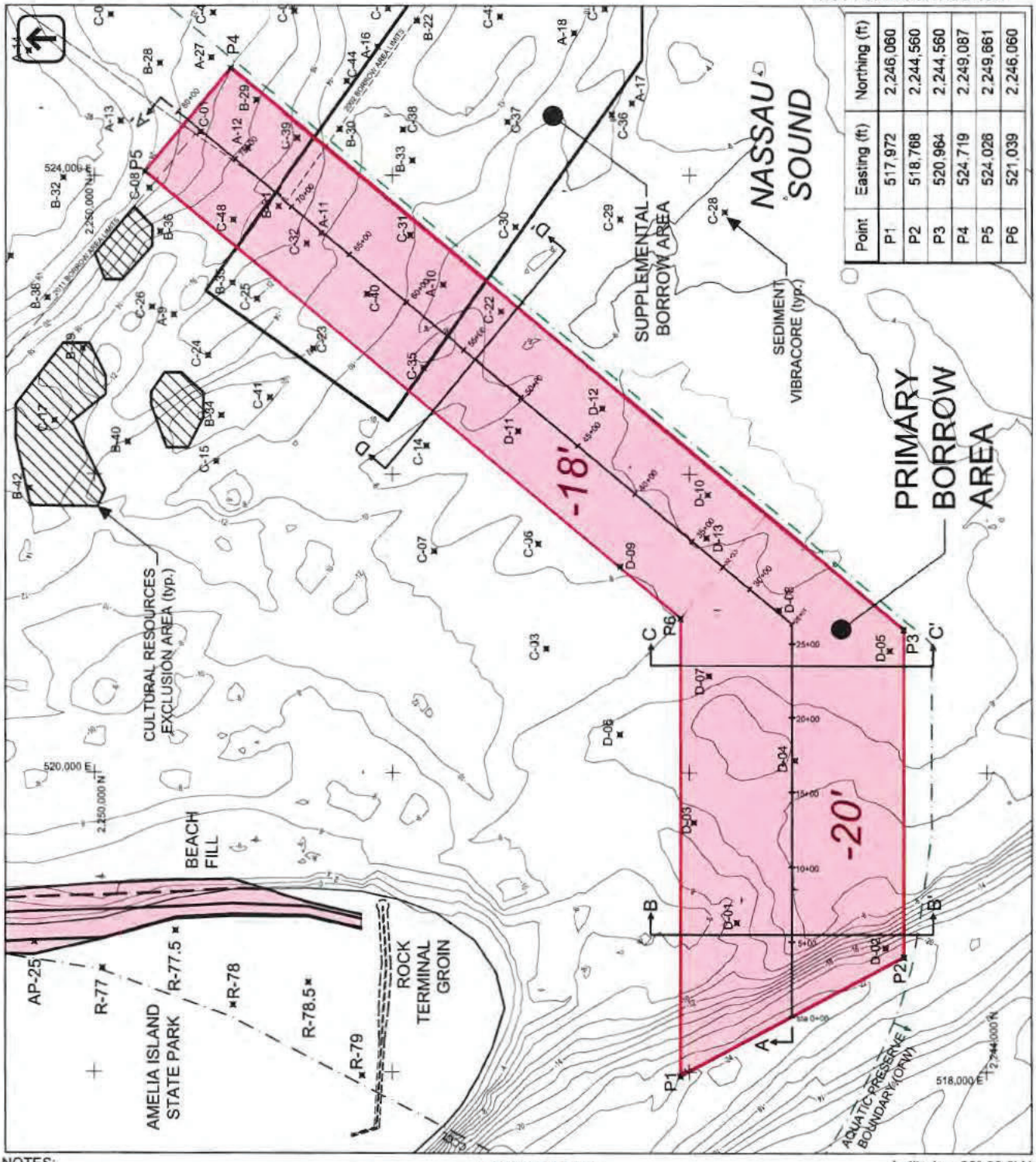
AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

BORROW AREAS GENERAL LOCATION

DATE: 12/14/2018
DRAWN BY: ML
SHEET 11 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
NOT FOR CONSTRUCTION



Point	Easting (ft)	Northing (ft)
P1	517,972	2,246,060
P2	518,768	2,244,560
P3	520,964	2,244,560
P4	524,719	2,249,087
P5	524,026	2,249,661
P6	521,039	2,246,060

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) VIBRACORE DATES VARY (2001, 2007, 2017, 2018)

GRAPHIC SCALE
0 500 1,000 FT

Latitude: 30° 33.0' N
Longitude: 81° 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
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DATE	APPR	REVISION	DATE	APPR	REVISION

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PRIMARY BORROW AREA PLANVIEW

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 12 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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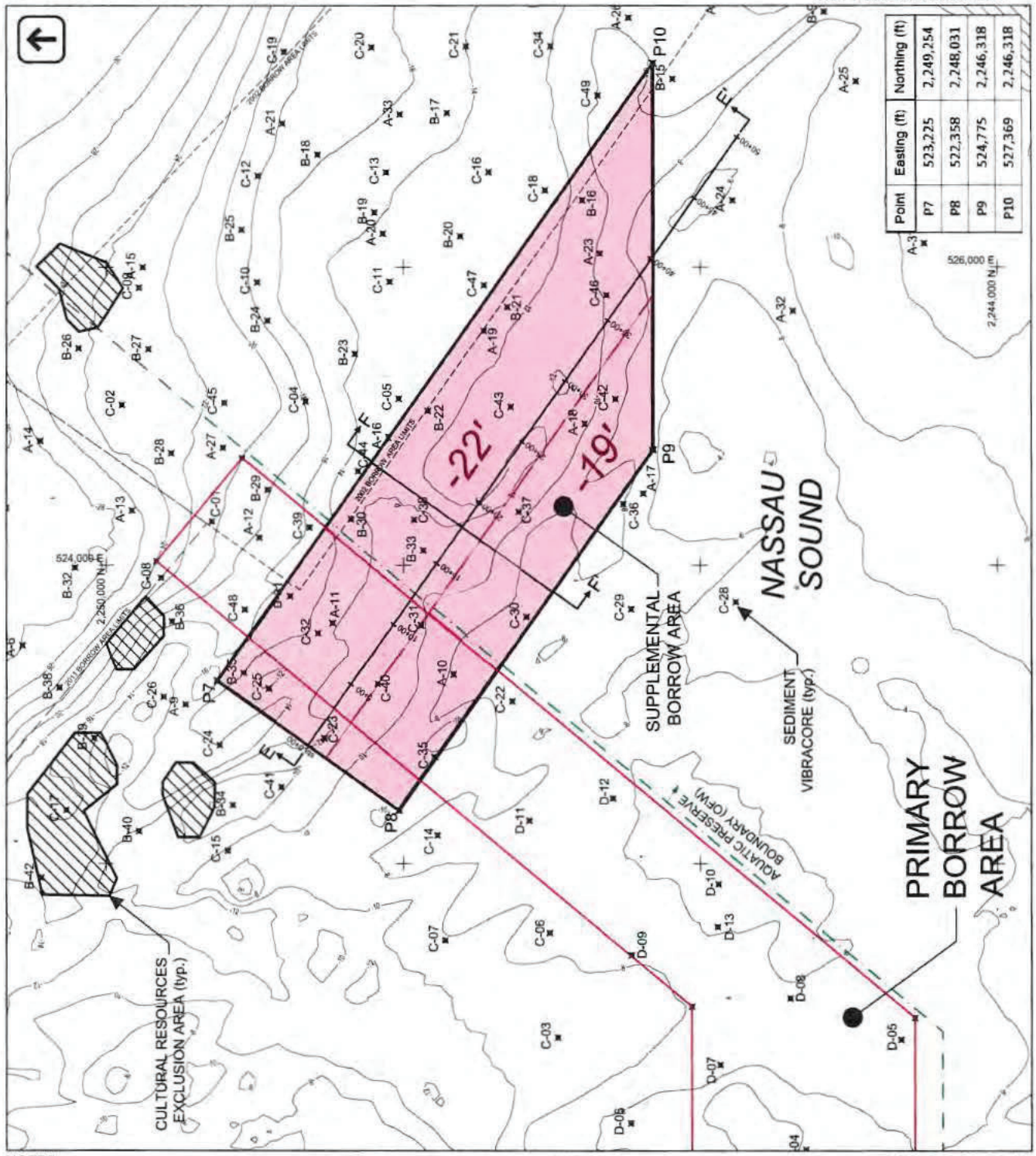

Point	Easting (ft)	Northing (ft)
P7	523,225	2,249,254
P8	522,358	2,248,031
P9	524,775	2,246,318
P10	527,369	2,246,318

NOTES:
1) Hor. - NAD83 SPC FL WEST, Vert. - NAVD88, feet
2) SURVEY: JUNE 2018
3) VIBRACORE DATES VARY (2001, 2007, 2017, 2018)

GRAPHIC SCALE
0 500 1,000 FT

Latitude: 30° 33.0' N
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ALBERT EDWARD BROWDER LICENSE No. 57403
STATE OF FLORIDA PROFESSIONAL ENGINEER

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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

SUPPLEMENTAL BORROW AREA PLANVIEW

Albert E. Browder, P.E. FL #57403
14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 13 OF 15

NASSAU COUNTY, FL

FOR PURPOSES OF PERMIT ONLY
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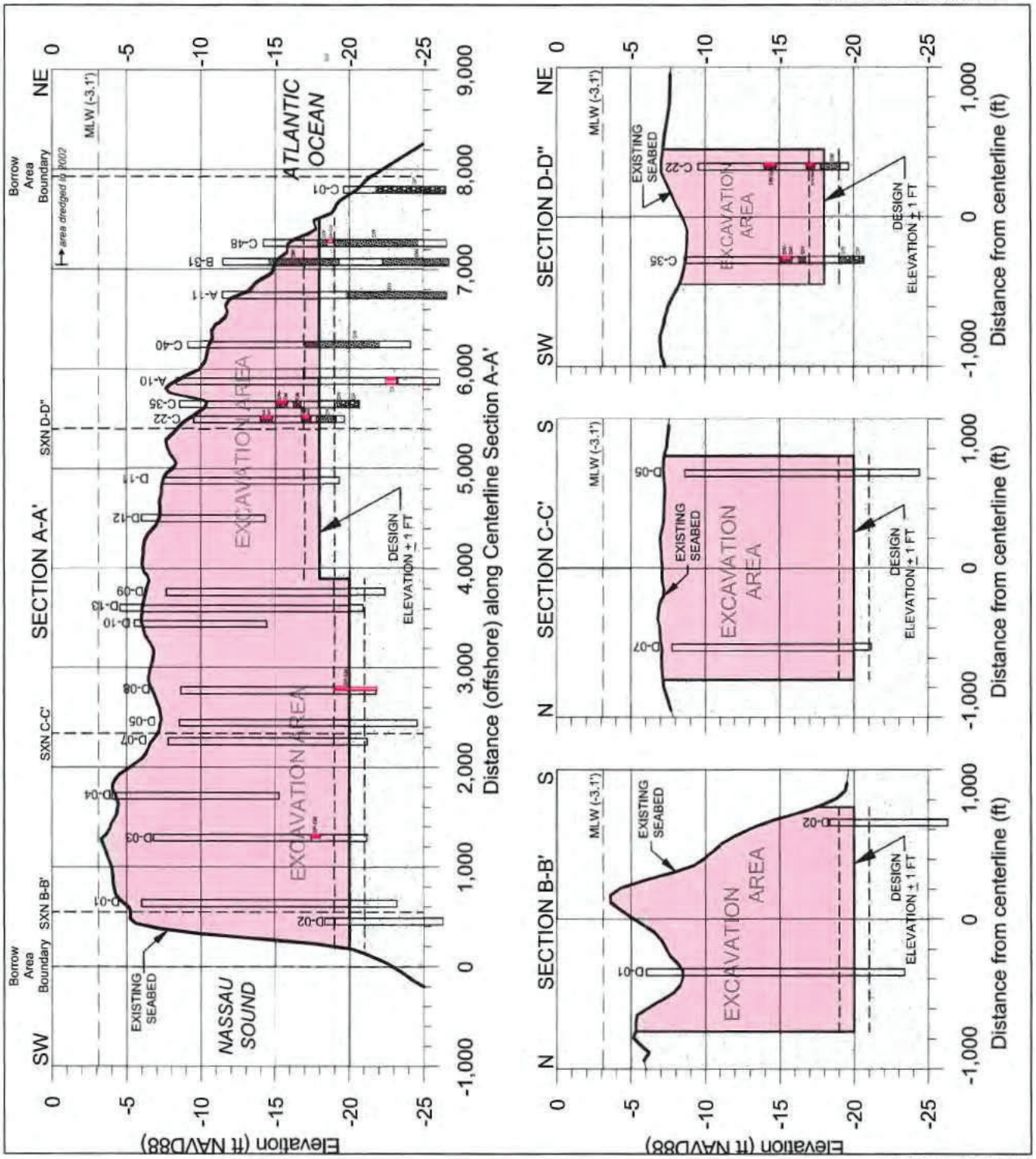

NOTES:

1) DISTORTED SCALE 1v:150h
2) Vert. - NAVD88, feet, SURVEY: JUNE 2018
3) See planview sheets for offsets from section lines
4) SP sediments unless otherwise noted

Latitude: 30 33.0' N
Longitude: 81 26.5' W
Sect: 1, 6, 38, 39
Township: 1 N
Range: 29 E
Sect: 18, 22
Township: 2 N
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AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

PRIMARY BORROW AREA SECTIONS

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

Albert E. Browder, P.E. FL #57403

14 Dec '18

DATE: 12/14/2018
DRAWN BY: ML
SHEET 14 OF 15

NASSAU COUNTY, FL

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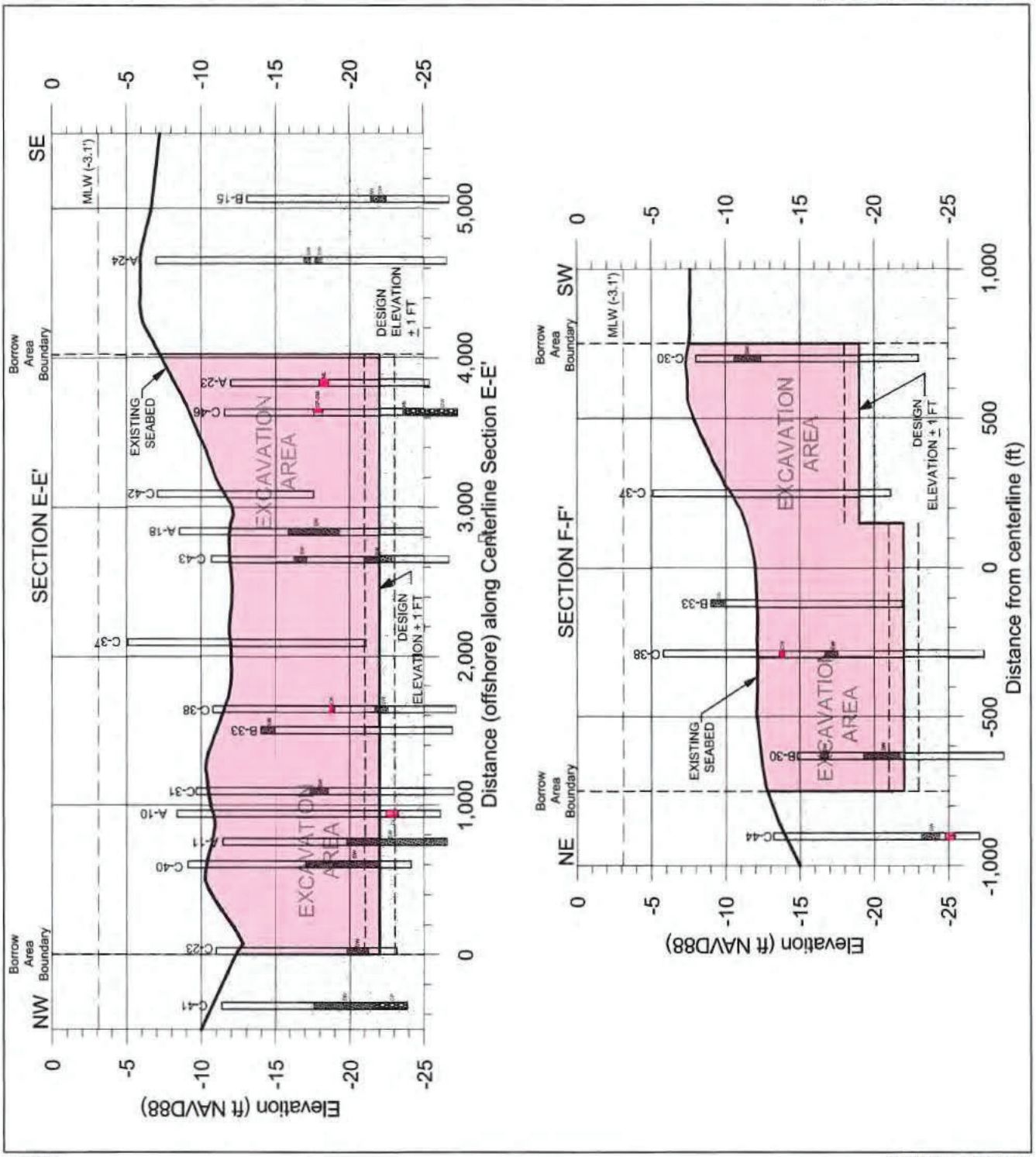

NOTES:
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Albert E. Browder, P.E. FL #57403

14 Dec '18

AMELIA ISLAND, FL
SHORE STABILIZATION PROJECT
PERIODIC RENOURISHMENT

SUPPLEMENTAL BORROW AREA SECTIONS

DATE: 12/14/2018
DRAWN BY: ML
SHEET 15 OF 15

FLORIDA DEPARTMENT OF Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

CONSOLIDATED JOINT COASTAL PERMIT AND SOVEREIGN SUBMERGED LANDS AUTHORIZATION

PERMITTEE:
South Amelia Island Shore Stabilization Assoc.
c/o Amelia Island Management, Inc.
Attn: William R. Moore
5440 First Coast Highway
Amelia Island, FL 32034
Moor1706@bellsouth.net

Nassau County Board of County Commissioners
Attn: Taco Pope, County Manager
96135 Nassau Place
Yulee, FL 32097
countymanager@nassaucountyfl.com

Division of Recreation and Parks
Florida Department of Environmental Protection
Attn: Michael W. Foster, P.E. Chief, Bureau of Design and Construction, Florida Park Service
3900 Commonwealth Blvd., MS 500
Tallahassee, FL 32399-3000
Michael.Foster@floridadep.gov

AGENT:
Olsen Associates, Inc.
Attn: Albert E. Browder, Ph.D., P.E.
2618 Herschel St.
Jacksonville, FL 32259
abrowder@olsen-associates.com

PERMIT INFORMATION:
Permit Number: 0187721-013-JC

Project Name: South Amelia Island Beach Nourishment

County: Nassau

Issuance Date: March 22, 2021

Expiration Date: March 22, 2036

REGULATORY AUTHORIZATION:

This permit is issued under the authority of Chapter 161 which includes consideration of the provisions contained in Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the

Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

PROJECT DESCRIPTION:

The project consists of beach nourishment along approximately 3.6 miles of shoreline at the southern end of Amelia Island using beach compatible material obtained from Nassau Sound. The primary borrow area, which is the only authorized borrow area for the project, lies within the Nassau Sound ebb shoal complex. The beach fill template ties directly into the upland dune system along the landward limits of the template. This authorization is for one nourishment event only.

The landward fill areas will be variable with a maximum elevation of +10.0 feet North Atlantic Vertical Datum (NAVD). The landward portion of the beach berm will be flat with a berm elevation of +10.0 feet NAVD and a variable width ranging from 10 feet to 120 feet. The seaward portion of the berm will be 192 feet wide with a seaward slope of 1V:55H to an elevation of +6.5 NAVD. The foreshore slope of the berm will be 1V:15H until it ties into the existing grade. The construction berm template also includes a +0.5-foot elevation tolerance. Sand fencing and planting of dune vegetation is also authorized within the approved project template.

PROJECT LOCATION:

The beach placement site is located between Department Range Monuments R-59 and R-79 at the (buried) terminal rock groin on the Amelia Island State Park property near the southern tip of Amelia Island, Nassau County, Sections 1, 6, 38, 39, 18, 22, Township 1 North and 2 North, Range 29 East and 28 East. The borrow area is located within the Nassau Sound ebb shoal complex, in the Atlantic Ocean, Class III Waters. The primary borrow area is located north of the Nassau River-St. Johns River Marshes Aquatic Preserve and Outstanding Florida Waters (OFW) and borders the northern boundary of the FWC Nassau Sound Islands Critical Wildlife Area (CWA) and partially within the FWC Amelia Island CWA.

PROPRIETARY AUTHORIZATION:

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands held in trust by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Board of Trustees delegated, to the Department, the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. This proprietary authorization has been reviewed in accordance with Chapter 253, F.S., Chapter 18-21 and Section 62-330.075, F.A.C., and the policies of the Board of Trustees.

The Department has determined that the use of the borrow area, for five years or less, and the placement of sand qualify for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Chapter 253.77, F.S., to perform the activity on the specified sovereign submerged lands.

COASTAL ZONE MANAGEMENT:

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

WATER QUALITY CERTIFICATION:

This permit constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341.

OTHER PERMITS:

Authorization from the Department does not relieve you from the responsibility of obtaining other permits (Federal, State, or local) that may be required for the project. When the Department received your permit application, a copy was sent to the U.S. Army Corps of Engineers (Corps) for review. The Corps will issue their authorization directly to you, or contact you if additional information is needed. If you have not heard from the Corps within 30 days from the date that your application was received by the Department, contact the nearest Corps regulatory office for status and further information. Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.

AGENCY ACTION:

The above named Permittee is hereby authorized to construct the work that is outlined in the Project Description and Project Location of this permit and as shown on the approved permit drawings, plans and other documents attached hereto. This agency action is based on the information submitted to the Department as part of the permit application, and adherence with the final details of that proposal shall be a requirement of the permit. **This permit and authorization to use sovereign submerged lands are subject to the General Conditions, General Consent Conditions, Specific Conditions, and the attached plans, which are a binding part of this permit and authorization.** Both the Permittee and their Contractor are responsible for reading and understanding this permit (including the permit conditions and the approved permit drawings) prior to commencing the authorized activities, and for ensuring that the work is conducted in conformance with all the terms, conditions and drawings.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the project description, permit drawings, plans and specifications approved as a part of this permit, and all conditions and requirements of this permit. The Permittee shall notify the Department in writing of any anticipated deviation from the permit prior to

implementation so that the Department can determine whether a modification of the permit is required pursuant to Rule 62B-49.008, F.A.C.

2. If, for any reason, the Permittee does not comply with any condition or limitation specified in this permit, the Permittee shall immediately provide the Department and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; and, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits that may be required by federal, state, local or special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project that are not addressed in this permit.

4. Pursuant to Sections 253.77 and 373.422, F.S., prior to conducting any works or other activities on state-owned submerged lands, or other lands of the state, title to which is vested in the Board of Trustees, the Permittee must receive all necessary approvals and authorizations under Chapters 253 and 258, F.S. Written authorization that requires formal execution by the Board of Trustees shall not be considered received until it has been fully executed.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under Section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the Permittee or create in the Permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the Permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The Permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The Permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the

permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

9. At least 48 hours prior to commencement of activity authorized by this permit, the Permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the Permittee and the contractor, if one is to be used, have read the general and specific conditions of the permit and understand them.

10. If any prehistoric or historic artifacts, such as pottery or ceramics, stone tools or metal implements, shipwreck remains or anchors, dugout canoes or other physical remains that could be associated with Native American cultures, or early Colonial or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the immediate vicinity of such discoveries. The Permittee, or other designee, shall contact the Florida Department of State, Division of Historical Resources, Compliance and Review Section at (850)245-6333 or (800)847-7278, as well as the appropriate permitting agency office. Project activities shall not resume without verbal and/or written authorization from the Division of Historical Resources. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, F.S.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the Permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specifications, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on as-built drawings electronically submitted to the Department, by email at JCPCompliance@dep.state.fl.us.

GENERAL CONSENT CONDITIONS:

1. Authorizations are valid only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use shall constitute a violation. Violation of the authorization shall result in suspension or revocation of the grantee's use of the sovereignty submerged land unless cured to the satisfaction of the Board.

2. Authorizations convey no title to sovereignty submerged land or water column, nor do they constitute recognition or acknowledgment of any other person's title to such land or water.

3. Authorizations may be modified, suspended or revoked in accordance with their terms or the remedies provided in Sections 253.04 and 258.46, F.S., or Chapter 18-14, F.A.C.

4. Structures or activities shall be constructed and used to avoid or minimize adverse impacts to sovereignty submerged lands and resources.

5. Construction, use or operation of the structure or activity shall not adversely affect any species that is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004 and 68A-27.005, F.A.C.

6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity shall be modified in accordance with the court's decision.

7. Structures or activities shall not create a navigational hazard.

8. Structures shall be maintained in a functional condition and shall be repaired or removed if they become dilapidated to such an extent that they are no longer functional. This shall not be construed to prohibit the repair or replacement subject to the provisions of Rule 18-21.005, F.A.C., within one year, of a structure damaged in a discrete event such as a storm, flood, accident or fire.

9. Structures or activities shall be constructed, operated and maintained solely for water dependent purposes, or for non-water dependent activities authorized under paragraph 18-21.004(1)(f), F.A.C., or any other applicable law.

SPECIFIC CONDITIONS:

1. Unless otherwise specified in the specific conditions of this permit all submittals required herein (e.g., progress reports, water-quality reports etc.) shall be electronically submitted (via e-mail, file transfer site or hard drive). Email submittals shall be sent to the Department's JCP Compliance Officer (e-mail address: JCPCompliance@dep.state.fl.us). If a file transfer site is used, a link shall be e-mailed to the JCP Compliance Officer. If data are too large to be submitted via e-mail or file transfer site, the Permittee may submit the data via an external hard drive, provided by the Permittee. The external hard drive shall be mailed to:

   Department of Environmental Protection
   Office of Resilience and Coastal Protection

Attn: JCP Compliance Officer
2600 Blair Stone Road, Mail Station 3566
Tallahassee, FL 32399-2400

2. The Permittee shall not store or stockpile tools, equipment, materials, etc., within littoral zones or elsewhere within surface waters of the state without prior written approval from the Department. Storing, stockpiling or accessing equipment on, in, over or through areas with benthic biological resources (including beds of submerged aquatic vegetation [SAV], wetlands, oyster reefs or hardbottom) is prohibited unless it occurs within a work area or ingress/egress corridor that is specifically approved by this permit and is shown on the approved permit drawings. Anchoring or spudding of vessels and barges within areas with benthic biological resources is also prohibited.

3. The Permittee shall not conduct project operations or store project-related equipment in, on or over dunes, or otherwise impact dune vegetation, outside the approved staging, beach access and dune restoration areas designated in the permit drawings.

4. No work shall commence until the Permittee has satisfactorily submitted all information noted in this condition. At least 45 days prior to commencement of construction, the Permittee shall submit the following items for review by the Department. Unless otherwise notified by the Department within 15 days of receipt of all information specified below, the Permittee shall assume the submittals are satisfactory:

    a. An electronic copy of detailed ***final construction plans and specifications*** for all authorized activities. The plans and specifications must be consistent with the project description, conditions and approved drawings of this permit. These documents shall be certified by a professional engineer (P.E.), who is registered in the State of Florida. The Permittee shall point out any deviations from the Project Description of this permit (as stated above) or the approved permit drawings (attached to this permit), and any significant changes that would require a permit modification. The plans and specifications shall include a description of the dredging and construction methods to be utilized and drawings and surveys that show all biological resources and work spaces (e.g., anchoring areas, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project.

    b. ***Turbidity Monitoring:*** In order to assure that turbidity levels do not exceed the compliance standards established in this permit, construction at the project site shall be monitored closely by an independent third party with formal training in water quality monitoring and professional experience in turbidity monitoring for coastal construction projects. Also, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when turbidity generating activities are occurring. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit.

i. ***Qualifications***. The names, credentials (demonstrating experience and qualifications) and 24-hour contact information of those individuals performing these functions;

ii. A ***Scope of Work*** for the turbidity monitoring to ensure that the right equipment is available to conduct the monitoring correctly at any location, and under any conditions;

iii. ***Draft turbidity sampling map.*** An example of the geo-referenced map that will be provided with turbidity reports, including aerial photography and the boundaries of biological resources and/or OFW (pursuant to Specific Condition 25)

c. Documentation from the U.S. Fish and Wildlife Service (FWS) that this work will be covered under a Statewide Programmatic **Biological Opinion** or a Biological Opinions (BO) issued for construction on this project site. If the BO contains conditions that are not already contained herein, a permit modification may be required prior to construction to include those additional conditions.

d. **Fish & Wildlife Monitoring Qualifications:** To ensure that individuals conducting monitoring of fish and wildlife resources have appropriate qualifications, the Permittee shall provide documentation demonstrating expertise/experience in surveying the types of resources that are present in the project. The Department and the Florida Fish and Wildlife Conservation Commission (FWC) will review this information for confirmation that the monitors are capable of meeting the requirements in Specific Conditions 8 through 22. This documentation shall include the following:

i. *Marine Turtle Protection:* A list of the names and FWC permit numbers for the Marine Turtle Permit Holders.

ii. *Shorebird Protection:* A list of Bird Monitors with their contact information, summary of qualifications including bird identification skills, and avian survey experience, proposed locations of shorebird survey routes, and the locations of travel routes.

e. ***Pre-Construction Conference.*** **After all items required by a through d above have been submitted to the Department,** the Permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with the Permittee's contractors, the engineer of record, those responsible for turbidity monitoring, those responsible for protected species monitoring, staff representatives of the Fish and Wildlife Conservation Commission (FWC) and the JCP Compliance Officer (or designated alternate) prior to each construction event. In order to ensure that appropriate representatives are available, at least twenty-one (21)

days prior to the intended commencement date for the permitted construction, the Permittee is advised to contact the Department, and the other agency representatives listed below:

DEP, JCP Compliance Officer
e-mail: JCPCompliance@dep.state.fl.us

FWC, Imperiled Species Management Section
e-mail: marineturtle@myfwc.com

FWC Regional Biologist
See Contact list for phone numbers
(http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/contacts)

The Permittee is also advised to schedule the pre-construction conference at least a week prior to the intended commencement date. At least seven (7) days in advance of the pre-construction conference, the Permittee shall provide written notification, advising the participants of the agreed-upon date, time and location of the meeting, and also provide a meeting agenda and a teleconference number.

If the actual construction start date is different from the expected start date proposed during the preconstruction conference, at least 48 hours prior to the commencement of each dredging event, the Permittee shall ensure that notification is sent to the FWC, at marineturtle@myfwc.com, indicating the actual start date and the expected completion date. The Permittee shall also ensure that all contracted workers and observers are provided a copy of all permit conditions.

5. When discharging slurried sand onto the beach from a pipeline, the Permittee shall employ best management practices (BMPs) to reduce turbidity. At a minimum, these BMPs shall include the following:

   a. Use of shore-parallel sand dike to promote settlement of suspended sediment on the beach before return water from the dredged discharge reenters the Atlantic Ocean; and

   b. A minimum set-back of 50 feet from open water, or at the landward end of the beach berm (without disturbing the dune), whichever is less, for the pipeline discharge location.

6. **Borrow Area:** The primary borrow area is the only borrow area authorized for the project. Authorization of the secondary borrow area or subsequent use of the primary borrow area will be dependent on the effects of the excavation on the primary borrow

area, as depicted/observed/demonstrated by physical monitoring and would require a modification to this permit.

7. Sediment quality shall be assessed as outlined in the offshore or upland Sediment QA/QC Plan (as appropriate for the source), dated August 14, 2019. Placement of material that is not in compliance with the Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. The sediment testing result shall be submitted to The Department within 90 days following the completion of beach construction. The following requirements are included in the Sediment QA/QC Plan:

   a. If, during construction, the Permittee determines that the beach fill material does not comply with the sediment compliance specifications, the Permittee shall take measures to avoid further placement of noncompliant fill, and the sediment inspection results shall be reported to the Department.

   b. The Permittee shall submit post-construction sediment testing results and an analysis report as outlined in the Sediment QA/QC plan to the Department within 90 days following beach construction. The sediment testing results will be certified by a P.E. or P.G. from the testing laboratory. A summary table of the sediment samples and test results for the sediment compliance parameters as outlined in Table 1 of the Sediment QA/QC plan shall accompany the complete set of laboratory testing results. A statement of how the placed fill material compares to the sediment analysis and volume calculations from the geotechnical investigation shall be included in the sediment testing results report.

   c. A post-remediation report containing the site map, sediment analysis, and volume of noncompliant fill material removed and replaced shall be submitted to the Department within 7 days following completion of remediation activities.

FISH AND WILDLIFE CONDITIONS

8. **In-water Activity.** The Permittee shall adhere to the following requirements for all in- water activity:

   a. The Permittee shall instruct all personnel associated with the project about the presence of marine turtles and manatees, and the need to avoid collisions with (and injury to) these protected marine species. The Permittee shall be responsible for harm to these resources and shall require their contractors to advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees or marine turtles, which are protected under the Endangered Species Act, the Marine Mammal Protection Act, the Marine Turtle Protection Act and the Florida Manatee Sanctuary Act.

   b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate project area and while in water where

the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

c. Siltation or turbidity barriers (if used) shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers shall not impede manatee or marine turtle movement or travel.

d. The Permittee is responsible for all on-site project personnel and shall require them to observe water-related activities for the presence of marine turtles and manatee(s). All in-water operations shall be immediately shall be shut down if a marine turtle or manatee comes within 50 feet of the operation. For unanchored vessels, operators shall disengage the propeller and drift out of the potential impact zone. If drifting would jeopardize the safety of the vessel then idle speed may be used to leave the potential impact zone. Activities shall not resume until the animal(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the animal(s) has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving.

e. Any collision with (or injury to) a marine turtle or manatee shall be reported immediately to the FWC Hotline at 1-888-404-3922, and to FWC at ImperiledSpecies@myFWC.com. Any collision with (and/or injury to) a marine turtle shall also be reported immediately to the Sea Turtle Stranding and Salvage Network (STSSN) at SeaTurtleStranding@myfwc.com.

f. Temporary signs concerning manatees shall be prominently posted prior to and during all in-water project activities, at sufficient locations to be regularly and easily viewed by all personnel engaged in water-related activities. Two temporary signs, which have already been approved for this use by the FWC, shall be posted at each location. One sign shall read “Caution Boaters – Watch for Manatees”. A second sign measuring at least 8 ½" by 11", shall explain the requirements for “Idle Speed/No Wake” and the shutdown of in-water operations. All signs shall be removed by the Permittee upon completion of the project. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to ImperiledSpecies@myFWC.com.

9. **Hopper Dredging.** If a hopper dredge is used for this project, the following requirements shall be met:

a. Handling of captured marine turtles during hopper dredging activities shall be conducted only by persons with prior experience and training in these activities, and who are duly authorized to conduct such activities through a valid Marine Turtle Permit issued by the FWC, pursuant to Chapter 68E-1, F.A.C. The Permittee

shall forward documentation of these qualifications to FWC for review, as required in Specific Condition 4.

b. In order to minimize impingement or entrainment of marine turtles within the water column, dredging pumps shall be disengaged by the operator, or the draghead bypass valve shall be open and in use when the dragheads are not firmly on the bottom. This precaution is especially important during the cleanup phase of dredging operations.

c. A state-of-the-art rigid deflector draghead shall always be used on all hopper dredges.

d. The Sea Turtle Stranding and Salvage Network (STSSN) Coordinator shall be notified of the start-up and completion of hopper dredging operations at 1-904-573- 3930 or via e-mail at Allen.Foley@myfwc.com. If a marine turtle is captured or marine turtle parts are recovered, the STSSN shall be contacted at seaturtlestranding@myfwc.com.

10. **Trawling**. If relocation trawling or non-capture trawling for marine turtles is required as per applicable NMFS Biological Opinions and Incidental Take authorizations, the following is required:

a. Any activity involving the use of nets to harass and/or to capture and handle marine turtles in Florida waters requires a Marine Turtle Permit from FWC prior to trawling.

b. The Permittee or their contractor shall e-mail (MTP@MyFWC.com) reports to the FWC's Imperiled Species Management Section on Friday of each week that trawling is conducted in Florida waters. These weekly reports shall include the species and number of turtles captured, their general health, and release information. A summary of all trawling activity (including non-capture trawling) shall be submitted to MTP@myfwc.com by January 15 of the following year, or at the end of the project. The summary shall be recorded/documented on the FWC-provided Excel spreadsheet (available at http://myfwc.com/media/33168/Trawl-Report-Template.pdf), and shall list all turtles captured in Florida waters, the measurements of all captured turtles, the location of captures (latitude and longitude in decimal degrees), the location of tow start-stop points (latitude and longitude in decimal degrees), and times for the start- stop points of the tows (including tows when no turtles are captured).

11. **Construction Area Project Lighting.** During the marine turtle nesting season (May 1 through October 31), direct lighting of the beach and nearshore waters shall be limited to the immediate area of active construction .

Lighting on offshore and onshore equipment shall be minimized by reducing the number of fixtures, shielding, lowering the height and appropriately placing fixtures to avoid excessive illumination of the water's surface and nesting beach. The intensity of lighting shall be reduced to the minimum standard required for general construction area safety. Shields shall be affixed to the light housing on dredge and on land-based lights and shall be large enough to block lamp light from being transmitted outside the construction area or to the adjacent marine turtle nesting beach. (Figure 1 below).

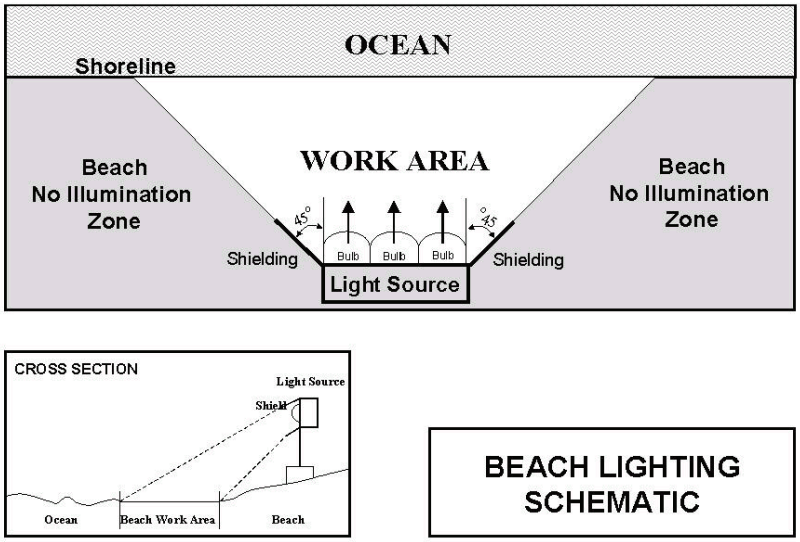


Figure 1

12. **Wildlife Conditions for All Beach Related Activities.** The Permittee shall adhere to the following requirements for all beach-related activities during marine turtle and shorebird nesting/breeding seasons March 1 through October 31.

a. **Beach Maintenance:**

i. The Permittee shall require their contractor and protected species monitors to inspect all work areas that have excavations and temporary alterations of beach topography each day, to determine which areas have deviations (such as depressions, ruts, holes and vehicle tracks) capable of trapping flightless shorebird chicks or marine turtle hatchlings. If so, the deviations shall be filled or leveled from the natural beach profile prior to 9:00 p.m. each day. The beach surface shall also be inspected subsequent to completion of the project, and all tracks, mounds, ridges or impressions, etc. left by construction equipment on the beach shall be smoothed and leveled.

ii. All debris, including derelict construction or coastal armoring material,

concrete and metal, found on the beach placement site, shall be removed from the beach to the maximum extent practicable prior to any placement of fill material. If debris removal activities will take place during protected species nesting seasons, the work shall be conducted during daylight hours only, and shall not commence until completion of daily monitoring surveys.

b. **Equipment Storage and Placement.**

i. Staging areas and temporary storage for construction equipment and pipes shall be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment that is not in use shall be located off the beach. If staging and storage areas off the beach are not possible, then additional marine turtle and shorebird protective measures shall be implemented. Such protective measures shall be determined in coordination with the Department and FWC prior to beginning of construction. All construction pipes that are in use on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune.

ii. If it is necessary to extend construction pipes past a known shorebird nesting site, then those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season. If such placement is not feasible for the project, FWC's Regional Biologist shall be contacted for alternative measures. See contacts available at http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/contacts.

c. **Beach Driving.** All vehicles operated on the beach shall operate in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at speeds less than 6 mph and run at or below the high-tide line. All personnel associated with the project shall be instructed about the potential presence of protected species, and the need to avoid injury and disturbance to these species. *Note: when flightless chicks are present within or adjacent to travel corridors, construction-related vehicles shall not be driven through the corridor unless a Bird Monitor is present pursuant to Specific Condition 22.*

13. **Marine Turtle Protection Conditions.** Construction-related activities are authorized to occur on the nesting beach (sandy beach seaward of existing coastal armoring structures or dune crest and all areas used for beach access) during marine turtle nesting season (May 1 through October 31) under the following conditions:

a. Daily early morning marine turtle nest surveys shall start two weeks prior to

marine turtle nesting season (April 15) or 65 days prior to beach placement whichever is later. Daily nesting surveys shall continue through November 30, or until two weeks after the last crawl in the project area, whichever is earlier.

b. Daily nesting surveys shall be conducted beginning ½ hour prior to sunrise, and no construction activity may commence outside of the nightly restricted zone until completion of the marine turtle survey each day.

c. The Permittee shall ensure that marine turtle nesting surveys are conducted as required in this authorization, and only conducted by personnel with a valid FWC Marine Turtle Permit, that covers all project activities as required by Chapter 68E-1, F.A.C. For information on the authorized Marine Turtle Permit Holders in the project area, contact FWC at MTP@myfwc.com.

d. Only those nests laid in the area where sand placement will occur shall be relocated, and nest relocation shall cease after the sand placement is completed. Nests requiring relocation shall be moved no later than 9 a.m., the morning following deposition (no longer than 12 hours from the time the eggs are laid), to a nearby self-release beach site in a secure setting, where artificial lighting will not interfere with hatchling orientation. The relocation site shall be determined in conjunction with and approved by FWC prior to nest relocations. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of beach settings that are not expected to experience any of the following: inundation by high tides; severe erosion; previous egg loss; or illumination by artificial lighting.

e. Nests deposited within areas where construction activities will not occur for 65 days, or nests laid in the nourished berm prior to tilling, shall be marked and left in place. The Marine Turtle Permit Holder shall install on-beach markers at the nest site to establish a minimum 5-foot radius around the approximate clutch location and shall also install a secondary marker at a point as far landward as possible to assure that the nest can be located should the on-beach marker be lost. No activity shall occur within the marked area, nor shall any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

14. **Fill Restrictions.** During the marine turtle nesting season, the contractor shall not advance the beach fill more than 500 feet along the shoreline between dusk and the following day, until the daily nesting survey is completed, and the beach has been cleared for fill advancement. If the 500-foot advancement limitation is not feasible for the project, an alternative distance shall be established during the preconstruction meeting, if a distance can be agreed upon in consultation with FWC. If the work area is extended, nighttime nesting surveys are required, and a Marine Turtle Permit Holder is required to be present on-site to ensure that no nesting and hatching marine turtles are

present. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the Marine Turtle Permit Holder responsible for nest monitoring has relocated the nest.

15. **Marine Turtle or Nest Encounters.** Upon locating a dead or injured marine turtle adult, hatchling, or egg that may have been harmed or destroyed as a result of the project, the Permittee shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922). Care shall be taken in handling injured marine turtles or exposed eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials for later analysis. If a marine turtle nest is excavated during construction activities, but not as part of the authorized nest relocation process outlined in these specific conditions, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

16. **Tilling, Compaction and Escarpment Remediation Requirements.** For the years after the first-year sand placement (out-year), compaction monitoring, tilling and escarpment monitoring are not required if placed material no longer remains on the dry beach.

    a. **Compaction Sampling.** Sand compaction shall be monitored in the area of sand placement immediately after completion of the nourishment event, and two weeks prior to the beginning of marine turtle nesting season, for three (3) subsequent years. The requirement for compaction monitoring may be eliminated if the placed sand is tilled, regardless of post-construction compaction levels. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled prior to the beginning of marine turtle nesting season. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required. Compaction monitoring shall be in accordance with the following protocol:

        i. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high-water line (normal wrack line).

        ii. At each station, the cone penetrometer shall be pushed to depths of 6, 12 and 18 inches three times (i.e., three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final

values for each depth at each station. Reports shall include all 18 values for each transect line, and the final 6 averaged compaction values.

iii. If values exceeding 500 psi are distributed throughout the project area, but in no case do those values exist at two adjacent stations at the same depth, then the Permittee shall consult with the FWC to determine if tilling is required. A request for a tilling waiver based on these compaction values shall be submitted to the FWC at marineturtle@myfwc.com.

b. **Tilling Requirements.** If tilling is performed regardless of post-construction compaction levels or tilling is required based on compaction measurements, the area shall be tilled to a depth of 24 inches. Tilling shall be in accordance with the following protocol:

i. All tilling activity shall be completed prior to the marine turtle nesting season. If the project is completed during the marine turtle nesting season, tilling shall not be performed in areas where nests have been left in place or relocated.

ii. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling. Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling.

iii. Tilling shall occur landward of the wrack line and shall avoid all naturally vegetated areas that are at least 3 square feet in size, as well as any planted areas that have been authorized by the Department. A 3-foot-wide No-Tilling buffer shall be maintained around vegetated areas. The slope between the mean high-water line and the mean low water line shall be maintained to approximate natural slopes.

c. **Escarpment Surveys.** Visual surveys for escarpments along the project area shall be made immediately after completion of sand placement, within 30 days prior to April 15 and weekly throughout the marine turtle season for three (3) subsequent years, each year placed sand remains on the dry beach. Escarpment remediation shall be as follows:

i. Prior to marine turtle nesting season, escarpments that interfere with marine turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled to the natural beach contour or the beach profile shall be reconfigured to minimize scarp formation. Any escarpment removal shall be reported relative to R- monument location to FWC at marineturtle@myfwc.com, with a copy sent to the JCP Compliance Officer.

ii. If weekly surveys during the marine turtle nesting season document escarpments that exceed 18 inches in height for a distance of at least 100 feet and have persisted for more than two weeks, the FWC shall be contacted immediately to determine the appropriate action to be taken. The Permittee shall provide locations and measurements of the escarpments to the closest R monument as well as the coordinates for the location of marine turtle nests located within 20 feet of the escarpments (latitude and longitude in decimal degrees), with photographs when possible. Upon written notification by FWC that the escarpment needs to be leveled, the Permittee shall level the escarpment. If nests are located nearby, to minimize impacts to any existing nest the Permittee shall also coordinate with the marine turtle permit holder prior to leveling the escarpments. An annual summary of escarpment surveys and actions taken shall be submitted electronically to FWC (marineturtle@myfwc.com) by December 31 of each year.

Note for Shorebird Protection: If compaction sampling, tilling or escarpment removal occurs during shorebird breeding season, the Shorebird Conditions (including surveys) included in this authorization shall be followed. No heavy equipment shall operate, and no compaction sampling or tilling shall occur within 300 feet of any shorebird nest. If flightless shorebird chicks are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that no heavy equipment operates within 300 feet of the flightless young or within a site-specific corridor established per Specific Condition 22. It is the responsibility of the Permittee to ensure that their contractors avoid tilling, scarp removal or dune vegetation planting in areas where nesting birds are present.

17. **Post-Construction Lighting Surveys.** The Permittee shall ensure that lighting surveys be conducted from the nourished berm and the following actions taken to address potential adverse impacts expected with artificial lights visible from any dry portion of the newly elevated beach. The surveys shall be conducted from the top of the foreshore slope (i.e., the seaward edge of the filled berm before it slopes into the water), facing landward. The survey shall follow standard techniques for such a survey, such as including the number and type of visible lights, location of lights, and photo documentation (see additional techniques as per the 2015 USFWS Statewide Programmatic Biological Opinion).

a. The first survey shall be conducted between May 1 and May 15 for the first nesting season following construction. For each visible light source, the Permittee shall document that the property owners have been notified and has been provided with recommendations for correcting the light as soon as possible. Recommendations shall be in accordance with local lighting ordinances. A report summarizing all visible lights and the recommendations for correcting the light shall be forwarded to local code enforcement. If no lighting ordinances exist, the recommendations to the property owners shall be consistent with FWC lighting guidelines, which

include no lights or light sources shall be visible from the newly elevated beach. The second survey shall be conducted between July 15 and August 1 to assess any remaining visible lights requiring corrective action.

b. A summary report of the surveys and what corrective actions or local enforcement actions have been taken shall be submitted to FWC at marineturtle@myfwc.com and copied to JCPCompliance@dep.state.fl.us by December 31 of the year in which surveys are conducted. Upon request by the FWC, the Permittee shall set up and hold a meeting with the those responsible for code enforcement (when applicable), FWC and the USFWS to discuss the report and potential additional corrective action needed, as well as any documented marine turtle disorientations in or adjacent to the project area.

18. **Post-Construction Monitoring and Reporting Marine Turtle Protection Conditions**

a. For each sand placement event, reports for all required marine turtle nesting surveys shall be provided for the post construction (partial or remaining) nesting season and for two full nesting seasons post construction in accordance with the Table 1 (below). If nesting and reproductive success is less than the criteria in the table below, an additional year of monitoring and reporting may be required. If criteria is not met, additional conditions prior to the next sand placement on this beach may be required by the Department and FWC.

b. Data shall be reported and summarized for the nourished areas in accordance with Table 1 (below). Reports shall summarize all crawl activity, hatching success of a representative sampling of nests left in place (if any) by species, project name and applicable project permit numbers and dates of construction. Data shall be submitted in electronic format (Excel spreadsheets) which are available upon request from marineturtle@myfwc.com. Reports shall be sent to the FWC Imperiled Species Management section at marineturtle@myfwc.com and **copied to** JCPCompliance@dep.state.fl.us. All summaries should be submitted by January 15th of the following year.

Table 1. Marine Turtle Monitoring for Beach Placement of Material

Date	Duration	Variable	Criterion
Nesting Success	Year of in-season construction and two entire nesting seasons post construction, with possible additional year[1 & 2]	Number of nests and non-nesting emergences by day by species	40 percent or greater

Hatching success	Year of in-season construction and one entire nesting season post construction, with possible additional year[1 & 2]	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in-season construction and one entire nesting season post construction, with possible additional year[1 & 2]	Number of hatchlings by species to emerge from nest onto beach	Average must not be significantly different than the average hatching success
Disorientations	Year of in-season construction and two entire nesting seasons post construction[1]	Number of nests and/or individuals that misorient or disorient	
Nests affected by erosion or inundation	Year of construction and two years post construction if placed sand remains on the beach	Number of nests lost and/or affected, by species	
Lighting Surveys	Two in-season surveys the year following construction; First survey between May 1 and May 15 and second survey between July 15 and August 1[1]	Number, location and photographs of lights visible from nourished berm, corrective actions recommended, and notifications made	Lighting survey and possible meeting resulting with plan for reduction in lights visible from nourished berm
Compaction	Three nesting seasons beginning with the year of construction. Not required if the beach is tilled prior to nesting season[1]	Shear resistance	Less than 500 psi

Escarpment Surveys	Weekly during nesting season for three years beginning with year of construction[1]	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed
[1] If placed sand remains on the beach [2] Additional years may be required if variable does not meet criterion based on previous year			

19. **Shorebird Protection.** The term "shorebird" is used here to refer to all solitary nesting shorebirds and colonial nesting seabirds that nest on Florida's beaches. These conditions are intended to avoid direct impacts associated with the construction of the project and may not address all potential take incidental to the operation and use related to this authorization. The Permittee shall adhere to the shorebird protection conditions during the shorebird breeding cycle, which includes nesting.

    a. Shorebird breeding season dates for this project area are **March 1 through September 1** (note that while most species have completed the breeding cycle by September 1, flightless young may be present through September and must be protected if present).

    b. Any parts of the project where "project activities" on the beach take place *entirely outside the breeding season*, do not require shorebird surveys. The term "project activities" includes operation of vehicles on the beach, movement or storage of equipment on the beach, sand placement or sand removal, and other similar activities that may harm or disturb shorebirds. Bird survey routes must be established and monitored throughout the entire breeding season in any parts of the project area where: 1) potential shorebird breeding habitat occurs, and 2) project activities are expected to occur at any time within the breeding season. Breeding season surveys shall begin on the first day of the breeding season or 10 days prior to project commencement (including survey activities and other pre-construction presence on the beach), whichever is later.

    c. Bird surveys shall be conducted in all potential beach-nesting bird habitats within the project boundaries that may be impacted by construction or pre-construction activities. One or more shorebird survey routes shall be established by the Permittee to cover project areas which require shorebird surveys. These routes shall be determined in coordination with the FWC Regional Biologist prior to the initiation of construction. Routes shall not be modified without prior notification to FWC.

d. During the pre-construction and construction activities associated with the project, the Permittee shall ensure that surveys for detecting breeding activity and the presence of flightless chicks shall be completed **on a daily basis** by a qualified bird monitor. This shall be completed prior to movement of equipment, operation of vehicles, or other activities that could potentially disrupt breeding behavior or cause harm to the birds or their eggs or young. If all project activities are completed and all personnel and equipment have been removed from the beach prior to the end of the breeding season, route surveys shall continue to be conducted at least weekly through the end of the breeding season. If breeding or nesting behavior is confirmed by the presence of a scrape, eggs or young, the Permittee (or their designee) shall establish a 300-foot buffer around the site and shall notify the FWC Regional Biologist within 24 hours. **Smaller, site-specific buffers may be established if approved in writing by the FWC Regional Biologist.** The posts and materials for the shorebird buffer zones shall be removed once all breeding or nesting behavior has ceased.

e. The Permittee shall require the Bird Monitor to conduct a shorebird education and identification program (and/or provide educational materials) with the on-site staff to ensure protection of precocial (mobile) chicks. All personnel are responsible for watching for shorebirds, nests, eggs and chicks. If the Bird Monitor finds that shorebirds are breeding within the project area, the Permittee shall place and maintain a bulletin board in the construction staging area with the location map of the construction site showing the bird breeding areas and a warning, clearly visible, stating that "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE and FEDERAL MIGRATORY BIRD ACTS".

20. **Shorebird Monitor Requirements.**

a. The Permittee shall ensure that nesting and breeding shorebird surveys are conducted by trained, dedicated individuals (Bird Monitors) with proven shorebird identification skills and avian survey experience.

b. Bird Monitor(s) shall be required to review and become familiar with the general information, employ the data collection protocol, and implement data entry procedures outlined on the FWC's FSD website (http://www.flshorebirddatabase.org or Florida Shorebird Database). They shall use the data-collection protocol and implement data entry procedures as outlined in that website.

c. The Permittee shall submit a list of Bird Monitors, with their contact information and a summary of qualifications, including bird identification skills and avian survey experience to the FWC Regional Biologist and JCPCompliance@dep.state.fl.us, prior to any construction or shorebird surveys. The determination that the selected

Bird Monitor(s) meet the required qualifications shall be coordinated between the Permittee and the FWC Regional Biologist. Once approved, the Permittee shall submit the names and contact information of the Bird Monitor(s) who have been approved by FWC to JCPCompliance@dep.state.fl.us, prior to any construction or shorebird surveys. The Bird Monitor(s) shall meet the following minimum qualifications:

i. Has previously participated in beach-nesting shorebird surveys in Florida (provide references or resume). Experience with previous projects must document the ability to 1) identify all species of beach-nesting birds by sight and sound, 2) identify breeding/territorial behaviors, and find nests of shorebirds that occur in the project area, and 3) identify habitats preferred by shorebirds nesting in the project area.

ii. Have a clear working knowledge of, and adhere to, the *Breeding Bird Protocol for Florida's Seabirds and Shorebirds.* https://publictemp.myfwc.com/crossdoi/shorebirds/resources.aspx

iii. Have completed full-length webinars: Route-Surveyor Training and Rooftop Monitoring Training, including the annual refresher training. Training resources can be found on the *Florida Shorebird Database* (FSD) website. https://publictemp.myfwc.com/crossdoi/shorebirds/index.aspx

iv. Familiar with FWC beach driving guidelines. (https://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

v. Experience posting beach-nesting bird sites, consistent with *Florida Shorebird Alliance (FSA) Guidelines.* http://flshorebirdalliance.org/resources/instructions-manuals.aspx

vi. Has registered as a contributor to the FSD.

21. **Shorebird Survey Protocols.** Bird survey protocols, including downloadable field data sheets, are available on the FSD website. All breeding activity shall be reported to the FSD website within one week of data collection. If the use of this website is not feasible for data collection, the FWC Regional Biologist shall be contacted for alternative methods of reporting. The Permittee shall ensure that the Bird Monitors use the following survey protocols:

a. Surveys shall be conducted by walking the length of all survey routes and visually surveying for the presence of shorebirds exhibiting breeding behavior, shorebird chicks or shorebird juveniles, as outlined in the FSD Breeding Bird Protocol for Shorebirds and Seabirds. Use of binoculars (minimum 8x40) is required and use of a spotting scope may be necessary to accurately survey the area. If an ATV or other

vehicle is needed to cover large survey routes, the Bird Monitor shall stop at intervals of no greater than 600 feet to visually inspect for breeding activity.

b. Once breeding or nesting behavior is confirmed by the presence of a scrape, eggs or young, the Permittee (or their designee) shall notify the FWC Regional Biologist within 24 hours.

22. **Shorebird Buffer Zones and Travel Corridors.** The Permittee shall require the Bird Monitor(s) and Contractor(s) to meet the following:

a. The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where the Bird Monitor has observed shorebirds engaged in breeding behavior, including territory defense. A 300-foot buffer shall be established around each nest or around the perimeter of each colonial nesting area. A 300-foot buffer shall also be placed around the perimeter of areas where shorebirds are seen digging nest scrapes or defending nest territories. All construction activities, movement of vehicles, stockpiling of equipment, and pedestrian traffic are prohibited in the buffer zone. **Smaller, site-specific buffers may be established if approved in writing by the FWC Regional Biologist.** Travel corridors shall be designated and marked outside the buffer areas for pedestrian, equipment or vehicular traffic.

b. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall immediately widen the buffer zone to a sufficient size to protect breeding birds.

c. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be allowed when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success. These site-specific buffers must be determined in coordination with the FWC Regional Biologist.

d. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones shall be marked according to FSA Posting Guidelines available at: http://flshorebirdalliance.org/resources/instructions-manuals.aspx) with posts, twine and FWC-approved signs stating “Do Not Enter, Important Nesting Area” or similar language around the perimeter (see example of signage for marking designated

buffer zones at http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/). Posts shall not exceed 3 feet in height once installed. Symbolic fencing (twine, string or rope) should be placed between all posts at least 2.5 feet above the ground and rendered clearly visible to pedestrians. If pedestrian pathway and/or equipment travel corridor modifications are approved by the FWC Regional Biologist, these shall be clearly marked. **Posting shall be maintained in good repair until no active nests, eggs, or flightless young are present.** Although solitary nesters may leave the buffer zone temporarily with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

e. The Permittee shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

f. The Permittee shall ensure that the Bird Monitor(s) designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may transit past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

g. When flightless chicks are present within or adjacent to travel corridors, construction related vehicles shall not be driven through the corridor unless a Bird Monitor is present to adequately monitor the travel corridor.. The Permittee shall require the contractor with the oversight of the Bird Monitor(s) to avoid any chicks that may be in the path of moving vehicles. The Permittee shall also require the contractor with the oversight of the Bird Monitor(s) to level any tracks, ruts, or holes that may be capable of trapping flightless chicks, while avoiding any impacts to the chicks.

h. *Notification.* Any injury or death of a shorebird (including crushing eggs or young) resulting from project activities shall be reported immediately to the FWC Regional Biologist.

MONITORING REQUIRED:

23. Water Quality - Turbidity shall be monitored as follows:

Units: Nephelometric Turbidity Units (NTUs).

Frequency: Monitoring for dredging and sand placement activities shall be conducted 3 times daily, approximately 4 hours apart during daylight hours, and at any other time that there is a likelihood of an exceedance of the turbidity standard. Sampling shall be conducted **while the highest project-related turbidity levels are crossing the edge of the mixing zone**. Since

turbidity levels can be related to pumping rates, the dredge pumping rates shall be recorded, and provided to the Department upon request. The compliance samples and the corresponding background samples shall be collected at approximately the same time, i.e., background sample shall immediately follow the compliance sample.

Location: Background: Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet). **All background sampling shall occur clearly outside the influence of any artificially generated turbidity plume** or the influence of an outgoing inlet plume.

Dredge Site: Samples shall be collected at least 300 meters up-current from the source of turbidity at the dredge site.

Beach Site: Samples shall be collected at least 300 meters up-current from any portion of the beach that has been, or is being, filled during the current construction event, at the same distances offshore as the associated compliance samples.

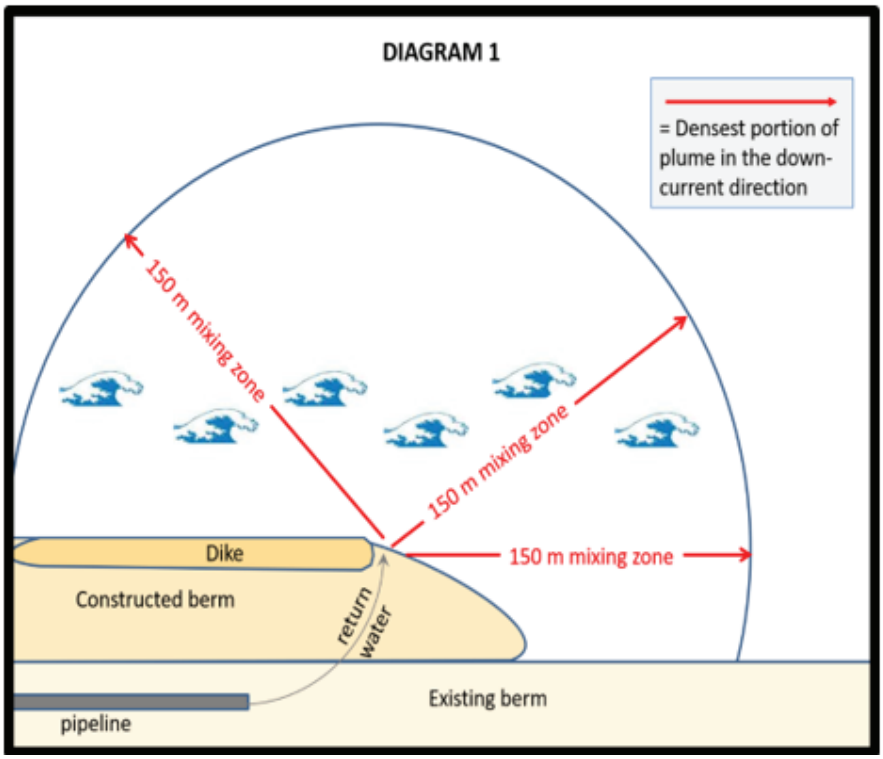
Compliance: Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet).

Dredge Sites more than 1,000 meters from the Nassau River-St. Johns River Aquatic Preserve boundary: 150 meters downcurrent from the cutterhead or the hopper dredge overflow point, **and** from any other source of turbidity generated by the dredge, in the densest portion of any visible turbidity plume. If no plume is visible, follow the likely direction of flow.

Dredge Sites within 1,000 meters of the Nassau River-St. Johns River Aquatic Preserve boundary: 1,000 meters downcurrent from the cutterhead or the hopper dredge overflow point, **and** from any other source of turbidity generated by the dredge, in the densest portion of any visible turbidity plume. If no plume is visible, follow the likely direction of flow.

Beach Site: Samples shall be collected 150 meters down-current from the point where the return water from the dredged discharge reenters the Atlantic Ocean. *Note: If the plume flows parallel to the shoreline, the densest portion of the plume may be close to shore, in shallow water. In*

that case, it may be necessary to access the sampling location from the shore, in water that is too shallow for a boat. See Diagram 1.



Intermediate Monitoring (required when using a mixing zone that exceeds 150 meters in size): Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet). At points approximately150, 500, and 750 meters downcurrent from the point where the return water from the dredged discharge reenters the Atlantic Ocean (if those points are located inside the mixing zone), within the densest portion of any visible turbidity plume generated by this project. These measurements will be used to calibrate the size of the mixing zone for future events.

Calibration: The instruments used to measure turbidity shall be fully calibrated with primary standards within one month of the commencement of the project, and at least once a month throughout the project. Calibration with secondary standards shall be verified each morning prior to use, after each time the instrument is turned on, and after field sampling using two secondary turbidity "standards" that bracket the anticipated turbidity samples. If the post-sampling calibration value deviates more than 8% from the previous calibration value, results shall be reported as estimated and a description of the problem shall be included in the field notes.

Analysis of turbidity samples shall be performed in compliance with DEP-SOP-001/01 FT 1600 Field Measurement of Turbidity: http://publicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/ft1600.pdf

If the turbidity monitoring protocol specified above prevents the collection of accurate data, the person in charge of the turbidity monitoring shall contact the JCP Compliance Officer to establish a more appropriate protocol. Once approved in writing by the Department, the new protocol shall be implemented through an administrative permit modification.

24. The **compliance** locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the **compliance** sites that are greater than **29 NTUs** above the corresponding background turbidity levels **outside of the Nassau River-St. Johns River Aquatic Preserve,** or **17 NTUs** above the corresponding background turbidity levels when the plume extends into **the Nassau River-St. Johns River Aquatic Preserve**, construction activities shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Any such occurrence shall also be immediately reported to the JCP Compliance Officer via email at JCPCompliance@dep.state.fl.us and include in the subject line, "TURBIDITY EXCEEDANCE", and the Project Name and Permit Number. Also notify the Department's Northeast District office.

Any project-associated turbidity source other than dredging or fill placement for beach nourishment (e.g., scow or pipeline leakage) shall be monitored as close to the source as possible. If the turbidity level exceeds 29 NTUs above background, or 17 NTUs within the Aquatic Preserve, the construction activities related to the exceedance shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. This turbidity monitoring shall continue every hour until background turbidity levels are restored or until otherwise directed by the Department. The Permittee shall notify the Department, by separate email to the JCP Compliance Officer, of such an event within 24 hours of the time the Permittee first becomes aware of the discharge. The subject line of the email shall state "OTHER PROJECT-ASSOCIATED DISCHARGE, TURBIDITY EXCEEDANCE".

a. When reporting a turbidity exceedance, the following information shall also be included:

   i. the Project Name;

   ii. the Permit Number;

   iii. location and level (NTUs above background) of the turbidity exceedance;

iv. the time and date that the exceedance occurred; and

v. the time and date that construction ceased.

b. Prior to re-commencing the construction, a report shall be emailed to the Department with the same information that was included in the "Exceedance Report", plus the following information:

i. turbidity monitoring data collected during the shutdown documenting the decline in turbidity levels and achievement of acceptable levels;

ii. corrective measures that were taken; and

iii. cause of the exceedance.

25. **Turbidity Reports:** All turbidity monitoring data shall be submitted within one week of analysis. The data shall be presented in tabular format, indicating the measured turbidity levels at the compliance sites for each depth, the corresponding background levels at each depth and the number of NTUs over background at each depth. Any exceedances of the turbidity standard (29 NTUs above background or 17 NTUs within the Aquatic Preserve) shall be highlighted in the table. In addition to the raw and processed data, the reports shall also contain the following information:

a. time of day samples were taken;

b. dates of sampling and analysis;

c. coordinates of sample and source. *When possible, coordinates should be provided in decimal degrees with a 5 decimal level of precision (i.e., 0.00001). Please also indicate the datum*;

d. depth of water body;

e. depth of each sample;

f. antecedent weather conditions, including wind direction and velocity;

g. tidal stage and direction of flow;

h. water temperature;

i. a geo-referenced map, overlaid on an aerial photograph, indicating the sampling locations (background and compliance), location of active construction, the visible

plume pattern and direction of flow. The map shall also include the boundaries of any benthic resources and the Aquatic Preserve, where applicable. A sample map shall be submitted to and reviewed by the Department prior to construction;

j. a statement describing the methods used in collection, handling, storage and analysis of the samples;

k. a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection, calibration of the meter, accuracy of the data and precision of the GPS measurements; and

l. When samples cannot be collected, include an explanation in the report. If unable to collect samples due to severe weather conditions, include a copy of a current report from a reliable, independent source, such as an online weather service.

Monitoring reports shall be submitted by email to the Department's JCP Compliance Officer. In the subject line of the reports, include the Project Name, Permit Number and the dates of the monitoring interval. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the Department's JCP Compliance Officer, on the cover page to the submittal and at the top of each page, please state: **"This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0187721-013-JC, for the South Amelia Island Beach Nourishment"**

26. Monitoring and reporting of the permitted project shall be conducted in accordance with the Physical Monitoring Plan dated October 26, 2020. The approved Physical Monitoring Plan can be revised at any later time by written request of the Permittee and with the written approval of the department. If subsequent to approval of the plan there is a request for modification of the permit, the department may require revised or additional monitoring requirements as a condition of approval of the permit modification.

27. **Post-Construction Meeting.** Within 60 days following each construction activity authorized by this permit, the Permittee shall hold a post-construction conference. Attendees shall include at minimum, the Permittee, Agent, Department representative, and FWC representative.

EXECUTION AND CLERKING:
Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Gregory W. Garis.
Program Administrator
Beaches, Inlets and Ports Program
Office of Resilience and Coastal Protection

Attachment(s):

1. Approved Permit Drawings (15 pages, signed and sealed October 26, 2020)
2. Physical Monitoring Plan (dated October 26, 2020)
3. Sediment QA/QC Plan (dated August 24, 2019)

CERTIFICATE OF SERVICE
The undersigned duly designated deputy clerk hereby certifies that this permit and all attachments were sent on the filing date below.

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to Section 120.52, F. S., with the designated Department Clerk, receipt of which is hereby acknowledged.

Jacob Koerner — 3/22/2021

Clerk **Date**

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE
U.S. Fish and Wildlife Service
August 12, 2013

The eastern indigo snake protection/education plan (Plan) below has been developed by the U.S. Fish and Wildlife Service (USFWS) in Florida for use by applicants and their construction personnel. At least **30 days prior** to any clearing/land alteration activities, the applicant shall notify the appropriate USFWS Field Office via e-mail that the Plan will be implemented as described below (North Florida Field Office: jaxregs@fws.gov; South Florida Field Office: verobeach@fws.gov; Panama City Field Office: panamacity@fws.gov). As long as the signatory of the e-mail certifies compliance with the below Plan (including use of the attached poster and brochure), no further written confirmation or "approval" from the USFWS is needed and the applicant may move forward with the project.

If the applicant decides to use an eastern indigo snake protection/education plan other than the approved Plan below, written confirmation or "approval" from the USFWS that the plan is adequate must be obtained. At least 30 days prior to any clearing/land alteration activities, the applicant shall submit their unique plan for review and approval. The USFWS will respond via e-mail, typically within 30 days of receiving the plan, either concurring that the plan is adequate or requesting additional information. A concurrence e-mail from the appropriate USFWS Field Office will fulfill approval requirements.

The Plan materials should consist of: 1) a combination of posters and pamphlets (see **Poster Information** section below); and 2) verbal educational instructions to construction personnel by supervisory or management personnel before any clearing/land alteration activities are initiated (see **Pre-Construction Activities** and **During Construction Activities** sections below).

POSTER INFORMATION

Posters with the following information shall be placed at strategic locations on the construction site and along any proposed access roads (a final poster for Plan compliance, to be printed on 11" x 17" or larger paper and laminated, is attached):

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

SIMILAR SNAKES: The black racer is the only other solid black snake resembling the eastern indigo snake. However, black racers have a white or cream chin, thinner bodies, and WILL BITE if handled.

LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands

and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION UNDER FEDERAL AND STATE LAW: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

IF YOU SEE A <u>LIVE</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the live eastern indigo snake sufficient time to move away from the site without interference;
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A <u>DEAD</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

Telephone numbers of USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

PRE-CONSTRUCTION ACTIVITIES

1. The applicant or designated agent will post educational posters in the construction office and throughout the construction site, including any access roads. The posters must be clearly visible to all construction staff. A sample poster is attached.

2. Prior to the onset of construction activities, the applicant/designated agent will conduct a meeting with all construction staff (annually for multi-year projects) to discuss identification of the snake, its protected status, what to do if a snake is observed within the project area, and applicable penalties that may be imposed if state and/or federal regulations are violated. An educational brochure including color photographs of the snake will be given to each staff member in attendance and additional copies will be provided to the construction superintendent to make available in the onsite construction office (a final brochure for Plan compliance, to be printed double-sided on 8.5" x 11" paper and then properly folded, is attached). Photos of eastern indigo snakes may be accessed on USFWS and/or FWC websites.

3. Construction staff will be informed that in the event that an eastern indigo snake (live or dead) is observed on the project site during construction activities, all such activities are to cease until the established procedures are implemented according to the Plan, which includes notification of the appropriate USFWS Field Office. The contact information for the USFWS is provided on the referenced posters and brochures.

DURING CONSTRUCTION ACTIVITIES

1. During initial site clearing activities, an onsite observer may be utilized to determine whether habitat conditions suggest a reasonable probability of an eastern indigo snake sighting (example: discovery of snake sheds, tracks, lots of refugia and cavities present in the area of clearing activities, and presence of gopher tortoises and burrows).

2. If an eastern indigo snake is discovered during gopher tortoise relocation activities (i.e. burrow excavation), the USFWS shall be contacted within one business day to obtain further guidance which may result in further project consultation.

3. Periodically during construction activities, the applicant's designated agent should visit the project area to observe the condition of the posters and Plan materials, and replace them as needed. Construction personnel should be reminded of the instructions (above) as to what is expected if any eastern indigo snakes are seen.

POST CONSTRUCTION ACTIVITIES

Whether or not eastern indigo snakes are observed during construction activities, a monitoring report should be submitted to the appropriate USFWS Field Office within 60 days of project completion. The report can be sent electronically to the appropriate USFWS e-mail address listed on page one of this Plan.

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

IF YOU SEE A LIVE EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site without interference.
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate U.S. Fish and Wildlife Service (USFWS) office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A DEAD EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

Killing, harming, or harassing indigo snakes is strictly prohibited and punishable under State and Federal Law.

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

SIMILAR SNAKES: The black racer is the only other solid black snake resembling the eastern indigo snake. However, black racers have a white or cream chin, thinner bodies, and WILL BITE if handled.

LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

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- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate U.S. Fish and Wildlife Service (USFWS) office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

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- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida ES Office – (904) 731-3336
Panama City ES Office – (850) 769-0552
South Florida ES Office – (772) 562-3909

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

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Killing, harming, or harassing indigo snakes is strictly prohibited and punishable under State and Federal Law.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

LEGAL STATUS: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

August 12, 2013

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

Please read the following information provided by the U.S. Fish and Wildlife Service to become familiar with standard protection measures for the eastern indigo snake.

AS-BUILT CERTIFICATION BY PROFESSIONAL ENGINEER

Submit this form and one set of as-built engineering drawings to the U.S. Army Corps of Engineers, Enforcement Section, 701 San Marco Boulevard, Jacksonville, Florida, 32207. If you have questions regarding this requirement, please contact the Enforcement Branch at 904-232-3131.

1. Department of the Army Permit Number: SAJ-2001-03870(PRJ)

2. Permittee Information:

Name: _____

Address: _____

_____

3. Project Site Identification (physical location/address):

_____

_____

_____

4. As-Built Certification: I hereby certify that the authorized work, including any mitigation required by Special Conditions to the permit, has been accomplished in accordance with the Department of the Army permit with any deviations noted below. This determination is based upon on-site observation, scheduled, and conducted by me or by a project representative under my direct supervision. I have enclosed one set of as-built engineering drawings.

_____ _____

Signature of Engineer Name (*Please type*)

_____ _____

(FL, PR, or VI) Reg. Number Company Name

_____ _____ _____

City State ZIP

(Affix Seal)

_____ _____

Date Telephone Number

Identify any deviations from the approved permit drawings and/or special conditions (attach additional pages if necessary):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Prepared by:
Permittee: _____
Address: _____
_____
Phone:_____

NOTICE OF DEPARTMENT OF THE ARMY PERMIT

TAKE NOTICE the U.S. Army Corps of Engineers (Corps) has issued Department of the Army Permit SAJ-2001-03870 to SAISSA, FDEP, and Nassau County (Permittee) on , 200 , authorizing impacts to waters of the United States (including wetlands) in accordance with Section 404 of the Clean Water Act on a parcel of land known as Folio/Parcel ID: _____ encompassing _____ acres located within a portion of Section _____, Township _____ south, Range _____ east, _____, _____ County, Florida.

Within 30 days of any transfer of interest or control of that portion of the premises containing the area authorized to be filled (or any portion thereof), the Permittee must notify the Corps in writing of the property transfer by submitting the completed permit transfer page of the permit. Notification of the transfer does not by itself constitute a permit transfer. Therefore, purchasers of that portion of the premises containing the area authorized to be filled (or any portion thereof) are notified that it is unlawful for any person to construct, alter, operate, maintain, remove or abandon any works, including dredging or filling, without first having obtained a permit from the Corps in the purchaser's name.

The subject Permit concerns only that portion of the property determined to fall within the jurisdiction of the Corps and this notice is applicable only to those portions of the subject property containing areas authorized to be filled and wetland mitigation/conservation areas subject to the Permit.

Conditions of the Permit: The Permit is subject to General Conditions and Special Conditions which may affect the use of the subject property. Accordingly, interested parties should closely examine the entire Permit, all associated applications, and any subsequent modifications.

To obtain a copy of the permit in its entirety submit a written request to:
U.S. Army Corps of Engineers
Regulatory Division - Special Projects & Enforcement Branch
Post Office Box 4970
Jacksonville, Florida 32232-0019

Questions regarding compliance with these conditions should be directed to:
U.S. Army Corps of Engineers
Enforcement Section
Post Office Box 4970
Jacksonville, Florida 32232-0019

Conflict Between Notice and Permit
This Notice of Permit is not a complete summary of the Permit. Provisions in this Notice of Permit shall not be used in interpreting the Permit provisions. In the event of conflict between this Notice of Permit and the Permit, the Permit shall control.

This Notice is Not an Encumbrance
This Notice is for informational purposes only. It is not intended to be a lien, encumbrance, or cloud on the title of the premises.

Release
This Notice may not be released or removed from the public records without the prior written consent of the Corps.

This Notice of Permit is executed on this _____ day of _____, 20____. This document is being submitted for recordation in the Public Records of _____ County, Florida as part of the requirement imposed by Department of the Army Permit No SAJ-2001-03870 issued by the Corps.

Permittee:
_____
Address:
_____
_____
____
Phone:_____
___

STATE OF FLORIDA
COUNTY OF _____

The foregoing instrument was acknowledged before me this _____day of _____, 20____, by _____, who is personally known to me or has produced _____ as identification.

_____
Notary Public

(seal)

_____
Print

My Commission Expires_____

CS-20-206
NC 21-008

NOTICE TO PROCEED

PROJECT: **BID NO. NC21-008**
Board of County Commissioners, Nassau County, FL (OWNER)
South Amelia Island Dredging & Beach Nourishment Project

DATE: May 26, 2021

TO: SJ Hamill Construction Co.
2008 Cherry Ln.
Charleston, SC 29405

As of the date posted above, you are hereby notified to commence work in accordance with the Agreement dated May 18, 2021, and you are to fully and satisfactorily complete the work to the point of Final Acceptance on, or before December 15, 2021.

ISSUED BY: Nassau County Board of County Commissioners

BY: _____
(Authorized Signature)

Megan K. Diehl, OMB Director
(TYPED NAME & TITLE)

ACCEPTANCE OF NOTICE TO PROCEED

Receipt of the above NOTICE TO PROCEED is hereby acknowledged this 27th day of May, 20 21.

SJ Hamill Construction Company, LLC
(CONTRACTOR)

_____
(SIGNATURE)

President
(TITLE)