THE GOVERNING BOARD OF THE
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
NEWTON PARK DREDGING DESIGN
REQUEST FOR QUALIFICATIONS 38343

The Governing Board of the St. Johns River Water Management District (the "District") requests that interested parties respond to the solicitation below by 2:00 p.m., April 6, 2023. Further information is available through DemandStar at *Demandstar.com* [(800) 711-1712], Vendor Registry at *Vendorregistry.com*, or the District's website at *sjrwmd.com*. Solicitation packages may be obtained from DemandStar, Vendor Registry, or the District by calling or emailing Amy Lucey, Senior Procurement Specialist, at 321-409-2156 or ALucey@sjrwmd.com. Responses will be opened at the Palm Bay Service Center, 525 Community College Parkway SE., Palm Bay, FL 32909.

The objective of this project is to complete final design and permitting of dredging previously investigated in the *Preliminary Dredging Design, Newton Park, Lake Apopka at Winter Garden, Florida (2013)* and the *Site Placement Area Alternative Analysis and Recommendation (2018)*, Exhibit A, both prepared by Taylor Engineering, Inc. Other tasks will include:

1) evaluation of dredge material characteristics, along with risks to wildlife at proposed placement site(s), and
2) evaluation of the placement site and method proposed in the 2018 conceptual design, and
3) evaluation of alternative local methods of handling and dewatering of dredged material.

The successful Respondent shall work closely with the District to incorporate site-specific placement constraints associated with the project.

The estimated budget for the project is $300,000.00.

The District's Evaluation Committee will meet at the Palm Bay Service Center, 525 Community College Parkway SE, Palm Bay, FL 32909, to evaluate and rank Submitttals as follows:

- 10:00 a.m., on April 13, 2023, to
  - Discuss the responses
  - Finalize the initial ranking
  - Determine a shortlist of Respondents
- 10:00 a.m., May 11, 2023 to
  - Negotiate professional fees and project costs with the top-ranked Respondent as authorized by the District's Governing Board at its May 9, 2023, meeting.

Americans With Disabilities Act (ADA)

The District does not discriminate on the basis of disability in its services, programs, or activities. Special accommodations for disabilities may be requested through Amy Lucey, or by calling (800) 955-8771 (TTY), at least five business days before the date needed.

INSTRUCTIONS TO RESPONDENTS

1. CONTRACT ADMINISTRATION

All inquiries related to this solicitation may only be directed to the Procurement Specialist:

Amy Lucey, Senior Procurement Specialist Phone: 321-409-2156 Email: ALucey@sjrwmd.com

Between the release of this solicitation and the posting of the notice of intended decision, Respondents to this solicitation or persons acting on their behalf may not contact any employee or officer of the District concerning any aspect of this solicitation, except the procurement employee listed above. Violation of this provision is grounds for rejecting a response.

2. WHERE TO DELIVER SUBMITTAL

Responses can now be uploaded directly to www.demandstar.com

OR

The Submittal must be submitted in a sealed envelope to:

Amy Lucey, Senior Procurement Specialist St. Johns River Water Management District Palm Bay Service Center 525 Community College Parkway SE, Palm Bay, FL 32909

If the Submittal is mailed, Respondent must clearly label the Submittal envelope with **large bold, and/or colored lettering (place label on inner envelope if double sealed)** as follows:

SEALED SUBMITTAL — DO NOT OPEN Respondent's Name: ________________________________ Request for Qualifications: 38343 Opening Time: 2:00 p.m. Opening Date: April 6, 2023

3. OPENING OF SUBMITTALS

Respondents or their authorized agents are invited to attend the opening of the Submittals at the following time and place:

2:00 p.m., April 6, 2023 St. Johns River Water Management District Palm Bay Service Center 525 Community College Parkway SE, Palm Bay, FL 32909

The Florida Public Records Act, §119.071(1)(b), Fla. Stat., exempts sealed Submittals from inspection and copying until such time as the District provides notice of an intended decision pursuant to §120.57(3)(a), Fla. Stat., or until 30 days after opening of bids, proposals, submittals, or final replies, whichever is earlier. This exemption is not waived by the public opening of the Submittals.

Unless otherwise exempt, Respondent's Submittal is a public record subject to disclosure upon expiration of the above exemption period. If any information submitted with the Submittal is a trade secret as defined in §812.081, Fla. Stat., and exempt from disclosure pursuant to §815.04, Fla. Stat., Respondent must clearly identify any such material as "CONFIDENTIAL TRADE SECRET" in its Submittal and explain the basis for such exemption. The District reserves the right, in its sole judgment and discretion, to reject a Submittal for excessive or unwarranted assertion of trade secret confidentiality and return the Submittal to Respondent.

4. **PREPARATION AND ORGANIZATION OF SUBMITTALS**

Respondent must submit its response in "digital" format. Instructions for submitting are provided below.

:

1. All blank spaces on the Submittal Form shall be typed or legibly printed in ink.
2. Respondents shall provide and complete the following forms and questionnaires, and include them in their Submittal under the tabs identified below (responses to the forms and questionnaires can be submitted on reproduced copies):

   <u>Tab 1: Firm's and subcontractors' overall qualifications, capabilities and availability to conduct work as presented in the Statement of Work</u>

   a) Description of the Respondent and their overall qualifications and capabilities
   b) Description of subcontractor(s) and their overall qualifications and capabilities
   c) Submittal Form
   d) Certificate as to Corporation Form (District-provided form)
   e) Affidavit as to Non-Collusion and Certification of Material Conformance with Specifications (District-provided form)
   f) Qualifications Form — General (District-provided form)
   g) Proposed Subcontractor Form (District-provided form)
   h) Drug-Free Workplace Form (not required unless there is a tie – District-provided form)
   i) Understanding of requested services
   j) Team organizational structure and specific names, functions, and availability of key personnel
   k) Project management approach and capabilities
   l) Willingness to meet time and budget requirements
   m) Has Respondent been certified by the state of Florida's Office of Supplier Diversity as a woman-, veteran-, or minority-owned business enterprise? (if yes, provide certification)
   n) Has the applicant been certified as a small business? (if yes, provide certification)
   o) Number of employees currently employed by Respondent and its subconsultants; and Respondent's and its subconsultant's average annual volume of work for the past three years
   p) Copies of professional licenses

   <u>Tab 2: Technical qualifications and experience of Key personnel to conduct work as presented in the Statement of Work</u>

   a) A "Letter of Commitment" from a principal of each subcontractor stating that the subcontractor is committed to being a part of Respondent's team
   b) Respondent is responsible for providing information to document its and its subcontractors' past and present experience.

   <u>Tab 3: Relevant Experience and performance on Engineering projects and Construction Services – emphasis on projects conducted within last ten years</u>

   a) Qualifications Form – Client References

b) Qualifications Form – Similar Projects with Respondent prepared documentation

Tab 4: Location of managing firm/project manager

Higher consideration will be given to firms whose managing firm/project manager is located nearest to the project area. The District has selected the location of its Lake Apopka Field Station, 25633 county Road 448A, Mount Dora, FL 32757 for distance calibration purposes.

Tab 5: Volume of District work previously awarded to Respondent

No forms are provided for this criterion — however, the Respondent is responsible to submit documentation as to the volume of work (in dollars) awarded by the District to firm in the past three years, including contracts, work orders and purchase orders.

3. Respondent is encouraged to include as much pertinent data and information under each section as necessary to ensure proper evaluation of its qualifications. Each section shall be evaluated separately on its own merit.
4. Respondent must follow all procedures for electronic submission or the Respondent's Submittal may be determined as "non-responsive" and rejected.
5. Unless directed otherwise, all information required by the solicitation, including the forms and questionnaires listed under Item "A" above must be completed (typed or hand written) and included in the submission in electronic format (forms must be completed and converted/scanned to PDF format (Adobe).
6. All of the forms and questionnaires in the Request for Qualifications package are available upon request in Microsoft® Word to aid the Respondent in providing its Submittal in electronic format.
7. The file-naming conventions for the Submittal shall include:
   a) Submittal: RFQ # Respondent's name (abbreviated) Due Date
      (Example: RFQ _____ ABC Company 11-11-15)
8. The Submittal must include a separator page between each "Tabbed" section:
   a) Example: Tab 1 – Background and Qualifications
9. All electronically submitted files shall be saved to a single CD or pin/thumb/jump drive. The CD or pin/thumb/jump drive MUST be placed in a sealed envelope pursuant to the instructions under Item 3 for sealed responses – **DO NOT SUBMIT YOUR RESPONSE BY EMAIL — THIS WILL RESULT IN THE SUBMITTAL BEING REJECTED AS NON-RESPONSIVE.**
10. **Please do NOT password protect your files.** The District recommends that Respondents confirm their Submittal will open correctly on a non-company owned computer. Any electronic submittal received by the District that does not open on a District-owned computer is subject to rejection as a defective response.

If you need assistance or have any questions about the format, please email or call Amy Lucey at ALucey@sjrwmd.com or 321-409-2156.

In the event you decline to submit a Submittal, the District would appreciate Submittal of the "No Response Form" provided at the end of the "FORMS" section to describe the reason for not submitting a Submittal.

5. INQUIRIES AND ADDENDA

District staff are not authorized to orally interpret the meaning of the specifications or other Agreement documents, or correct any apparent ambiguity, inconsistency, or error therein. In order to be binding upon the District, the interpretation or correction must be given by the Procurement Specialist and must be in writing. The Procurement Specialist may orally explain the District's procedures and assist Respondents in referring to any applicable provision in the Request for Qualifications documents, but the

Respondent is ultimately responsible for submitting the Submittal in the appropriate form and in accordance with written procedures.

Every request for a written interpretation or correction must be received at least nine days prior to opening of Submittals in order to be considered. Requests may be submitted by email to ALucey@sjrwmd.com. Interpretations, corrections, and supplemental instructions will be communicated by written addenda to this solicitation posted by DemandStar and Vendor Registry to all prospective Respondents (at the respective addresses furnished for such purposes) no later than five days before the opening of Submittals.

Submission of a Submittal constitutes acknowledgment of receipt of all addenda. Submittals will be construed as though all addenda had been received. Failure of the Respondent to receive any addenda does not relieve Respondent from any and all obligations under the Submittal, as submitted. All addenda become part of the Agreement.

6. BUDGET

The estimated budget for the Work is $300,000.00. The above amount is an estimate only and does not limit the District in awarding the Agreement. Respondents are cautioned to not make any assumptions from the budget estimate about the total funds available for the Work.. The District retains the right to adjust the estimate in awarding the Agreement. The District also reserves the right to reject all Submittals if subsequent negotiations with qualified Respondents result in costs over this estimated budget amount. In addition, the District reserves the right to increase, decrease, or delete any class, item, or part of the Work in order to reduce costs for any reason. The District may discuss alternatives for reducing the cost of the Work with Respondents and make such modifications as it determines to be in its best interest.

7. MINIMUM QUALIFICATIONS

Respondent must use the "Qualification" forms (General, Similar Projects, and Client References) provided in these documents to document the minimum qualifications listed below. Failure to include these forms with the Submittal may be considered non-responsive.

a. Respondent (or a combination of the firm, individual, or project manager assigned to the work) must have successfully completed at least three projects of a similar nature (lake dredging and spoil-containment area design which includes contaminant risk evaluation for disposal area) within the ten years immediately preceding the date for receipt of Submittals. Each project must have had a project value of at least $100,000.00.

b. Respondent's key personnel must have no less than ten years of experience on projects of the nature specified above.

c. All engineers associated with this work on this project (including subcontractors) must be currently licensed as a professional engineer through the Florida Department of Business and Professional Regulation and must have expertise in the following two disciplines provide copy of license(s) with submittal:

   1. Lake dredging design
   2. Spoil-containment area design

   (Respondent-provided documentation; label and include under Tab 1)

d. All surveyors associated with the work on this project (including subcontractors) must be currently licensed as a professional surveyor through the Florida Department of Agriculture and Consumer Affairs and should have expertise in underwater surveying for dredging projects – provide copy of license(s) with submittal.

(Respondent-provided documentation; label and include under Tab 1)

e. Respondent must provide three client references. At least one of the client references must be from the similar projects listed in response to sub-paragraph (a), above. No more than one of the references may be from completed District projects. If a District project is cited, the evaluation team will use the project's closeout documents and may consult with the District project manager.

(District form and Respondent-provided documentation; label and include under Tab 3)

Irrespective of the minimum qualifications stated above, the District may make such investigations as it deems necessary to determine the ability of the Respondent to perform the Work. The District reserves the right to reject any Submittal if the evidence submitted by such Respondent and/or the District's independent investigation of such Respondent fails to satisfy the District that such Respondent is properly qualified to carry out the obligations of the Agreement and complete the Work in a manner acceptable to the District within the time period specified.

8. **SIGNATURE AND CERTIFICATION REQUIREMENTS**

An individual submitting a Response must sign his/her name therein and state his/her address and the name and address of every other person interested in the Submittal as principal. If a firm or partnership submits the Submittal, state the name and address of each member of the firm or partnership. If a corporation submits the Submittal, an authorized officer or agent must sign the Submittal, subscribing the name of the corporation with his or her own name and affixing the corporate seal. Such officer or agent must also provide the name of the state under which the corporation is chartered, and the names and business addresses of the President, Secretary, and Treasurer. Corporations chartered in states other than Florida must submit evidence of registration with the Florida Secretary of State for doing business in the State of Florida. Respondent must certify that all persons or entities having an interest as principal in the Submittal or in substantial performance of the Work have been identified in the Submittal forms.

9. **DISQUALIFICATION OF RESPONDENTS**

Any of the following causes will be considered as sufficient grounds for disqualification of a Respondent and rejection of the Submittal:

a. Contacting a District employee or officer other than the procurement employee named in this solicitation about any aspect of this solicitation before the notice of intended decision is posted.
b. Submission of more than one Submittal for the same subject matter by an individual, firm, partnership, or corporation under the same or different names;
c. Evidence of collusion among Respondents;
d. Submission of materially false information with the Submittal;
e. Information gained through checking of references or other sources which indicates that Respondent may not successfully perform the Work;
f. Respondent is failing to adequately perform on any existing contract with the District;
g. Respondent has defaulted on a previous contract with the District;
h. The evidence submitted by Respondent, or the District's investigation of Respondent, fails to satisfy the District that Respondent is properly qualified to carry out the obligations of the Agreement in a manner acceptable to the District and within the time period specified;
i. Any other cause that is sufficient to raise doubt regarding the ability of a Respondent to perform the Work in a manner that meets the District's objectives for the Work.

10. REJECTION OF SUBMITTALS

11. WITHDRAWAL OF SUBMITTAL

Respondent may withdraw its Submittal if it submits such a written request to the District prior to the designated date and hour of opening of Submittals. Respondent may be permitted to withdraw its Submittal no later than 72 hours after the Submittal opening for good cause, as determined by the District in its sole judgment and discretion.

12. EVALUATION AND AWARD PROCEDURES

a. Submittals will be evaluated by a staff Evaluation Committee based upon the criteria and weighting set forth in "EVALUATION CRITERIA." The committee members will meet at District headquarters or other location as appropriate to discuss the Submittals and their individual evaluations. Each committee member completes an evaluation form, from which the overall ranking of Submittals is compiled. Evaluation forms may be submitted at or subsequent to the Evaluation Committee meeting. If it is determined that it will assist the committee's evaluation for some or all Respondents to make an oral presentation, such presentations will be scheduled at District headquarters or other location as appropriate.

b. Section 286.0113, Fla. Stat., exempts from being open to the public, any portion of a meeting at which: (1) a negotiation with a Respondent is conducted pursuant to a competitive solicitation; (2) a Respondent makes an oral presentation as part of a competitive solicitation; (3) a Respondent answers questions as part of a competitive solicitation; or (4) negotiation strategies are discussed. Also, recordings of, and any records presented at, the exempt meeting are exempt from §119.07(1) and §24(a), Art. I of the State Constitution (Public Records) until such time as the District provides notice of an intended decision or until 30 days after opening the bids, proposals, submittals, or final replies, whichever occurs earlier. A complete recording shall be made of any portion of an exempt meeting. No portion of the exempt meeting may be held off the record.

c. Pursuant to §286.0113 Fla. Stat., if the District rejects all Submittals and concurrently provides notice of its intent to reissue the competitive solicitation, any recordings or records presented at any exempt meeting relating to the solicitation shall remain exempt from §119.07(1) and §24(a), Art. I of the State Constitution (Public Records) until such time as the District provides notice of an intended decision concerning the reissued competitive solicitation or until the District withdraws the reissued competitive solicitation. A recording and any records presented at an exempt meeting are not exempt for longer than 12 months after the initial District notice rejecting all Submittals.

d. Following the evaluation process, the District will submit the final ranking of Submittals to the Governing Board for approval, except for those instances in which the authority to approve and execute the Agreement has been delegated by the Governing Board to the Executive Director, or designee. All Respondents will be notified in writing of the Evaluation Committee's final ranking of Submittals.

e. The Committee will meet to evaluate and rank the Submittals in the location(s), time(s) and date(s), stated at the beginning of this Request for Qualifications package.

f. Contract negotiations will then commence with the Respondent submitting the highest-ranked Submittal. If negotiations fail with the highest-ranked Respondent, negotiations will proceed with the other Respondents in ranked order.

g. The Agreement will be awarded to the Respondent having the highest ranked Submittal, which successfully concludes negotiations with the District (the "Successful Respondent"). The Agreement may be modified based on the District's acceptance of any alternatives listed in this Request for Qualifications that the District deems in its best interest.

h. If two or more Submittals are equal in all respects, the Agreement will be awarded as follows: (1) to the Respondent that certifies compliance with §287.087, Fla. Stat., via the Drug-Free Workplace Form; (2) to a Respondent university in the State University System pursuant to §373.63, Fla. Stat.;.

i. The District reserves the right to award the Agreement to the next highest ranked and available Respondent in the event the Successful Respondent fails to enter into the Agreement, or the Agreement with said Respondent is terminated within 90 days of the effective date.

j. All Respondents will be notified of the District's intent to award or decision to award the Agreement. For the purpose of filing a protest under §120.57(3), Fla. Stat., the time period will commence as provided in “NOTICES AND SERVICES THEREOF.”

13. EVALUATION CRITERIA: NEWTON PARK DREDGING DESIGN

Responses shall include sufficient information and documentation. Responses shall be evaluated using the criteria set forth below. The evaluation rating scale is as follows or as indicated for each criterion:

More adequate	8 – 10	Less adequate	1 – 4
Adequate	5 – 7	Not covered in submittal	0

	CRITERIA	SCORE	WEIGHT	TOTAL
1	**Respondent's and subconsultants' overall qualifications, capabilities, and availability to conduct work as presented in the Statement of Work** a) Knowledge of subject b) Understanding of requested services c) Willingness to meet time and budget requirements d) Description of the Respondent and their overall qualifications and capabilities e) Woman-, veteran-, or minority-owned business enterprise certified by state of Florida Office of Supplier Diversity (if yes, provide certification) f) Small business certification (if yes, provide certification) g) Number of employees currently employed by Respondent and its subconsultants; and Respondent's and its subconsultant's average annual volume of work for the past ten years		30%	
2	**Technical qualifications and experience of key personnel to conduct work as presented in the Statement of Work** a) Allocation of staff b) Management methods c) A "Letter of Commitment" from a principal of each subcontractor stating that the subcontractor is committed to being a part of Respondent's team d) Dredging — Safety and Environmental Protection Plans e) Commitment to project completion within time and budget constraints f) Qualifications, resumes, licenses, certifications or industry recognitions g) Hours committed to project h) Special expertise of personnel i) Demonstrate experience with the design and permitting of dredging projects, j) Demonstrate experience with the design and permitting of dredged wetland placement of material and/or alternative disposal or reuse of dredged material, k_ Demonstrate experience in open-water pesticide and contaminant sampling and testing projects, l) Demonstrate the ability to analyze consolidated and unconsolidated sediments, m) Have the capabilities to evaluate constituents as described in the July 2018 Wood Report, Section 6 (Exhibit B), and be experienced with sampling and testing procedures for sediment samples with a high moisture and carbon content. Laboratory sample method detection limits (MDLs) for metals and organochlorine pesticides (OCPs) shall meet or exceed target values in Table A in Statement of Work n) Have the ability to analyze and interpret synthetic precipitation leachate procedure results using EPA Method 1312 for a subset of the sediment samples.		35%	
3	**Relevant experience and performance on Engineering projects and Construction Services — emphasis on projects conducted within last ten years** a) Client Reference Form b) Similar Projects Form and Respondent-prepared documentation c) List of dredging projects completed within the past ten years		30%	
4	**Location of Respondent's Management Office or Project Manager relative to the project area** Higher consideration will be given to firms whose managing firm/project manager is located nearest to the project area. The District has selected the location of it Lake Apopka Field Station 25633 County Road 448A, Mount Dora, FL 32757 for distance calibration purposes • Within 0 - 75 miles of project = **10 points** • Within 75 - 150 miles from project = **5 points** • Greater than 150 miles from project = **0 points**		2%	

5	**Volume of District work previously awarded to Respondent** Submit documentation as to the volume of work (in dollars) awarded by the District to Respondent in the past five years, including contracts, work orders, and purchase orders. Points will be allocated from 0 to 10; Respondents with higher awarded contract totals in the last five years based on the solicitation date of this RFQ shall receive fewer award points. Respondents with no previous work awards may receive the highest allocation of points (10). Respondent with the highest volume of work will receive zero points. The District shall rely on its official financial records to resolve any discrepancies. Contracts, work orders, and purchase orders issued by the District in the last five years shall be included in this total even if Respondent has not yet received payment. The District shall calculate scores as follows: The amount (in dollars) awarded to the Respondent with the highest volume of work in the last five years shall represent the Allocation Basis Total (ABT). The ABT less a Respondent's total volume of work awarded shall be divided by the ABT and then multiplied by 10; the result rounded to the tenths shall represent the Respondent's score for this criterion.		3%	
	TOTAL		100%	

14. **EXECUTION OF AGREEMENT**

Submittal of a Response binds the Successful Respondent to perform the Work upon acceptance of the and execution of the Agreement by the District.

Unless all Responses are rejected, a contract substantially in the form included in these documents will be provided to the Successful Respondent, who must execute and return the Agreement to the District within ten days of the date of receipt, along with the following:

a. A completed Internal Revenue Service Form W-9
b. Satisfactory evidence of all required insurance coverage
c. Proof satisfactory to the District of the authority of the person or persons executing the Agreement on behalf of Respondent
d. All other information and documentation required by the Agreement

The District will not execute the Agreement until the above documents have been executed and delivered to the District. The Agreement will not be binding until executed by the District. A copy of the fully executed Agreement will be delivered to the Successful Respondent. The District reserves the right to cancel award of the Agreement without liability at any time before the Agreement has been fully executed by all parties and delivered to the Successful Respondent.

Failure upon the part of the Successful Respondent to execute the Agreement or timely submit the required evidence of insurance coverage, or any other matter required by the Agreement, will be just cause, if the District so elects, for the recommended award to be annulled.

15. **EXAMINATION OF AGREEMENT DOCUMENTS AND WORK AREA**

Respondent is solely responsible for being fully informed of the conditions under which the Work is to be performed in relation to existing conditions. Respondent is responsible for carefully examining the general area of the Work, the requirements of the drawings and other contract documents related to the Work, the time in which the Work must be completed, and any other details of the Work. Respondent must satisfy itself from its own personal knowledge and experience or professional advice as to the character of the Work, the conditions and materials to be encountered, the character, quality, and quantities of the Work, and any other conditions affecting the Work, including surrounding land.

Failure to satisfy the obligations of this paragraph will not relieve a Successful Respondent of its obligation to furnish all material, equipment, and labor necessary to perform the Agreement and to complete the Work for the consideration set forth in its response, awarded Contract or fee schedule. Any such failure will not be sufficient cause to submit a claim for additional compensation.

No verbal agreement or conversation with any District officer, agent or employee, either before or after the execution of the Agreement, will affect or modify any of its terms.

16. **DIVERSITY**

The District is committed to the opportunity for diversity in the award and performance of all procurement activities. The District encourages its Respondents to make a good faith effort to ensure that women and minority-owned business enterprises (W/MBE) are given the opportunity for maximum participation as second and lower tier participants. The District will assist Respondents by sharing information on W/MBEs to encourage their participation.

17. **FLORIDA SALES TAX**

The District is exempt from payment of State of Florida sales tax pursuant to §212.08(6), Fla. Stat. Any tangible personal property that is the subject of this Request for Qualifications is intended to remain tangible personal property and not become part of a public work owned by the District.

18. **PUBLIC ENTITY CRIMES/DISCRIMINATORY VENDORS**

In accordance with §287.133 and §287.134, Fla. Stat., a person or affiliate who has been placed on the convicted or discriminatory vendor lists following a conviction for a public entity crime or placement on the discriminatory vendor list may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies 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 §287.017 for CATEGORY TWO ($35,000) for a period of 36 months following the date of being placed on the convicted or discriminatory vendor lists.

19. **USE BY OTHER FLORIDA GOVERNMENTAL ENTITIES**

Respondent may provide services to other State of Florida governmental entities pursuant to the terms and conditions of the Agreement. These governmental entities include other water management districts, state of Florida agencies (including members of the state university system and community college system), counties, school boards, municipalities, special districts, and other local public agencies or authorities. References to the St. Johns River Water Management District in the Agreement will be replaced with the purchasing entity and the District will not be a party to any other governmental entity's agreement to purchase. Nor will the District be responsible for payment for any goods or services delivered or performed for any other governmental entity that utilizes Respondent pursuant to this paragraph.

20. **NOTICES AND SERVICES THEREOF**

The District will publish notice of specifications and criteria, including addenda, intended agency decisions, or other matters pertinent to this solicitation on Onvia DemandStar at *DemandStar.com* and Vendor Registry at *vendorregistry.com*. Onvia DemandStar and Vendor Registry may also be accessed through the District's web site at *sjrwmd.com*. In addition, the District will post notices of intended agency decisions at the District's headquarters, 4049 Reid Street, Palatka, Florida, Administration Building, Procurement Bulletin Board, on the date the publication is posted on Onvia DemandStar and Vendor Registry.

Notices will be posted for a minimum of 72 hours. The time period for filing a Notice of Protest pursuant to §120.57(3), Fla. Stat., and Rule 28-110.003, Fla. Admin. Code, commences at the time notices are posted.

As a courtesy to Respondents, the District may send copies of the notices of intended agency decisions via email or facsimile to Respondent. These courtesy communications neither constitute official notice nor vary the times of receipt set forth above.

21. **PROTEST PROCEDURES**

Pursuant to§120.57(3), Fla. Stat., and Rule 28-110.003, Fla. Admin. Code, any person adversely affected by the procurement methodology described herein, or the specifications or criteria, including addenda, must file a Notice of Protest within 72 hours after its posting.

Pursuant to §120.57(3), Fla. Stat., and Rule 28-110.003, Fla. Admin. Code, any person adversely affected by a District decision or intended decision to award a contract, or to reject all bids, proposals, or qualifications, must file a written Notice of Protest within 72 hours after posting of the decision or intended decision.

Pursuant to §120.57(3), Fla. Stat., and Rule 28-110.004, Fla. Admin. Code, the protester must also file with the District Clerk a Formal Written Protest within ten days after the date the Notice of Protest is filed with the District. The Formal Written Protest must state with particularity the facts and law upon which the protest is based. Pursuant to §287.042(2)(c), Fla. Stat., any person who files an action protesting the decision or intended decision must post with the District Clerk at the time of filing the formal written protest a bond, cashier's check, or money order made payable to the St. Johns River Water Management District in an amount equal to one percent (1%) of the District's estimated contract amount.

No additional time will be added for mailing. All filings must comply with Rule 28-106.104, Fla. Admin. Code, and must be addressed to and received by the District Clerk at the District Headquarters in Palatka, Florida within the prescribed time periods. The District will not accept as filed any electronically transmitted facsimile pleadings, petitions, Notice of Protest or other documents.

The District's acceptance of pleadings, petitions, Notice of Protest, Formal Written Protest, or other documents filed by email is subject to certain conditions set forth in the District's Statement of Agency Organization and Operation (issued pursuant to Rule 28-101.001, Florida Administrative Code), which is available for viewing at sjrwmd.com. These conditions include, but are not limited to, the document being in the form of a PDF or TIFF file and being capable of being stored and printed by the District.

Failure to file a protest within the time prescribed in §120.57(3), Fla. Stat., or failure to post the bond or other security required by law within the time allowed for filing a bond will constitute a waiver of proceedings under chapter 120, Fla. Stat. Mediation under §120.573, Fla. Stat., is not available.

FORMS

SUBMITTAL FORM

Include this form in the response

RESPONDENT:

The undersigned, as Respondent, hereby declares and certifies that the only person(s) or entities interested in this submittal as principal(s), or as persons or entities who are not principal(s) of the Respondent but are substantially involved in performance of the Work, is or are named herein, and that no person other than herein mentioned has any interest in this submittal or in the Agreement to be entered into; that this submittal is made without connection with any other person, company, or parties making a submittal; and that this submittal is in all respects fair and in good faith without collusion or fraud.

Respondent represents to the District that, except as may be disclosed in an addendum hereto, no officer, employee or agent of the District has any interest, either directly or indirectly, in the business of Respondent to be conducted under the Agreement, and that no such person shall have any such interest at any time during the term of the Agreement, should it be awarded to Respondent.

Respondent further declares that it has examined the Agreement and informed itself fully in regard to all conditions pertaining to this solicitation; it has examined the specifications for the Work and any other Agreement documents relative thereto; it has read all of the addenda furnished prior to the submittal opening, as acknowledged below; and has otherwise satisfied itself that it is fully informed relative to the Work to be performed.

The District anticipates qualifying and negotiating fee schedules with up to five Respondents. Respondent agrees that if its submittal is accepted, Respondent shall contract with the District in the form of the attached Agreement and shall furnish everything necessary to complete the Work in accordance with the time for completion specified in the Agreement and shall furnish the required evidence of the specified insurance.

Acknowledgment is hereby made of the following addenda (identified by number) received:

Addendum No.	Date	Addendum No.	Date
____________	____________	____________	____________
____________	____________	____________	____________
____________	____________	____________	____________

____ ____________________________
Respondent (firm name) Date

____
Address

____
Email address

____ ____________________________
Signature Telephone number

____ ____________________________
Typed name and title Fax number

PROPOSED SUBCONTRACTORS

Include this form in the response

Respondent must submit with its Submittal a list of all known subcontractors who will participate in more than ten percent of the Work by providing the information requested below. Acceptance of the Submittal does not constitute approval of the subcontractors identified with the Submittal.

1. Name and address of subcontractor: ______________________________

   ____

   Description of work: ______________________________

   ____

   Estimated value of Work:______________________________

   Anticipated License Utilized to Obtain a Permit (include classification and issuing authority): ________

   ____

2. Name and address of subcontractor: ______________________________

   ____

   Description of work: ______________________________

   ____

   Estimated value of Work:______________________________

   Anticipated License Utilized to Obtain a Permit (include classification and issuing authority): ________

   ____

3. Name and address of subcontractor: ______________________________

   ____

   Description of work: ______________________________

   ____

   Estimated value of Work:______________________________

   Anticipated License Utilized to Obtain a Permit (include classification and issuing authority): ________

   ____

4. Name and address of subcontractor: ______________________________

   ____

   Description of work: ______________________________

   ____

   Estimated value of Work:______________________________

   Anticipated License Utilized to Obtain a Permit (include classification and issuing authority): ________

   ____

5. Name and address of subcontractor: ______________________________

   ____

Description of work: ____

____

Estimated value of Work:____

Anticipated License Utilized to Obtain a Permit (include classification and issuing authority): _______

____

6. Name and address of subcontractor: ____

____

Description of work: ____

____

Estimated value of Work:____

Anticipated License Utilized to Obtain a Permit (include classification and issuing authority): _______

____

CERTIFICATE AS TO CORPORATION

Include this form in the response

The below Corporation is organized under the laws of the State of ________________; is authorized by law to respond to this Request for Qualification and perform all work and furnish materials and equipment required under the Agreement, and is authorized to do business in the state of Florida.

Corporation name: ____

Address: ____

Registration No.: ____

Registered Agent: ____

By: _________________________________

____
(Official title)

(Affix corporate seal)

Attest: ______________________________
(Secretary)

The full names and business or residence addresses of persons or firms interested in the foregoing submittal as principals or officers of Respondent are as follows (specifically include the President, Secretary, and Treasurer and state the corporate office held of all other individuals listed):

____

____

____

____

Identify any parent, subsidiary, or sister corporations involving the same or substantially the same officers and directors that will or may be involved in performance of the Project, and provide the same information requested above on a photocopy of this form.

____

____

____

If applicable, attach a copy of a certificate to do business in the state of Florida, or a copy of the application that has been accepted by the state of Florida to do business in the state of Florida, for the Respondent and/or all out-of-state corporations that are listed pursuant to this form.

AFFIDAVIT AS TO NON-COLLUSION AND CERTIFICATION OF
MATERIAL CONFORMANCE WITH SPECIFICATIONS

Include this form in the response

STATE OF ______________________

COUNTY OF ____________________

I, the undersigned, ______________________________ being first duly sworn, depose and say that:

1. I am the owner or duly authorized officer, representative, or agent of:
   ____
   the Respondent that has submitted the attached submittal.
2. The attached submittal is genuine. It is not a collusive or sham submittal.
3. I am fully informed respecting the preparation and contents of, and knowledgeable of all pertinent circumstances respecting the attached submittal.
4. Neither Respondent nor any of its officers, partners, owners, agents, representatives, employees, or parties in interest, including this affiant, has in any way colluded, conspired, connived, or agreed, directly or indirectly, with any other Respondent, firm, or person to submit a collusive or sham submittal in connection with the Agreement for which the attached response has been submitted, or to refrain from submitting in connection with such Agreement, or has in any manner, directly or indirectly, sought by agreement, collusion, communication, or conference with any other Respondent, firm, or person to fix the price or prices in the attached submittal of any other Respondent, or to fix any overhead, profit, or cost element of the submittal prices or the submittal price of any other Respondent, or to secure through collusion, conspiracy, connivance, or unlawful agreement any advantage against the District or any other person interested in the proposed Agreement.
5. The attached submittal is fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Respondent or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.
6. No official or other officer or employee of the District, whose salary or compensation is payable in whole or in part by the District, is directly or indirectly interested in this submittal, or in the supplies, materials, equipment, work, or labor to which it relates, or in any of the profits therefrom.
7. Any materials and equipment proposed to be supplied in fulfillment of the Agreement to be awarded conform in all respects to the specifications thereof. Further, the proposed materials and equipment will perform the intended function in a manner acceptable and suitable for the intended purposes of the District.

Signature: ____________________________________

Title: ____

Subscribed and sworn to before me this _______ day of _______________, 20 ___.

Notary Public, state of _________________ at Large

My commission expires:

(SEAL)

QUALIFICATIONS — GENERAL

Include this form in the response

As part of the submittal, Respondent shall complete the following so that the District can determine Respondent's ability, experience, and facilities for performing the Work.

Name of Respondent: ____

Year company was organized/formed: __________________________

Number of years Respondent has been engaged in business under the present firm or trade name: __________

Total number of years Respondent has experience in similar lake dredging and spoil-containment area design which includes contaminant risk evaluation for disposal area is work described in the INSTRUCTIONS TO RESPONDENTS: ________________________________

Has Respondent previously been engaged in the same or similar business under another firm or trade name? If so, please describe each such instance.

____

____

____

____

Has Respondent ever been adjudicated bankrupt, initiated bankruptcy, or been the subject of bankruptcy proceedings on behalf of the current entity submitting this submittal or a prior entity that Respondent substantially operated or controlled? If yes, please describe the nature and result of those proceedings and the entity involved.

____

____

____

____

Describe the background/experience of the person or persons who will be primarily responsible for directing the Work that will be performed pursuant to this submittal. This inquiry is intended to encompass the project manager and/or superintendent who will be engaged on a daily basis in directing performance of the Work.

____

____

____

____

QUALIFICATIONS — SIMILAR PROJECTS

Include this form in the response

Respondent (or a combination of the firm, individual, or project manager assigned to the work) must have successfully completed at least three similar projects within the ten years immediately preceding the date set for receipt of the response, as described in the INSTRUCTIONS TO RESPONDENTS. Each project shall have had a project value of at least $100,000.00. (Add additional sheet for optional additional completed projects.)

Completed Project 1:

Agency/company: ____

Current contact person at agency/company: ______________________________

Telephone: ______________ Fax: ________________ Email: __________________________

Address of agency/company: ______________________________________

Name of project: ____

Description: ____

____

____

Project value: __________ Start date: ____________ Completion date: ______________________
(month/year) (month/year)

Name(s) of assigned personnel:

Project manager: ____

Others: ____

____

Completed Project 2:

Agency/company: ____

Current contact person at agency/company: ______________________________

Telephone: ______________ Fax: ________________ Email: __________________________

Address of agency/company: ______________________________________

Name of project: ____

Description: ____

____

____

Project value: __________ Start date: ____________ Completion date: ______________________
(month/year) (month/year)

Name(s) of assigned personnel:

Project manager: ____

Others: ____

____

Completed Project 3:

Agency/company: ____

Current contact person at agency/company: ____

Telephone: ________________ Fax: __________________ Email: ______________________________________

Address of agency/company: ____

Name of project: ____

Description: ____

____

____

Project value: ____________ Start date: ______________ Completion date: ______________________________

(month/year) (month/year)

Name(s) of assigned personnel:

Project manager: ____

Others: ____

____

QUALIFICATIONS — CLIENT REFERENCE

Include this form in the response

Respondent must provide three client references. At least one of the client references must be from the similar projects listed in response to Paragraph 7. MINIMUM QUALIFICATIONS. No more than one of the references may be from completed District projects. If a District project is cited, the evaluation team will use the project's closeout documents and may consult with the District project manager.

Client Reference 1:

Agency/company: ____

Current contact person at agency/company:____

Telephone: __________________ Fax: ___________________ E-mail: __________________________

Agency/Company Address: ____

Name of project: ____

Description: ____

____

Project value: _______________________ Project manager: ________________________________

Client Reference 2:

Agency/company: ____

Current contact person at agency/company:____

Telephone: __________________ Fax: ___________________ E-mail: __________________________

Agency/Company Address: ____

Name of project: ____

Description: ____

____

Project value: _______________________ Project manager: ________________________________

Client Reference 3:

Agency/company: ____

Current contact person at agency/company:____

Telephone: __________________ Fax: ___________________ E-mail: __________________________

Agency/Company Address: ____

Name of project: ____

Description: ____

Project value: _______________________ Project manager: ________________________________

DRUG-FREE WORKPLACE FORM

This form required only in the event of a tie response

The Respondent, (business name) ____, in accordance with §287.087, Fla. Stat., hereby certifies that Respondent does the following:

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

2. Publishes a statement notifying employees that

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

   b. as a condition of working on the contractual services that are the subject of this solicitation, 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 contendere to, any violation of chapter 893, Fla. Stat., 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.

3. Gives each employee engaged in providing the contractual services that are the subject of this solicitation a copy of the statement specified in paragraph 2, above.

4. Imposes 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 convicted of a violation listed in sub-paragraph 2.b., above.

5. Makes a good faith effort to continue to maintain a drug-free workplace through implementation of §287.087, Fla. Stat.

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

By: ____

Title: ____

Date: ____/

NO RESPONSE FORM

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
REQUEST FOR QUALIFICATIONS 38343

Your reasons for not responding to this Request for Qualifications are valuable to the St. Johns River Water Management District's procurement process. Please complete this form and return it to the Office of Financial Services no later than the date set for receipt of submittals. Thank you for your cooperation.

Please check (as applicable):

______ Specifications too "general" (explain below)

______ Insufficient time to respond to the solicitation

______ Do not provide this type of work for this project

______ Schedule would not permit us to perform

______ Unable to meet solicitation specifications

______ Specifications unclear (explain below)

______ Disagree with solicitation or Agreement terms and conditions (explain below)

______ Other (specify below)

Remarks: ____

____

____

____

____

DATE

____

RESPONDENT (FIRM NAME)

____

ADDRESS

____

E-MAIL ADDRESS

________________________________ ________________________________

SIGNATURE | TYPED NAME AND TITLE

________________________________ ________________________________

TELEPHONE NUMBER | FAX NUMBER

AGREEMENT
BETWEEN THE
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
AND ________________________ FOR
NEWTON PARK DREDGING DESIGN

THIS AGREEMENT is entered into by and between the GOVERNING BOARD of the ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (the "District"), whose address is 4049 Reid Street, Palatka, Florida 32177-2571, and ________________________ ("Consultant"), whose address is ________________________. All references to the parties hereto include the parties, their officers, employees, agents, successors, and assigns.

In consideration of the payments hereinafter specified, Consultant agrees to furnish and deliver all materials and perform all labor required for 38343, Newton Park Dredging Design (the "Work"). In accordance with RFQ 38343, Consultant shall complete the Work in conformity with this Agreement, which consists of and incorporates all of the following documents: (1) advertisement for bids, proposals, or qualifications; (2) Instructions to Respondents; (3) addenda; certifications, and affidavits; (4) bid, proposal, or qualifications submittals; (5) Agreement, including the Statement of Work, and any Special Conditions or other attachments. If any provision in the body of this Agreement conflicts with any attachment hereto, the body of this Agreement shall prevail. This Agreement, including attachments, shall take precedence over all solicitation documents (items 1 – 4). The parties hereby agree to the following terms and conditions.

1. **TERM**

(a) The term of this Agreement shall be from the Effective Date to the Completion Date. Time is of the essence for each and every aspect of this Agreement. Where additional time is allowed to complete the Work, the new time limit shall also be of the essence. All provisions of this Agreement that by their nature extend beyond the Completion Date survive termination or expiration hereof.

(b) **Effective Date.** The Effective Date is the date upon which the last party to this Agreement has dated and executed the same.

(c) **Completion Date.** The Completion Date of this Agreement is twenty-four (24) months from the effective date, unless extended by mutual written agreement of the parties.

(d) **Commencement of Work.** Consultant shall commence the Work within 14 days of issuance of a Contract by the District. This date shall be known as the "Commencement Date." Consultant shall prosecute the Work regularly, diligently, and uninterruptedly so as to complete the Work ready for use in accordance with the Statement of Work and the time for completion stated therein. Consultant shall not commence the Work until any required submittals are received and approved.

2. **DELIVERABLES**

(a) The Work is specified in the Statement of Work, Attachment A. Consultant shall deliver all products and deliverables as stated therein, and shall correct errors or omissions without additional compensation. In addition to hard copies, all written deliverables (reports, papers, analyses, etc.) shall be submitted in machine readable form in formats consistent with the District's standard software products, which include the Microsoft® Office Suite (Word, Excel, Access, and PowerPoint). Other formats may be accepted if approved by the District's Project

Manager. If the Statement of Work does not include assistance in litigation undertaken or defended by the District, Consultant agrees to testify and assist the District in any such litigation that is dependent upon or related to the Work, except suits or claims between the parties, at the hourly rate provided in the Statement of Work. This obligation shall survive termination or expiration of this Agreement.

(b) If not otherwise addressed in the Statement of Work, upon written request, Consultant shall submit written progress reports to the District's Project Manager at the frequency requested in a form approved by the Project Manager at no additional cost to the District. The progress report shall provide an updated progress schedule, taking into account all delays and approved changes in the Work. Failure to provide a progress report will be cause to withhold payment.

3. **OWNERSHIP OF DELIVERABLES** All deliverables, including Work not accepted by the District, are District property when Contractor has received compensation therefor, in whole or in part. Any District source documents or other District or non-District documents, specifications, materials, reports, or accompanying data developed, secured, or used in the performance of the Work, excluding proprietary materials, as outlined in a Statement of Work, are District property and shall be safeguarded and provided to the District upon request. District plans and specifications shall not be used on other work and, with the exception of the original plans and specifications, shall be returned to the District upon request. This obligation shall survive termination or expiration of this Agreement.

4. **FUNDING OF AGREEMENT**

(a) For satisfactory performance of the Work, the District agrees to pay Contractor $ To Be Determined (the "Total Compensation").

Funding for each fiscal year is subject to District Governing Board budgetary appropriation.

5. **PAYMENT OF INVOICES**

(a) Consultant shall submit itemized invoices on a monthly basis for the work by one of the following two methods: (1) by email to acctpay@sjrwmd.com (preferred) or (2) by mail to the St. Johns River Water Management District, Finance Director, 4049 Reid Street, Palatka, Florida 32177-2571. Each invoice shall be submitted in detail sufficient for proper pre-audit and post-audit review. If necessary for audit purposes, Contractor shall provide additional supporting information as required to document invoices

(b) **End of District Fiscal Year Reporting.** The District's fiscal year ends on September 30. Irrespective of the invoicing frequency, the District is required to account for all encumbered funds at that time. When authorized under the Agreement, submittal of an invoice for Work completed as of September 30 satisfies this requirement. The invoice shall be submitted no later than October 30. If the Agreement does not authorize submittal of an invoice for Work completed as of September 30, Consultant shall submit, prior to October 30, a description of the additional Work completed between the last invoice and September 30, and an estimate of the additional amount due as of September 30 for such Work. If there have been no prior invoices, Consultant shall submit a description of the Work completed on the project through September 30 and a statement estimating the dollar value of that Work as of September 30.

(c) **Final Invoice.** The final invoice must be submitted no later than 45 days after the Completion Date; provided, however, that when the Completion Date corresponds with the end of the District's fiscal year (September 30), the final invoice must be submitted no later than 30 days after the Completion Date. **Final invoices that are submitted after the requisite date shall be subject to a penalty of ten percent of the invoice. This penalty may be waived by the**

District, in its sole judgment and discretion, upon a showing of special circumstances that prevent the timely submittal of the final invoice. Consultant must request approval for delayed submittal of the final invoice not later than ten days prior to the due date and state the basis for the delay.

(d) **Required Invoice Information**. All invoices shall include the following information: (1) District contract number; (2) District encumbrance number; (3) District work-order number; (4) Consultant's name and address (include remit address, if necessary); (5) Consultant's invoice number and date of invoice; (6) District Project Manager; (6) Consultant's Project Manager; (7) supporting documentation as to cost and/or project completion (as per the cost schedule and other requirements of the Statement of Work; (8) Progress Report (if required). Invoices that do not correspond with this paragraph shall be returned without action, stating the basis for rejection. Payments shall be made within 45 days of receipt of an approved invoice. Disputes regarding invoice sufficiency are resolved pursuant to the dispute resolution procedure of this Agreement.

(e) **Travel expenses.** If the cost schedule for this Agreement includes a line item for travel expenses, travel expenses shall be drawn from the project budget and are not otherwise compensable. If travel expenses are not included in the cost schedule, they are a cost of providing the service that is borne by Consultant and are only compensable when specifically approved by the District as an authorized District traveler. In such instance, travel expenses must be submitted on District or State of Florida travel forms and shall be paid pursuant to District Administrative Directive 391.

(f) **Payments.** Absent exceptional circumstances, Consultant is required to sign up and receive payment(s) electronically from the District via Automated Clearing House (ACH) payment.

(g) **Payments.** The District shall pay Consultant 100% of each approved invoice.

6. **PAYMENT AND RELEASE.** Upon satisfactory completion of the Work, the District will provide Consultant a written statement accepting all deliverables. Consultant's acceptance of final payment shall constitute a release in full of all Consultant claims against the District arising from the performance of this Agreement, with the exception of any pending claims for additional compensation that have been documented and filed as required by this Agreement.

7. **PAYMENT OF LABORERS, SUBCONTRACTORS, MATERIAL SUPPLIERS, AND MATERIALMEN, PURSUANT TO §218.735 FLA. STAT.**

   If Consultant receives a payment from the District for labor, services, or materials furnished by subcontractors and suppliers hired by the Consultant, Consultant must remit payment due to those subcontractors and suppliers within 10 days after Consultant's receipt of payment in accordance with section 218.735, Fla. Stat.

8. **INDEMNIFICATION.** Consultant shall indemnify and hold harmless, release, and forever discharge the District, its public officers, employees, agents, representatives, successors, and assigns, from any and all liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees, arising from or caused by the Consultant, its employees or subcontractors, in the performance of the Work. Consultant shall further indemnify the District for all costs and penalties the District incurs related to any failure to offer Patient Protection and Affordable Care Act compliant health care coverage to Consultant-employees performing under this contract.

9. **INSURANCE.** Consultant shall acquire and maintain all insurance required by Attachment B, Insurance Requirements, and shall not commence Work until it has provided Certificates of Insurance to the District as per Attachment B. Receipt of Certificates of Insurance indicating less coverage than required does not constitute a waiver of the Insurance Requirements. Consultant waives its right of recovery against the District to the extent permitted by its insurance policies. Consultant's insurance

shall be considered primary, and District insurance shall be considered excess, as may be applicable to Consultant's obligation to provide insurance.

10. **CONTRACTUAL LIMITATION OF LIABILITY PURSUANT TO §558.0035 FLA. STAT. PURSUANT TO §558.0035, FLORIDA STATUTES, AN INDIVIDUAL EMPLOYEE OR AGENT OF CONSULTANT MAY NOT BE HELD INDIVIDUALLY LIABLE FOR ECONOMIC DAMAGES RESULTING FROM NEGLIGENCE UNDER THIS AGREEMENT IF THE CONDITIONS OF SECTION §558.0035 ARE SATISFIED.**

11. **FUNDING CONTINGENCY.** This Agreement is at all times contingent upon funding availability, which may include a single source or multiple sources, including, but not limited to: (1) ad valorem tax revenues appropriated by the District's Governing Board; (2) annual appropriations by the Florida Legislature, or (3) appropriations from other agencies or funding sources. Agreements that extend for a period of more than one Fiscal Year are subject to annual appropriation of funds in the sole discretion and judgment of the District's Governing Board for each succeeding Fiscal Year. Should the Work not be funded, in whole or in part, in the current Fiscal Year or succeeding Fiscal Years, the District shall so notify Consultant and this Agreement shall be deemed terminated for convenience five days after receipt of such notice, or within such additional time as the District may allow. For the purpose of this Agreement, "Fiscal Year" is defined as the period beginning on October 1 and ending on September 30.

12. **PROJECT MANAGEMENT PERSONNEL**

(a) The Project Managers listed below shall be responsible for overall coordination and management of the Work. Either party may change its Project Manager upon three business days' prior written notice to the other party. Written notice of change of address shall be provided within five business days. All notices shall be in writing to the Project Managers at the addresses below and shall be sent by one of the following methods: (1) hand delivery; (2) U.S. certified mail; (3) national overnight courier; (4) email. Notices via certified mail are deemed delivered upon receipt. Notices via overnight courier are deemed delivered one business day after having been deposited with the courier. Notices via email or fax are deemed delivered on the date transmitted and received.

DISTRICT	CONSULTANT
Robert Day, Project Manager	TBD, Project Manager
St. Johns River Water Management District	TBD
4049 Reid Street	TBD
Palatka, FL 32177	TBD
Phone: 386-329-4151	Phone: TBD
Email: rday@sjrwmd.com	Email: TBD

(b) The District's Project Manager shall have sole responsibility for transmitting instructions, receiving information, and communicating District policies and decisions regarding all matters pertinent to performance of the Work.

(c) Consultant shall provide efficient supervision of the Work, using its best skill and attention. The District may request Consultant replace its Project Manager if said manager fails to carry the Work forward in a competent manner, follow instructions or specifications, or for other reasonable cause.

(d) Consultant shall maintain an adequate and competent professional staff. Consultant's employees, subcontractors, or agents shall be properly trained to meet or exceed any specified licensing, training and/or certification applicable to their profession. Upon request, Consultant shall furnish proof thereof.

13. **SCHEDULING AND WORK PLANNING; PROGRESS REPORTING**

(a) **Progress Reports.** Consultant shall provide to the District update/status reports as provided in the Statement of Work. Reports will provide detail on progress of the Work and outline any potential issues affecting completion or the overall schedule. Reports may be submitted in any form agreed to by District's Project Manager and Consultant, and may include emails, memos, and letters.

1. **Progress Meetings.** The District may conduct progress meetings with Consultant on a frequency to be determined by the District. In such event, Consultant shall make available its Project Manager and other appropriate personnel to discuss matters pertinent to the Work.

2. **Failure to Meet Schedule.** If progress of the Work falls five percent or more behind schedule, except as a result of District-approved delays, Consultant shall take all necessary steps to augment the work effort to get the project back on schedule. Should the progress of the Work fall ten percent or more behind schedule, the District may advise Consultant through a "cure" notice that this Agreement is subject to termination for cause if the failure is not cured within the time frame specified in said notice.

14. **FORCE MAJEURE; DELAYS**

(a) **Force Majeure.** Consultant shall not be liable for failure to carry out the terms of this Agreement to the extent such failure is due to a Force Majeure event, except for failures that could have been reasonably foreseen and guarded against so as to avoid or reduce the adverse impact thereof. A Force Majeure event is hereby defined as the failure to carry out any of the terms of this Agreement due to any one of the following circumstances beyond the control of Consultant: (a) the operation and effect of rules, regulations, or orders promulgated by any commission, county, municipality, or governmental agency of the State of Florida or the United States, (b) a restraining order, injunction, or similar decree of any court of competent jurisdiction, (c) war, (d) flood, (e) earthquake, (f) fire, (g) severe wind storm, (h) acts of public disturbance, (i) quarantine restrictions, (j) epidemics, (k) strikes, (l) freight embargoes, or (m) sabotage. The times specified herein for performances include delays that can ordinarily be anticipated due to adverse weather conditions. The District is not obligated to grant an extension of time due to adverse weather conditions unless such conditions rise to the level of Force Majeure.

(b) **Delay.** Consultant shall not be compensated for delays caused by Consultant's inefficiency, rework made necessary by Consultant's error, failure to perform the Work as scheduled, or any other corrective or productivity measures made necessary by errors, omissions, or failures to properly perform the Work. Within ten days after the onset of a delay, Consultant shall notify the District in writing of the delay, which shall provide: (1) a detailed description the delay and its probable duration, (2) the specified portion of the Work affected, and (3) an opinion as to the cause of the delay and liability (if any) for the delay. Notices provided more than ten days after the inception of the delay shall only be effective as to additional costs or delay incurred during the ten day period preceding receipt of such notice. In the case of continuing cause delay for the same cause, only one notice of delay is necessary. **Failure to provide this notice waives any claim for extension of time or additional compensation resulting from such delay**. If the delay is due to the failure of another District contractor to complete its work in a timely manner, changes ordered in the Work, a Force Majeure event, or any other cause which the District, in its sole judgment and discretion, determines to justify the delay, then the Completion Date may be extended as necessary to compensate for the delay. All time extensions shall be in the form of a written amendment signed by both parties.

15. **AMENDMENTS; EMERGENCY CHANGES IN WORK**

(a) **Amendments.** The parties may not amend this Agreement except in writing. Modifications that alter, add to, or deduct from the Work, or otherwise modify the terms of this Agreement, shall be implemented through a change order or formal amendment, specifying the nature of the change and any associated change in the Total Compensation and/or Completion Date. The District's Project Manager may also issue a District Supplemental Instruction (DSI) form (Attachment C) to authorize minor adjustments to the Work that are consistent with the purpose of the Work. Both parties must sign the DSI. A DSI may not be used to change the Total Compensation, quantity, quality or the Completion Date of the Work, or to change or modify the Agreement.

(b) **Emergency Changes in Work.** In the event an emergency endangering life or property requires immediate action, the District may give Consultant an oral instruction to proceed with an emergency change in the Work, which will be confirmed in writing within five days. Within 15 days after commencement of the emergency change in the Work, Consultant shall provide the District with a written estimate of any increased costs or delays as a result thereof. **Failure to so notify the District constitutes a waiver of any right to an extension of time or increase in compensation**. Within 15 days after receipt of Consultant's estimate, the parties shall negotiate a Change Order. If unable to reach agreement, disputed issues shall be resolved pursuant to the dispute resolution procedure. In no event shall Consultant decline to perform the emergency change in the Work.

16. **TERMINATION AND SUSPENSION**

(a) **District Termination for Cause.** The Agreement may be terminated by the District for cause in the event of any breach hereof, including, but not limited to, Consultant's: (1) failing to carry forward and complete the Work as provided herein; (2) failing to comply with applicable laws, regulations, permits, or ordinances; (3) failing to timely correct defective Work; (4) making a general assignment for the benefit of its creditors; (5) having a receiver appointed because of insolvency; (6) filing bankruptcy or having a petition for involuntary bankruptcy filed against it; (7) failing to make payments when due to subcontractors, vendors, or others for materials or labor used in the Work; (8) making a material misrepresentation to the District regarding the Work, or (9) any other material breach of this Agreement. In such event, the District shall provide Consultant with written notice of its intention to terminate this Agreement, stating the nature of the deficiency and the effective date of termination. At the District's sole judgment and discretion, the District may afford Consultant an opportunity to cure said deficiency, in which event the notice shall specify the time allowed. Upon termination, the District may take possession of the premises and of all materials thereon and finish the Work by whatever means it deems expedient. In such event, Consultant shall not receive any further payment until the Work is completed by the District. Consultant shall be liable for all costs involved in completing the Work, including additional managerial and administrative services, which shall be offset against any amount due to Consultant.

(b) **District Termination for Convenience.** Notwithstanding any other provision hereof, the District may at any time terminate this Agreement or any Work issued under it, in whole or in part, without cause, upon 30 days' written notice to Consultant. In such event, Consultant shall be compensated for any Work performed prior to the date of termination and for materials that were ordered prior to receipt of notice of termination that cannot be returned to the vendor, which shall become District property. Upon receipt of notice, Consultant shall discontinue the Work on the date and to the extent specified therein and shall place no further orders for materials, equipment, services, or facilities, except as needed to continue any portion of the Work not terminated. Consultant shall also make every reasonable effort to cancel, upon terms satisfactory to the District, all orders or subcontracts related to the terminated Work. Consultant may not claim any compensation not specifically provided for herein, including, but not limited to: loss of anticipated profits; idle equipment, labor, and facilities; any additional claims of subcontractors and vendors.

(c) **District Suspension for Cause.** The District may issue a written partial or full Stop Work Notice in the event Consultant fails to comply with or is negligent in performing any provision hereof. All performance shall immediately cease as per such notice and no further billable costs shall be incurred. The District may terminate this Agreement if Consultant fails or refuses to comply with a Stop Work Notice.

(d) **District Suspension for Convenience.** The District may direct Consultant to stop Work, in whole or in part, whenever, in the District's sole judgment and discretion, such stoppage is necessary to ensure proper completion of the Work, avoid injury to third persons, or otherwise meet the District's objectives. The District shall provide Consultant not less than five days' written notice, except in emergency circumstances. Consultant shall immediately comply with such notice. Should such stoppage increase Consultant's cost, an equitable adjustment will be made by Change Order. The notice shall be effective until rescinded in writing, unless the period of suspension is stated in the notice.

(e) Consultant's Right to Stop Work or Terminate Agreement

(i) **Stop Work.** Consultant may stop work only under the following circumstances: (1) the Work is ordered temporarily discontinued by a court or other public authority; (2) it is necessary to stop work in order to protect the safety of Consultant or third persons; or (3) the District fails to pay Consultant when due any undisputed and adequately documented sum certified for payment by the District Project Manager. In such event, Consultant shall provide the District not less than seven days prior written notice of its intention to stop work, except in emergency circumstances or when necessary to prevent injury to persons or property.

(ii) **Termination.** Consultant may terminate this Agreement under only the following circumstances: (1) the Work is ordered discontinued by a court or other public authority, through no act or fault of Consultant, for a period of not less than three months; (2) the District fails to pay Consultant when due any undisputed and adequately documented sum certified for payment by the District Project Manager. In such event, Consultant shall provide not less than 20 days written notice of its intention to terminate and afford the District the opportunity to cure said deficiency within said time period.

(iii) **Duty to Perform.** Except as expressly provided above, in the event of any event, dispute, or other matter arising under this Agreement, Consultant shall fully perform the Work in accordance with the District's written instructions and may claim additional compensation as a Change Order, subject to the dispute resolution procedure.

ADDITIONAL PROVISIONS
(In Alphabetical Order)

17. **DEFINITIONS**

ADDENDA: Written or graphic instruments issued prior to the opening of responses, which make additions, deletions, or revisions to the solicitation or contract documents.

AGREEMENT: The written contract between the District and Consultant covering the Work, which includes all documents attached to this Agreement or incorporated herein by reference. The words "contract" and "Agreement" are synonymous in these documents.

AMENDMENT: Any written change made to the terms and conditions of the Agreement.

BUSINESS DAY: Monday through Friday, excepting those holidays observed by the District.

CHANGE ORDER: A written agreement of the parties after the Commencement Date to amend this Agreement so as to modify the Statement of Work or the Total Compensation or provide for an extension of time.

CONSULTANT: Consultant, its officers, employees, agents, successors, and assigns.

CONSULTANT's PROJECT MANAGER: The individual designated by the Consultant to be responsible for overall coordination, oversight, and management of the Work for Consultant.

PERSON: Any individual, partnership, society, association, joint stock company, corporation, estate, receiver, trustee, assignee, referee, or capacity, whether appointed by a court or others, and any combination of individuals.

DAY: All references to "day" shall be interpreted as a calendar day, unless specifically designated as a business day or holiday.

HOLIDAY: The following holidays as observed by the District: New Year's Day, Birthday of Martin Luther King, Jr., Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving and the Friday after Thanksgiving, and Christmas Day.

PERSON: Any individual, partnership, society, association, joint stock company, corporation, estate, receiver, trustee, assignee, referee, or capacity, whether appointed by a court or others, and any combination of individuals.

REQUEST FOR QUALIFICATIONS: An advertised solicitation for sealed Submittals, with the title, date, and hour of the public opening designated. It includes a detailed description of the services sought, the date for submittal of the response, and all contractual terms and conditions.

RESPONDENT: Any person who submits a response to a solicitation.

STATEMENT OF WORK: The District's written directions, requirements and technical specifications for completing the Work. Standards for specifying materials or testing that are incorporated therein by reference shall have the same force and effect as if fully set forth therein.

SUBCONTRACTORS: Those persons having a direct contract with Consultant relating to performance of the Work, including one who furnishes material worked into a special design in accordance with the plans or specifications of the Work, but not including one who merely furnishes material.

TOTAL COMPENSATION: The total funds to be expended pursuant to this Agreement upon satisfactory completion of the Work.

WORK: All labor, materials, equipment, transportation, supporting documentation, and other products, services, or facilities necessary for complete performance of the Agreement.

18. **ASSIGNMENT AND SUBCONTRACTS.**

(a) Consultant shall not sublet, assign, or transfer any Work involving more than 15% of the total cost of the Work, or assign any monies due hereunder, without the District's prior written consent. As soon as practicable after signing this Agreement, but not less than seven business days prior to the effective date of any subcontracts, Consultant shall notify the District's Project Manager in writing of the name of any subcontractor that has not been previously disclosed in the procurement process. Within five business days the District shall indicate its approval or disapproval, which shall not be unreasonably withheld. Failure to timely provide such approval or disapproval shall constitute approval. Neither District approval of a subcontractor nor any other provision of this Agreement creates a contractual relationship between any subcontractor and the District. Consultant shall be allowed a maximum 5% markup of their subcontractor's work for oversight and management.

(b) Consultant is responsible for fulfilling all work elements in any subcontracts and payment of all monies due. Consultant is fully responsible to the District for the acts and omissions of its subcontractors and persons directly or indirectly employed by them and shall hold the District harmless from any liability or damages resulting from any subcontract to the extent allowed by law.

19. **AUDIT; ACCESS TO RECORDS.** Consultant must preserve its books and other records involving transactions related to this Agreement and provide the District, or its duly authorized representatives, access and necessary facilities to inspect and audit those records for five years after the receipt of funds. If an examination or audit is performed, Consultant must continue to maintain all required records until such audit has been completed and all questions arising from it are resolved. Consultant shall refund any payment(s) that are found to not constitute allowable costs based upon an audit examination.

20. **CIVIL RIGHTS.** Pursuant to chapter 760, Fla. Stat., Consultant shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, pregnancy, or national origin, age, handicap, or marital status.

21. **COOPERATION WITH THE INSPECTOR GENERAL, PURSUANT TO §20.055(5) FLA. STAT.** Consultant and any subcontractors understand and will comply with their duty, pursuant to §20.055(5), Fla. Stat., to cooperate with the inspector general in any investigation, audit, inspection, review, or hearing.

22. **COORDINATION WITH THE DISTRICT AND OTHER DISTRICT CONTRACTORS**

(a) The District may let other contracts in connection with the Work. Wherever work done by the District or another District contractor is contiguous to Consultant's Work, the respective rights of the various interests shall be established by the District so as to secure completion of the Work. Consultant shall arrange its Work so as not to interfere with the District or other District contractors and join its Work to that of others in a proper manner, and in accordance with the intent of the Statement of Work. Consultant shall perform its Work in the proper sequence in relation to that of other District contractors, as may be directed by the District. Consultant shall afford other District contractors reasonable opportunity for introduction and storage of their materials and execution of their work, and shall properly conduct and coordinate its Work with theirs. Consultant shall take into account all contingent work to be done by others and shall not plead its want of knowledge of such contingent work as a basis for delay or non-performance. Consultant shall be liable for any damage it causes to the work performed by other District contractors.

(b) If any part of the Work depends for proper execution or results upon the work of other District contractors, Consultant shall inspect and promptly report any defects in the other contractors' work that render it unsuitable for Consultant's Work. Failure to so inspect and report shall constitute an acceptance of the other contractors' work as fit and proper for the reception of its Work, except as to defects which may develop in the other contractors' work after execution of the Work.

23. **CONTINGENCY FEES.** Pursuant to §287.055(6)(a), Fla. Stat., Consultant warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for Consultant, to solicit or secure this Agreement, and that it has not paid or agreed to pay any person, company, corporation, individual, or firm, other than a bona fide employee working solely for Consultant, any fee, commission, percentage, or other consideration, contingent upon or resulting from the award or making of this Agreement. For breach or violation of these provisions, the District may terminate this Agreement without liability and, at its discretion, deduct from the contract price or otherwise recover the full amount of any such fee, commission, percentage, gift, or other consideration.

24. **CORRELATION AND INTENT OF DOCUMENTS; QUESTIONS OR ISSUES REGARDING PERFORMANCE OF THE WORK**

(a) This Agreement and all attachments are complementary. What is called for by one is as binding as if called for by all. The intent is to include all labor and materials, equipment, transportation, and incidentals necessary for the proper and complete execution of the Work. Materials or work described in words, which so applied have a well-known technical or trade meaning, shall be held to refer to such recognized standards.

(b) It is the District's intention to fully assist Consultant in the successful performance of the Work and to respond in a timely manner to questions or issues that arise. Consultant should discuss any questions or issues with the District's Project Manager and communicate such questions or issues in writing when required by this Agreement. The District shall respond through its Project Manager.

25. **DISPUTE RESOLUTION**

(a) **During the course of work.** In the event any dispute arises during the course of the Work, Consultant shall fully perform the Work in accordance with the District's written instructions and may claim additional compensation. Consultant is under a duty to seek clarification and resolution of any issue, discrepancy, or dispute by submitting a formal request for additional compensation, schedule adjustment, or other dispute resolution to the District's Project Manager no later than 15 days after the precipitating event. If not resolved by the Project Manager within five business days, the Project Manager shall forward the request to the District's Office of General Counsel, which shall issue a written decision within 15 days of receipt. This determination shall constitute final action of the District and shall then be subject to judicial review upon completion of the Work. **Consultant shall proceed with the Work in accordance with said determination. This shall not waive Consultant's position regarding the matter in dispute.**

(b) **Invoices.** In the event the District rejects an invoice as improper, and the Consultant declines to modify the invoice, the Consultant must notify the District in writing within ten days of receipt of notice of rejection that the Consultant will not modify the invoice and state the reason(s) therefor. Within five business days of receipt of such notice, if not informally resolved through discussion with the District Project Manager, the Project Manager shall forward the disputed invoice and the

Consultant's written response to the District's Office of General Counsel. The matter shall then proceed as described in subsection (a), above.

26. **DIVERSITY OPPORTUNITIES.** The District is committed to the opportunity for diversity in its procurement activities, and encourages its prime vendors (contractors and suppliers) to make a good faith effort to ensure that women and minority-owned business enterprises (W/MBE) are given the opportunity for maximum participation as sub-contractors. The District will assist Consultant by sharing information on W/MBEs.

27. **DUTY TO INSPECT AND REPORT DEFICIENCIES IN PLANS AND SPECIFICATIONS**

(a) For any Work that is dependent upon conditions at the worksite, Consultant's acceptance of contract award represents and warrants that Consultant has inspected and satisfied itself concerning the nature and location of the Work and general and local conditions, including, without limitation: (1) conditions affecting transportation, disposal, handling, and storage of materials; (2) availability and quality of labor; (3) availability and condition of roads; (4) climatic conditions and seasons; (5) hydrology of the terrain; (6) topography and ground surface conditions; (7) nature and quantity of surface materials to be encountered; (8) equipment and facilities needed preliminary to and during the Work; and (9) all other matters that can affect the Work and the cost thereof. Consultant's failure to acquaint itself with such conditions will not relieve it from its responsibility for properly estimating the time required or cost of performing the Work. Where the District has investigated subsurface conditions, this data may be provided to Consultant or is available upon request. Consultant must either seek clarification concerning the data or assume the responsibility for its interpretation.

(b) If Consultant discovers hidden or subsurface conditions that differ materially from those normally expected or indicated in the technical specifications, Consultant shall immediately, and before such conditions are disturbed, notify the District in writing of: (1) subsurface or latent physical conditions differing materially from those indicated in the technical specifications, or (2) unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for herein. The District shall promptly investigate the conditions and determine whether they materially differ so as to cause an increase or decrease in Consultant's cost. Where the differing site conditions materially impact Consultant's cost, an equitable adjustment shall be made and the Agreement modified accordingly. No claim will be allowed if Consultant fails to provide the required notice.

(c) If Consultant in the course of the Work finds any defect in the plans and specifications, including, but not limited to, any discrepancy between the drawings and the physical conditions at the worksite, or any errors or omissions in the drawings or in the layout, as given by points and instructions, it shall immediately inform the District in writing, which shall be promptly verified by the District. Any Work done after such discovery, until authorized, will be done at Consultant's risk as to cost overruns and modifications necessary to correct deficiencies in the Work. To ensure the proper execution of its subsequent Work, Consultant shall measure Work already in place or completed and shall immediately report any discrepancy between the executed Work and the drawings or other specifications.

28. **EMPLOYMENT ELIGIBILITY.**

(a) Pursuant to section 448.095, Fla. Stat., Consultant must use the United States Department of Homeland Security's E-Verify system ("E-Verify") to verify the work authorization status of all newly hired employees during the term of this Agreement. Within 30 days of this Agreement's Effective Date, Consultant must provide the District with evidence that Consultant is enrolled in the E-Verify system. Answers to questions regarding E-Verify as well as instructions on enrollment may be found at the E-Verify website: www.e-verify.gov.

(b) Consultant shall include in related subcontracts, if authorized under this Agreement, a requirement that subcontractors performing work or providing services pursuant to this Agreement utilize the E-Verify system to verify employment eligibility of all employees used by the subcontractor for the performance of the Work. The subcontractor must provide Consultant with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. Consultant must maintain a copy of such affidavit for the duration of the Agreement. If the District has a good faith belief that a subcontractor knowingly violated section 448.095, Fla. Stat., and notifies Consultant of such, but the Consultant otherwise complied with the statute, then Consultant shall immediately terminate the contract with the Subcontractor.

29. **GOVERNING LAW, VENUE, ATTORNEY'S FEES, WAIVER OF RIGHT TO JURY TRIAL.** This Agreement shall be construed according to the laws of Florida and shall not be construed more strictly against one party than against the other because it may have been drafted by one of the parties. As used herein, "shall" is always mandatory. In the event of any legal proceedings arising from or related to this Agreement: (1) venue for any state proceedings is Putnam County and federal legal proceedings shall be in Orange County; (2) each party shall bear its own attorney's fees, including appeals; (3) for civil proceedings, the parties hereby consent to trial by the court and waive the right to jury trial.

30. **INTEREST IN THE BUSINESS OF CONTRACTOR; NON-LOBBYING.** Consultant certifies that no officer, agent, or employee of the District has any material interest, as defined in chapter 112, Fla. Stat., either directly or indirectly, in the business of Consultant to be conducted under this Agreement, and that no such person shall have any such interest at any time during the term of this Agreement. Pursuant to §216.347, Fla. Stat., monies received from the District pursuant to this Agreement shall not be used to lobby the Florida Legislature or any other state agency.

31. **INDEPENDENT CONTRACTOR.** Consultant is an independent contractor. Neither Consultant nor Consultant's employees are employees or agents of the District. Consultant controls and directs the means and methods by which the Work is accomplished. Consultant is solely responsible for compliance with all labor and tax laws pertaining to it, its officers, agents, and employees, and shall indemnify and hold the District harmless from any failure to comply with such laws. Consultant's duties include, but not be limited to: (1) providing Workers' Compensation coverage for employees as required by law; (2) hiring employees or subcontractors necessary to perform the Work; (3) providing any and all employment benefits, including, but not limited to, annual leave, sick leave, paid holidays, health insurance, retirement benefits, and disability insurance; (4) payment of all federal, state and local taxes, income or employment taxes, and, if Contractor is not a corporation, self-employment (Social Security) taxes; (5) compliance with the Fair Labor Standards Act, 29 U.S.C. §§ 201, et seq., including payment of overtime as required by said Act; (6) compliance with the Patient Protection and Affordable Care Act 42 U.S.C. §§ 18001, et seq.; and (7) providing employee training, office or other facilities, equipment and materials for all functions necessary to perform the Work. In the event the District provides training, equipment, materials, or facilities to meet specific District needs or otherwise facilitate performance of the Work, this shall not affect Consultant's duties hereunder or alter Consultant's status as an independent contractor. This paragraph does not create an affirmative obligation to provide any employee benefits not required by law.

32. **LAND AND WATER RESOURCES.** Consultant shall not discharge or permit the discharge, directly or indirectly, of any fuels, oils, calcium chloride, acids, insecticides, herbicides, wastes, toxic

or hazardous substances, or other pollutants or harmful materials, onto any lands or into any surface or ground waters, including, but not limited to, streams, lakes, rivers, canals, ditches, or reservoirs. Consultant shall investigate and comply with all applicable federal, state, county, and municipal laws concerning toxic wastes, hazardous substances, and pollution of surface and ground waters. If any waste, toxic or hazardous substance, or other material that can cause pollution, as defined in §403.031, Fla. Stat., is dumped or spilled in unauthorized areas, Consultant shall notify the District thereof within one workday and thereafter shall remove the material and restore the area to its original condition. If necessary, contaminated ground shall be excavated and disposed of as directed by the District and replaced with suitable fill material, compacted and finished with topsoil, and planted as required to re-establish vegetation. All cleanup and disposal costs shall be borne by Consultant.

33. **NUISANCE.** Consultant shall exercise every reasonable means to avoid creating or continuing a public or private nuisance resulting from the Work, including, but not limited to: (1) excessive noise associated with radio or other forms of electronic entertainment for persons at the worksite; (2) dust from construction operations, and (3) the uncontrolled flow of surface waters.

34. **PERMITS AND LICENSES; COMPLIANCE WITH LAW.** Consultant shall comply with all applicable federal, state and local laws and regulations, including those pertaining to health and safety. All materials used and work performed must conform to the laws of the United States, the state of Florida and county and municipal ordinances. Consultant represents and warrants that it is duly licensed to perform the Work in accordance with the laws of the state of Florida and the county or municipality in which the Work is to be performed. Unless otherwise specifically provided for herein, Consultant shall give to the proper authorities all required notices relative to the Work in its charge; obtain and pay for all official permits or any other licenses, including any and all professional licenses required by the nature of the Work; and furnish any bonds, security, or deposits required to permit performance of the Work. Consultant is responsible for the resolution of any issues resulting from a finding of noncompliance by any regulatory agencies, due to the Consultant’s failure to comply with applicable regulatory requirements, including all costs for delays, litigation, fines, or other costs.

35. **PUBLIC RECORDS**

(a) Consultant is responsible for identifying confidential trade secret information as such upon submittal to the District. Notwithstanding any other provision hereof, the District shall not be liable to Consultant for release of confidential information not identified as such upon submittal. If the District receives a public records request that requests information claimed to be confidential by Consultant, the District shall take such steps as are necessary to comply with chapter 119, Fla. Stat., while protecting the confidentiality of trade secret information. In the event of a dispute as to whether the requested information is a trade secret, Consultant shall be liable for all costs incurred by the District resulting from the dispute, including any court costs and attorney’s fees. The calculation of those costs shall not include costs that are charged to the public records requestor.

(b) Consultant shall comply with Florida Public Records law under Chapter 119, Fla. Stat. Records made or received in conjunction with this Agreement are public records under Florida law, as defined in §119.011(12), Fla. Stat. Consultant shall keep and maintain public records required by the District to perform the services under this Agreement.

(c) If Consultant meets the definition of “Contractor” found in §119.0701(1)(a), Fla. Stat.; [i.e., an individual, partnership, corporation, or business entity that enters into a contract for services with a public agency and is acting on behalf of the public agency], then the following requirements apply:

(i) Pursuant to §119.0701, Fla. Stat., a request to inspect or copy public records relating to this Agreement for services must be made directly to the District. If the District does not possess the requested records, the District shall immediately notify the Consultant of the request, and the Consultant must provide the records to the District or allow the records to be inspected or copied within a reasonable time. If Consultant fails to provide the public records to the District within a reasonable time, the Consultant may be subject to penalties under s. 119.10, Fla. Stat.

(ii) Upon request from the District's custodian of public records, Consultant shall provide the District with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Fla. Stat., or as otherwise provided by law.

(iii) Consultant shall identify and ensure that all 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 Agreement term and following completion of the Agreement if the Consultant does not transfer the records to the District.

(iv) Upon completion of the Agreement, Consultant shall transfer, at no cost to District, all public records in possession of Consultant or keep and maintain public records required by the District to perform the services under this Agreement. If the Consultant transfers all public records to the District upon completion of the Agreement, the Consultant shall destroy any duplicate public records that are exempt or confidential and exempt from public disclosure requirements. If the Consultant keeps and maintains public records upon completion of the Agreement, the Consultant shall meet all applicable requirements for retaining public records. All records that are stored electronically must be provided to the District, upon request from the District's custodian of public records, in a format that is accessible by and compatible with the information technology systems of the District.

(d) IF THE CONSULTANT HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLA. STAT., TO THE CONSULTANT'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE DISTRICT'S CUSTODIAN OF PUBLIC RECORDS AT:

District Clerk
St. Johns River Water Management District
4049 Reid Street
Palatka, Florida 32177-2571
(386) 329-4127
clerk@sjrwmd.com

36. **RELEASE OF INFORMATION.** Consultant shall not publish or release any information related to performance of this Agreement, or prepare, publish, or release any news or press release in any way related to this Agreement, without prior District review and written consent.

37. **REMEDIES FOR NON-PERFORMANCE**

(a) **District Remedies.** The remedies enumerated herein are non-exclusive. In addition to the remedies set forth below, the District may avail itself of any statutory and/or common law remedies not set forth herein. In the event of a breach, the District may terminate this Agreement for cause. Alternatively, the District may allow Consultant to correct the deficiency, or may take such action as is necessary to correct such deficiency through District action or that of a third party. Delay or failure by the District to enforce any right or remedy hereunder shall not impair, or be deemed a waiver of, any such right or remedy, or impair the District's rights or remedies for any subsequent breach of this Agreement.

(b) **Consultant Correction of Deficiencies.** The District shall provide Consultant with written notice of deficiency. At the District's sole judgment and discretion, the District may afford an opportunity to correct said deficiency, in which event the notice shall specify the time allowed to cure. If Consultant disputes that a failure of performance has occurred, Consultant shall, nevertheless, perform the corrective action and may submit a request for a Change Order subject to the dispute resolution procedure. Unless authorized through a Change Order, the Completion Date shall not be extended in order to correct deficiencies. Consultant shall bear the cost of correcting all work of other contractors that is destroyed, damaged, or otherwise negatively impacted by its corrective action. Failure to take timely corrective action may result in termination for cause or the District pursuing alternative remedies, as provided herein.

(c) **Alternative Remedies to Correct Deficiency.** If the District determines that it is not in its best interest for Consultant to correct incomplete or damaged Work caused by Consultant's failure of performance, the District may pursue any or all of the following remedies, in whole or in part: (1) accept the Work as is and deduct the reasonable value of the deficient Work from the Total Compensation; (2) complete the Work through the utilization of District employees and deduct the cost thereof from the Total Compensation; (3) contract with a third party to complete the deficient Work and deduct the cost thereof from the Total Compensation.

(d) **District Technical Assistance.** The District may elect to provide technical assistance to Consultant in order to complete satisfactory performance of the Work. If the District is performing a function that Consultant is required to perform, the District may deduct the cost of providing such technical assistance from the Total Compensation. Prior to providing any such technical assistance, the District shall notify Consultant that it considers such assistance to be above and beyond its duties under this Agreement and that it intends to deduct the cost of providing such assistance from the Total Compensation. Consultant shall not be entitled to reject technical assistance when the District determines that such assistance is necessary to complete the Work.

38. **ROYALTIES AND PATENTS.** Consultant certifies that, to the best of its information and belief, the Work does not infringe on any patent rights. Unless provided otherwise herein, Consultant shall: (1) pay all royalties, patent, and license fees necessary for the Work; (2) defend all suits or claims for infringement of any patent rights, and (3) save and hold the District harmless from loss on account thereof; provided, however, that the District shall be responsible for any such losses when the utilization of a particular process or product of a particular manufacturer is specified by the District. If Consultant obtains information that the process or article so specified is a patent infringement, it shall be responsible for such loss unless it promptly so notifies the District.

39. **SAFETY.** For any Work that is to be performed on premises that are owned or controlled by the District (the Premises), Consultant has the sole and exclusive duty for the safety of the premises. Consultant shall provide and maintain sufficient protection for the safety of its employees and other persons who may utilize the Premises, and prevent damage to District property, materials, and equipment. Consultant shall at all times enforce strict discipline and good order among its employees and shall not employ any unfit person or anyone not skilled in the work assigned. Neither Consultant nor its subcontractors shall allow or cause to be allowed any hunting or any weapons, animals, alcohol, or drugs, on or from the Premises or adjacent property. Consultant employees shall not park

their vehicles or store equipment or materials adjacent to roads where it may be a hazard to traffic. A clear distance of at least 30 feet from the edge of the pavement or right-of-way shall be kept free of any obstacles unless otherwise authorized by the District. Consultant shall ensure that only authorized personnel are allowed on the worksite and shall post notices warning both employees and the public of all safety hazards created by Consultant.

40. **SCRUTINIZED COMPANIES.** Consultant certifies that it is not on the Scrutinized Companies that Boycott Israel List or engaged in a boycott of Israel. Pursuant to §287.135, Fla. Stat., the District may terminate this Agreement at its sole option if is found to have submitted a false certification; or if is placed on the Scrutinized Companies that Boycott Israel List or is engaged in the boycott of Israel during the term of the Agreement. If this Agreement is for more than one million dollars, Consultant certifies that it is also not on the Scrutinized Companies with Activities in Sudan, Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria as identified in §287.135, Fla. Stat. Pursuant to §287.135, Fla. Stat., the District may terminate this Agreement at its sole option if Consultant is found to have submitted a false certification; or if Consultant is placed on the Scrutinized Companies with Activities in Sudan List, or Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria during the term of the Agreement.

41. **SURVEYS; PRESERVATION OF MONUMENTS; POINTS AND INSTRUCTION**

    (a) **Surveys.** Consultant is responsible for interim staking during the job and all staking and layout work not otherwise furnished by the District. Consultant shall furnish all construction layout of the Work, including layout, centerline, and grade stakes for access roadways. Consultant shall furnish all personnel, equipment, and materials to make such surveys as are necessary to determine the quantity of Work performed. Field notes and computations for estimates shall be verified by the District's Project Manager as to the quantities estimated.

    (b) **Preservation of Monuments.** Consultant shall maintain and preserve all new and existing benchmarks, monuments, markers, reference points, and stakes established by others and/or the District. Should any of the aforesaid be destroyed or damaged by Consultant, the same shall be replaced by Consultant's licensed land surveyor at no cost to the District. Consultant shall be responsible for the cost of any deficiencies in the Work caused by such loss or disturbance.

    (c) **Points and Instructions.** Consultant shall provide reasonable and necessary opportunities and facilities for setting points and making measurements. Consultant shall not proceed until it has made a timely request to the District for, and has received, such points and instructions as may be necessary as the Work progresses. The Work shall be done in strict conformity with such points and instructions.

42. **TRUTH IN NEGOTIATIONS**. This provision applies only to lump sum or cost-plus-a-fixed-fee contracts entered into in excess of $195,000 (see §287.055(5)(a), Fla. Stat.). Consultant certifies that wage rates and other factual unit costs supporting the compensation are accurate, complete, and current at the time of contracting. The original contract price and any additions shall be adjusted to exclude any significant sums by which the District determines the contract price was increased due to inaccurate, incomplete, or noncurrent wage rates and other actual unit costs.

43. **USE OF COMPLETED PORTIONS OF THE WORK.** The District shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding the fact that the time for completing the entire Work or such portions may not have expired. Such taking of possession and use will not be deemed an acceptance of any Work not completed. If such possession and use increases the cost of or delays the Work, Consultant shall be entitled to a Change

Order for extra compensation, or extension of time, as necessary, to offset the effect of such prior possession and use.

44. **WORK SCHEDULE.** For construction or other services upon District property, no Work shall be accomplished on official holidays or weekends unless approved in advance by the District Project Manager. Unless otherwise approved by the District Project Manager, Consultant's work hours on District property shall not commence before 7:00 a.m. and shall conclude on or before 6:00 p.m. All requests to change the schedule shall be coordinated with the District a minimum of 24 hours in advance of the change and confirmed in writing.

IN WITNESS WHEREOF, the St. Johns River Water Management District has caused this Agreement to be executed on the day and year written below in its name by its Executive Director, or duly authorized designee, and Consultant has caused this Agreement to be executed on the day and year written below in its name by its duly authorized representatives, and, if appropriate, has caused the seal of the corporation to be attached. This Agreement may be executed in separate counterparts, which shall not affect its validity. Upon execution, this Agreement constitutes the entire agreement of the parties, notwithstanding any stipulations, representations, agreements, or promises, oral or otherwise, not printed or inserted herein. This Agreement cannot be changed by any means other than written amendments referencing this Agreement and signed by all parties.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT	CONSULTANT
By: ______________________________	By: ______________________________
Mary Ellen Winkler, Assistant Executive Director, or designee	______________________________ Typed Name and Title
Date: ____________________________	Date: ____________________________
	Attest: ___________________________
	______________________________ Typed Name and Title

Attachments:
Attachment A — Statement of Work/Technical Specifications
Attachment B — Insurance Requirements
Attachment C — District's Supplemental Instructions (sample)
Attachment D - Contract Payment Requirement for State-Funded Cost Reimbursement Contracts
Attachment E– Consultant's Cost Schedule (to be inserted prior to contract execution)

ATTACHMENT A — STATEMENT OF WORK

Final Design and Permitting of Lake Apopka
Newton Park Access Channel/Habitat Dredging and Material Placement

I. INTRODUCTION

Lake Apopka, the headwaters of the Ocklawaha Chain of Lakes, is the fourth largest lake in Florida (approximately 31,000 acres). The lake is located approximately 15 miles northwest of Orlando. Much of the bottom of Lake Apopka is covered by a consolidated muck layer which is mostly plant matter in origin. Above the consolidated muck layer is an unconsolidated flocculant (UCF) layer made up mostly of dead algae. These muck and flocculant layers are a nuisance to boaters and inhibit recovery efforts for submerged aquatic vegetation (SAV) in the lake. The purpose of this project is to design and permit channel dredging and near shore habitat dredging in the vicinity of the Newton Park boat ramp. Placement of dredge material can be on District owned Lake Apopka North Shore (LANS) property or potentially dewatered and used for an alternative beneficial use. The proposed dredging will also provide a Lake Apopka water quality benefit by removing unconsolidated floc easily resuspended by wave energy. Dredging the channel provides a benefit by removing sediment for boat navigation.

II. OBJECTIVES

The objective of this project is to complete final design and permitting of dredging previously investigated in the *Preliminary Dredging Design, Newton Park, Lake Apopka at Winter Garden, Florida (2013)* and the *Site Placement Area Alternative Analysis and Recommendation (2018)*, Exhibit A, both prepared by Taylor Engineering, Inc. Other tasks will include:

1) evaluation of dredge material characteristics, along with risks to wildlife at proposed placement site(s), and
2) evaluation of the placement site and method proposed in the 2018 conceptual design, and
3) evaluation of alternative local methods of handling and dewatering of dredged material.

The Consultant shall work closely with the District to incorporate site-specific placement constraints associated with the project.

III. SCOPE

The Consultant shall be responsible for designing and permitting dredging at the Newton Park boat ramp, Winter Garden, Florida. The Consultant shall also be responsible for designing and permitting the placement of material on the LANS or alternative disposal/reuse site selected by the District.

The Consultant will prepare the dredging, dredge material transport system and placement site design plans and specifications suitable for bid and construction. The Consultant shall provide necessary services to support the design and permitting process; including, but not limited to, surveying, geotechnical evaluations, sediment sampling, sediment testing, vegetation surveys, and listed species surveys. The Consultant will be responsible for submitting and obtaining permits required for this project from the following entities, including but not limited to: the U.S. Army Corps of Engineers (USACE), Florida Department of Environmental Protection (FDEP), Florida Fish and Wildlife Conservation Commission (FFWCC), U.S. Fish and Wildlife Service (USFWS) consultation, and local county/municipalities. The USFWS consultation meets the requirement for coordination with a federal agency that the USACE consults with before issuing a permit. The District will prepare and conduct a biological assessment for the dredge placement areas to assist with permitting, and the Consultant will collaborate with the District using the design plans and specifications.

A LANS placement design should be based on the current permitted Apopka Lake-wide Dredging permit, which may be modified to accommodate this project work. That permit indicates material will be placed in Phase 4 and/or Phase 5 on the LANS from the proposed dredge area (See Figure 1.). Alternatives to LANS property placement for the handling and reuse of dredged material may be proposed by the respondent.

TABLE A

Chemical	MDL
4,4'-DDD	20 ug/kg
4,4'-DDE	25 ug/kg
4,4'-DDT	50 ug/kg
Dieldrin	50 ug/kg
Toxaphene	15 ug/kg
cis-nonachlor	10 ug/kg
gamma-Chlordane	40 ug/kg
Heptachlor	1 ug/kg
Heptachlor epoxide	1 ug/kg
Oxychlordane	3 ug/kg
trans-nonachlor	40 ug/kg
alpha-Chlordane	40 ug/kg
Endrin	1 ug/kg
g-BHC	1 ug/kg
Aldrin	1 ug/kg
Arsenic	2 mg/kg
Barium	15 mg/kg
Chromium	10 mg/kg
Copper	10 mg/kg
Lead	5 mg/kg
Cadmium	0.1 mg/kg

Finally, the Consultant shall evaluate and coordinate with the regulatory agencies establishing the permitting procedure most appropriate for the project. There are currently a USACE Individual (maintenance dredging) Permit, an Orange County Environmental Protection Division (OCEPD) Conceptual Shoreline Alteration/Dredge and Fill Permit, and an FDEP conceptual Environmental Resources Permit included in Exhibits C1, C2, and C3, respectively. Modification of some or all these existing permits may be pursued by the Consultant.

IV. TIMEFRAMES AND DELIVERABLES

Design and permitting of the project are anticipated to require 24 months.

All surveys, survey reports, and engineering documents shall be signed and sealed by a Consultant's Florida Registered Professional Engineer/Surveyor, as applicable. The District will coordinate with the successful Respondent to develop a list of deliverables and the final Statement of Work during the negotiation and contract development process.

Deliverables shall include 30% plans and cost estimate, 60% plans and cost estimate, 90% plans and cost estimate, and final plans, specifications and a detailed final cost estimate and construction schedule. At the 60% design step the consultant shall also prepare draft and final permit applications (or modifications to existing permits) for submission to all applicable permitting authorities, including but not limited to the USACE, FDEP, and the OCEPD. The successful Respondent shall respond to requests for additional information until approved permits are received from all applicable regulatory agencies.

The Consultant will provide all final deliverables in both paper and applicable electronic form (PDF and AutoCAD Civil3D®). All reports and deliverables will remain the property of the District.

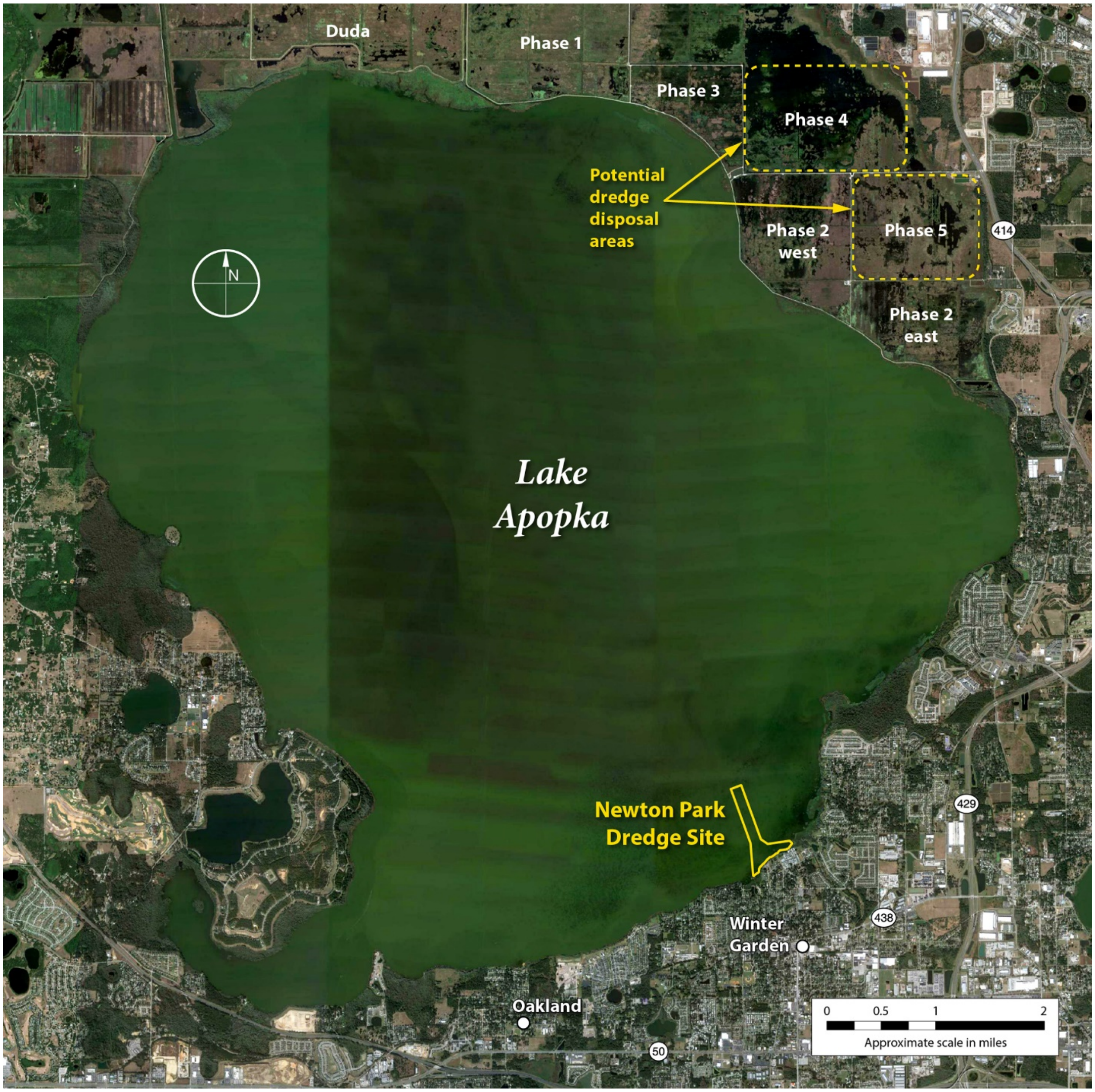

Figure 1.: Newton Park Dredge Site and Potential Dredge Disposal Areas

Exhibits:

Exhibit A– 2013 & 2018 Taylor Reports (PDF)
Exhibit B – 28895 WO 1 Task 1-4 Final July 2018 (PDF)
Exhibit C-1 – Army Corps Permit (PDF)
Exhibit C-2 - Orange County Dredge Permit (PDF)
Exhibit C-3 – FDEP Permit (PDF)

Preliminary Dredging Design, Newton Park, Lake Apopka at Winter Garden, Florida

General Investigation and Feasibility Documentation

Taylor Engineering Project No.: C2012-060
SJRWMD Contract No.: 26908, Work Order No.: 2

Prepared for:

St. Johns River Water Management District

April 2013

TAYLOR ENGINEERING, INC.

Delivering Leading-Edge Solutions

April 26, 2013

Mr. Robert Naleway, P.E.
St. Johns River Water Management District
25633 CR 448A
Mount Dora, FL 32757

Re: Preliminary Dredging Design, Newton Park, Lake Apopka at Winter Garden, Florida
General Investigation and Feasibility Documentation

Dear Mr. Naleway:

At the request of the St. Johns River Water Management District (District), Taylor Engineering, Inc. has completed the authorized preliminary dredging design for Newton Park in Lake Apopka, Winter Garden, Florida.

The District, in coordination with the Florida Fish and Wildlife Conservation Commission (FFWCC), developed a conceptual plan for shoreline and channel dredging near the Newton Park boat ramp on Lake Apopka. The attached report revises the Districts conceptual dredging plan based on data collected by the project team and the results of our evaluation of four dredging alternatives. This report briefly presents our understanding of the existing site conditions, along with our findings and our recommendations in the form of preliminary dredging design documentation.

A deep layer of organic "muck" covers the bottom of Lake Apopka within the proposed project area and most of the lake bottom. This muck layer creates shoreline water depths too shallow for boaters to navigate without disturbing the muck layer. Suspended muck sediments cause two undesirable consequences: the presence of malodorous and aesthetically displeasing black plumes of muck, and damage to boat motor cooling systems from muck entrained in outboard engines.

Based on the bathymetric survey data collected by Degrove Surveyors, Inc., the results of the geotechnical data collected and laboratory testing performed by CSI Geo Inc., and the subsequent analysis performed by Taylor Engineering, we recommend that the SJRWMD not move forward with dredging Lake Apopka until and unless the SJRWMD can consistently keep the lake above an elevation of 65 ft North American Vertical Datum, 1988 (NAVD 88).

Based on our review of the lake-wide bathymetry, the current mean depth at a lake elevation of 65 ft NAVD 88 is approximately 4.31 ft. Only 43.8% of the lake is at depth 60 ft or deeper, while only 6.9% of the lake is at 58 ft or deeper. More importantly, the distance from the Newton Park boat ramp to a lake depth of 5 ft is nearly 6,450 ft (1.22 miles).

Finally, a review of the Upper Ocklawaha River Basin, provisional water level data for the Lake Apopka and Apopka Beauclair Spillway indicate that since December of 2011 Lake Apopka has been at least 1 ft to 2.5 ft below the desired minimum lake elevation of 65 ft NAVD 88.

Therefore, dredging alone will only provide access to a very small section of the lake, especially during periods of lower lake elevations.

While the actual thickness of muck sediments throughout the lake is not important to the average boater, the virtual lake-wide presence of the sediments at shallow depths is. Exacerbating this condition is the fact that wind driven waves and boater disturbance frequently resuspend this muck layer.

If and when the District pursues dredging within Lake Apopka near Newton Park, as detailed in the attached report, Taylor Engineering recommends shoreline dredging and channel dredging near the Newton Park boat ramp on Lake Apopka within the minimal footprint outlined in Option 3 (Appendix D, Figure 3). Because the footprint outlined in Option 3 exceeds the District's project construction budget of $2,740,000, Taylor Engineering recommends either completing the dredging in phases or increasing the District's project construction budget prior to dredging.

Finally, Taylor Engineering recommends that prior to preparation of final design drawings and construction plans, that the District authorizes the collection of water velocity data near the proposed project area. This data should then be input into a numerical model to simulate forces acting upon the sediments.

If you have any questions about this report or our recommendations, please contact me via email at jwagner@taylorengineering.com or (904) 731-7040.

Best Regards,

Joe Wagner, P.E.
Senior Engineer, Waterfront Group

APR 26 2013

Robert J. Wagner
Florida P.E. #63208

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LIST OF APPENDICES

1.0 INTRODUCTION

Lake Apopka, in the headwaters of the Ocklawaha Chain of Lakes, is the third largest lake in Florida (approximately 31,000 acres). The lake is located in Central Florida approximately 15 miles northwest of Orlando. The lake lies mostly within the bounds of Orange County, although the western part of the lake lies in Lake County.

Apopka Spring (a natural spring located at the southwest corner of Lake Apopka), rainfall, and stormwater runoff all feed Lake Apopka. However, the major source of lake water is direct rainfall on the lakes surface. Historically, water left Lake Apopka by sheet flow through the Double Run Swamp marshlands on the northwest side of the lake.

In 1893, the Apopka Canal Company constructed the Apopka-Beauclair Canal connecting Lake Apopka with Lake Beauclair downstream. The canal reduced Lake Apopka's water elevation by approximately three ft and enhanced the farming ventures on the northern shore of the lake (Shofner, 1982).

Currently, water from Lake Apopka flows northward through the Apopka-Beauclair Canal Dam, into the Apopka-Beauclair Canal, then into Lakes Beauclair and Lake Dora. From Lake Dora, water flow continues into Lake Eustis, then into Lake Griffin and then northward into the Ocklawaha River, which subsequently flows into the St. Johns River.

1.1 History

Lake Apopka has a history of more than 100 years of human alteration, beginning with construction of the Apopka-Beauclair Canal in 1890s. Lake Apopka was one of Central Florida’s main attractions through the 1940s. Anglers traveled from throughout the United States to fish for trophy-sized bass in Lake Apopka, and as many as 21 fish camps lined the lake’s shoreline (St. Johns River Water Management District [SJRWMD], 2006). By 1967, nine fish camps were still open. By 1976, only four survived. Today, there are none left (Littlepage, 2013).

The District has traced the decline of Lake Apopka to the decision, in the 1940s, to construct a system of levees along the north shore of the lake to drain over 20,000 acres of shallow marsh for vegetable farming. The discharge of water, rich in nutrients from agricultural and other sources, produced conditions that created a chronic algal bloom and resulted in loss of the lake’s recreational value and game fish populations well into the 1990s (SJRWMD, 2006).

Historically, this shallow lake, approximately 4.3 ft mean depth at a minimal lake elevation of 65 ft North American Vertical Datum, 1988 (NAVD 88), (Appendix A, Figures 1 and 2) received a tremendous amount of nutrients and sediments through the drainage of adjacent farms (mainly vegetables and citrus), sewage effluent discharge, and nitrogen and carbon biological fixation. Consequently, Lake Apopka shifted in 1947 from a clear water state dominated by rooted macrophytes to a turbid hypereutrophic state dominated by phytoplankton (Thomas, S., 2009).

The first recorded lake-wide algal bloom occurred in 1947. Photographic evidence and historic accounts suggest that the increase in phytoplankton and decline in macrophytes occurred over a several-year period from 1947 to 1951. Since the 1950s, the lake has had high levels of phosphorous and nitrogen and high turbidity caused by algae and resuspended sediments (Battoe et al., 1999).

A significant factor in the Lake Apopka limnology is a layer of unconsolidated flocculent sediments (muck) that covers most of the lakebed. Wind-driven waves and boater disturbance frequently suspends this muck layer. Historical evaluation of this sediment layer indicates that it is roughly 98% water, contains 65% organic matter, and meets the definition of fluid mud in that the individual particles are in suspension rather than supported by the particles below. The layer has increased in thickness from about 10 cm in 1968 to 45 cm in 1997 (Schelske, 1997).

In 1987, the Florida Legislature created the Surface Water Improvement and Management (SWIM) Act to protect, restore, and maintain Florida's highly threatened surface water bodies. Under this act, the state's five water management districts identify a list of priority water bodies within their authority and implement plans to improve them. The District targeted Lake Apopka for cleanup under the SWIM (SJRWMD, 2003).

In 1996, Governor Lawton Chiles signed the Lake Apopka Restoration Act (Chapter 96-207, Florida Statutes), furthering the District's previous mandate to clean up the lake by providing funds to buy additional agricultural lands north of the lake. The shuttering of the farms allowed the District to begin plans to convert the fields back to the marsh area it had once been. Restoration of these farmlands to functioning wetlands is expediting cleanup efforts (SJRWMD, 2006).

To date, major cleanup activities include marsh and floodplain restoration and creation of a marsh flow-way system that filters Lake Apopka's waters by circulating lake water through restored wetlands. The primary goal of these efforts to restore the lake's ecosystem was to reduce the amount of phosphorus going into Lake Apopka. This included removing phosphorus and other suspended sediments from the lake (by filtration through the Marsh Flow-Way and by mass removal of gizzard shad, improve the food-web structure by removing gizzard shad), restoration of habitat through restoration of the littoral zone shoreline, and restoration of the north shore farmlands to wetlands.

The Marsh Flow-Way, a constructed wetland, is located along the northwest shore of Lake Apopka and west of the Apopka-Beauclair Canal. It began operation in November 2003 and the goal of the project is to remove phosphorus and suspended material from Lake Apopka water (Dunne et al., 2011).

The Marsh Flow-Way system covers approximately 760 acres and contains four individual wetland cells, in addition to levees, canals, and ditches. The Marsh Flow-Way treats water pumped into it from Lake Apopka. The lake's water has excessive amounts of phosphorus, algae, and suspended matter. The District manually controls water flow, within the cells, by a system of screw gates and riser boards in the individual cells. Most of the cleaner, treated water returns to Lake Apopka, while the remainder flows downstream toward Lake County Water Authority's nutrient removal facility (NuRF) and then down the Apopka Beauclair Canal (SJRWMD, 2006).

In response to the District's efforts, phosphorus levels in Lake Apopka are down by 62 percent, water clarity is 68 percent better than earlier conditions and in response to these improvements, native submersed plants have re-established themselves at almost 200 locations around the lake (SJRWMD, 2006 and Dunne et al., 2011).

As Lake Apopka has shown improvement, the District, the City of Winter Garden, and concerned civic groups, such as the Friends of Lake Apopka, all have begun to look for ways to increase public access to Lake Apopka, including the existing boat ramp at Newton Park. However, the presence of shallow muck sediments near the boat ramp has stymied these efforts. The major benefits of the proposed dredging project include an increase in lake’s depth near Newton Park, thus providing boating and fishing opportunities.

According to Kent Makin, a Winter Garden City Commissioner and competitive angler in Winter Garden whose grandfather was a fishing guide on Lake Apopka during the Lake’s glory years, he has tried unsuccessfully to organize fishing tournaments at Newton Park. However, his efforts have run aground because of the thick, loose muck around the city's boat launch (Hudak, 2012).

“All the boaters say, ‘I’m not launching in that stuff. Our motors suck it all up... It's got to be cleaned out, and it's a pain to clean’. I believe once it's dredged, the water will be deeper there, boats won’t be kicking up all that nasty stuff, and more people will come.”

Makin holds that that a muck-free boat launch will lure anglers to Lake Apopka in the way that the West Orange Trail attracts bicyclists to the City of Winter Garden (Hudak, 2012).

2.0 OBJECTIVES

2.1 Purpose of the Study

A deep layer of organic “muck” covers the bottom of Lake Apopka within the proposed project area and most of the lake bottom. This muck layer creates shoreline water depths too shallow for boaters to navigate without disturbing the muck layer. Suspended muck sediments cause two undesirable consequences: the presence of malodorous and aesthetically displeasing black plumes of muck, and damage to boat motor cooling systems from muck entrained in outboard engines.

The District, in coordination with the Florida Fish and Wildlife Conservation Commission (FFWCC), developed a conceptual plan for shoreline and channel dredging near the Newton Park boat ramp on Lake Apopka. This report revises the Districts conceptual dredging plan based on data collected by the project team and the results of our evaluation of four dredging alternatives. This report briefly presents our understanding of the existing site conditions, along with our findings and our recommendations in the form of preliminary dredging design documentation.

2.2 Study Authority

District Contract No.: 26908, Work Order No. 2 authorized this study.

3.0 METHODS

Numerous publications have documented the restoration of a number of hypereutrophic lakes throughout North America, Canada, and Europe. To a large degree, the success of dredging relates to the adequacy of pre-dredging studies to define clearly the magnitude of the problem and to identify accurately the desired post-dredging condition.

In general, dredging is most cost effective in small lakes with organically rich sediment, low sedimentation rates, and long hydraulic residence times. Pollman et al. (1988) note that with dredging large lakes, the economics become increasingly important as lake surface area increases. Cost increases in larger lakes are non-linear, reflecting not just associated increases in material dredged in larger lakes but also increased pumping costs due to increased pumping distance (reflecting head losses due to friction in the pipe conducting dredged material onshore) across larger lakes (Herbich, 2000).

One of the largest lakes ever dredged is Vancouver Lake, Washington. By comparison, Lake Apopka is nearly 12 times larger (Pollman et al., 1988). The general objectives of lake dredging projects are deepening for navigation, nutrient control, toxic substances removal, or macrophyte control. While the proposed dredging of Lake Apopka would primarily provide navigation benefits, it would also promote all of the other listed objectives.

3.1 Problem Description

As a remedy to the sedimentation problems near the Newton Park boat ramp, this report investigates four alternatives to help boaters access the lake.

- Alternative I: dredge a small area of Lake Apopka from the shore of Winter Garden to provide access through the shallow waters at the Newton Park boat ramp to deeper areas of the lake
- Alternative II: install a geotextile tube barrier to hinder infilling of the area created in Alternative I
- Alternative III: includes a combination of brush, sediment barrier, and fish attractor instead of the geotextile tube sediment barrier
- Alternative IV: includes a sheet pile barrier instead of the geotextile tube sediment barrier

This assessment includes Alternative IV to compare the effectiveness and cost of a brush barrier and geotextile tube barrier with the effectiveness and cost of a traditional engineering approach to sediment barrier construction.

3.2 Scope of Work

Taylor Engineering assessed the feasibility of all four alternatives — dredging only, dredging plus a combination of brush, sediment barrier, and fish attractor, dredging plus a geotextile barrier, and dredging plus a sheet pile barrier instead the geotextile tube.

This scope of work outlines the efforts undertaken to perform a comparative feasibility assessment of the four alternatives, which included the following elements:

- Stability assessment for structural alternatives (dredging, natural or synthetic barrier, geotextile tubes, and sheet pile)

- Estimate of sediment shoaling rate within the project area (all alternatives) based on previously published data
- Order of magnitude dredge area, based on a project construction budget of $2,740,000 excluding the cost of brush barriers funded in a separate contract (all alternatives)
- Given sufficient data, project lifespan estimate (all alternatives)
- Project maintenance interval (dredging for navigation depth, repairs, replacement) and order of magnitude maintenance cost estimates

Specific project tasks included:

Task 1. Bathymetric Survey

- Degrove Surveyors, Inc. (Degrove), surveyed and mapped the limits of the project area
- Degrove used procedures outlined in Chapter 21 of the U.S. Army Corps of Engineers Manual for Hydrographic Surveys entitled "Depth Measurements over Irregular or Unconsolidated Bottoms"
- The completed bathymetric survey referenced North American Datum of 1983 (NAD 83) Florida East state plane zone horizontal datum and NAVD 1988 vertical datum
- Degrove collected bathymetric survey for top of muck and the top of competent lake bottom transect lines on 200 ft by 200 ft grid cells throughout the majority of the project limits (Appendix B, Figures 1 and 2)
- Near the shore and near structures, where additional accuracy was required, Degrove reduced the bathymetric survey grid cells to 100 ft by 100 ft and 50 ft by 50 ft
- Top of muck soundings and position data were collected along profile lines spaced at 200-ft intervals North and South and East and West together with selected profile lines at 50-ft (Appendix B, Figures 1 and 2)
- Degrove collected sounding by fathometer or direct measurement and digital GPS position data.
- Degrove collected bathymetric survey data up to the 67-ft elevation NAVD 1988
- Degrove measured the water surface elevation at the beginning and end of each survey day.
- Degrove identified the existing shoreline
- Degrove used real time kinematic global positioning system (RTK/GPS) mounted on a pole with a 6-inch diameter plate to calibrate the fathometer soundings
- During data collection, Degrove and CSI Geo, Inc., the geotechnical engineer, compared survey techniques to the results of core samples on site and calibrated and refined techniques for obtaining depths to the underlying silt layers
- To verify the boat's horizontal positioning, Degrove surveyed a point in by static GPS near the project boat ramp to use as a daily horizontal position check
- Degrove established a minimum of two benchmarks on the shoreline for future District reference
- Finally, Degrove prepared two Digital Terrain Models, one of the top of muck and the other of the competent bottom sediments

Task 2. Geotechnical Assessment and Analyses

- CSI Geo, the project's geotechnical engineer, lead the geotechnical data collection and laboratory-testing efforts (Appendix B, Figures 1 and 2)
- CSI Geo collected and analyzed soil and sediment samples for the project area and prepared a written report summarizing its findings

General Geotechnical Investigation for the Project Area

- CSI Geo collected 10 sediment core samples that provided the approximate depth and thickness of the muck layer and the top of competent lake bottom within the proposed dredging area. Core samples were evenly spaced throughout the proposed dredging area.
- CSI Geo collected three sediment grab samples for use in column settling tests using procedures outlined in USACE EM 1110-2-5027
- Grab samples were taken from the muck layer sediments at different locations within the proposed dredging area (Appendix B, Figures 1 and 2)
- CSI Geo created a map with an aerial photo background showing the actual field location of each sediment core and grab sample
- CSI Geo determined the location of each sediment core and grab sample using GPS equipment
- All CSI Geo maps were plotted with reference to the NAD 83 Florida East state plane zone horizontal datum
- CSI Geo classified all sample data in general accordance with ASTM D-2487 and ASTM D-2488 and provided a generalized subsurface profile, which showed core data at the proper elevations
- As noted above, CSI Geo and Degrove compared survey techniques to the results of core samples on site and calibrated and refined techniques for obtaining depths to the underlying silt layers
- CSI Geo selected representative samples of the muck sediment to perform laboratory analyses
- In general, the muck sediment laboratory analyses included:
    - Grain size analyses including hydrometer
    - Moisture content analyses
    - Organic content analyses
    - Atterberg limit analyses
    - Specific gravity analyses
    - Column settling tests

Geotechnical Investigation for Sediment Barrier Area

- CSI Geo collected preliminary geotechnical data along the Sediment Barrier Area, which consisted of two centerlines each starting from either side of the proposed dredge area near shore and extending out into the lake to the proposed dredge limits
- CSI Geo collected standard penetration test (SPT) borings that provide preliminary information on the soil beneath the competent lakebed (Appendix B, Figures 1 and 2)
- CSI Geo aligned the SPT borings along the approximate area of the project intended for use as a sediment barrier

- Each SPT boring extended to a minimum depth of 20 ft below the competent lakebed and at least 30 ft below the top of muck sediments
- CSI Geo collected eight SPT borings on 2,000-ft intervals
- This provided preliminary subsurface data within the approximate area of the project intended for use as a sediment barrier.

Task 3. Sediment Data Summary

- Taylor Engineering produced a map combining the bathymetric survey data and geotechnical data collected (Appendix B, Figures 1 and 2)
- Taylor Engineering estimated the sediment shoaling rate within the project area (all alternatives) based on previously published data
- Taylor Engineering presented the District with its findings and significance of data collected in Task 1, 2 and 3, and the combined bathymetric-geotechnical map

Task 4. Preliminary Engineering Design of Dredging Templates and Structures, Order of Magnitude Construction Cost Estimate

- Taylor Engineering provided a preliminary design for each major construction component for the four alternatives (Appendix C, Figures 1 through and 2)
- Components of each preliminary design include:
  - Dredging (volumes will vary by alternative)
  - Brush sediment barrier (based on District-provided information)
  - North Shore disposal site layout for each dredging alternative
  - Geotextile tube barrier
  - Synthetic barrier
  - Sheet pile wall

Task 5. Recommendations and Reporting

- Based on the data and analyses generated in prior tasks, this letter report transmits Taylor Engineering's preliminary engineering design of the dredging templates and structures (geotextile tubes, synthetic or natural fish attractors, and sheet pile wall)
- This letter report transmits Taylor Engineering's order of magnitude construction cost estimate for each preliminary engineering design of the dredging templates and structures
- This letter report transmits Taylor Engineering's estimated dredging volumes based on the project budget and lifespan estimates for each alternative
- These estimates include construction costs, construction period, maintenance periods, and maintenance costs
- Project lifespan estimates (to replace geotextile tubes, synthetic or brush barriers, or sheet pile walls) assume the manufacturer's estimates for material lifespan, but do not consider potential high-energy events (e.g., hurricanes), wildlife-related damage, or other such actions and acts (force majeure)
- The lead engineer has signed and sealed the estimates, but only with respect to the quality of the information provided for the explicit task purposed

Task 6. Project Meetings and Coordination

- Taylor Engineering held an initial kickoff meeting in the District's Palatka office
- The kickoff meeting included the District and Taylor Engineering's project manager
- Taylor Engineering's project manager also attended two additional project team meetings with the Lake Apopka Task Force
- The additional project team meetings included a presentation of alternatives, findings, and recommendations developed from this scope of work and listed in this report

4.0 EXISTING CONDITIONS

4.1 Data Collection (Project and Lake-Wide Bathymetry)

Lake Elevation (Minimum and Maximum):

At the District's directive, Taylor Engineering assumed a minimum lake elevation of 65 ft NAVD 88 and an anticipated maximum lake elevation of 67 ft NAVD 88 for its review of the current and future lake conditions. Fluctuations above and below those elevations will have significant impacts on any proposed dredging template, sediment shoaling rates, project lifespan, and the project maintenance interval.

Project and Lake-Wide Bathymetry:

Degrove surveyed and mapped the limits of the project area, an approximate 4,000 ft by 8,000 ft (roughly 735 acres) section of Lake Apopka extending north-northwest from the Newton Park boat ramp towards the center of Lake Apopka. The completed bathymetric survey referenced NAD 83 Florida East state plane zone horizontal datum and NAVD 1988 vertical datum. The Degrove data provided an elevation for both the top of muck and the top of competent lake bottom. For the majority of the project limits, Degrove used 200 ft by 200 ft grid cells. However, within the nearshore and near structures, where additional accuracy was required, Degrove reduced the bathymetric survey grid cells to 100 ft by 100 ft and 50 ft by 50 ft. During data collection, Degrove and CSI Geo, Inc. (CSI Geo), the geotechnical engineer, compared their survey techniques to the results of core samples onsite and then calibrated and refined their techniques for obtaining depths to the underlying silt layers.

Finally, Degrove prepared a Digital Terrain Model (DTM) of the top of the muck layer and the top of competent bottom sediment.

Taylor Engineering combined Degrove's top of muck layer DTM with the Morgan and Eklund, Inc. February 2008 "Lake Apopka Bathymetric Survey Report" data to produce the lake-wide bathymetry shown in Appendix A, Figures 1 and 2.

Based on our review of the data, the current mean depth at a lake elevation of 65 ft NAVD 88 is approximately 4.31 ft Only 43.8% of the lake is at depth 60 ft or deeper, while 6.9% of the lake is at 58 ft or deeper. More, importantly, the distance from the Newton Park boat ramp to a lake depth of 5 ft is nearly 6,450 ft (1.22 miles)

4.2 Data Collection (Geotechnical Assessment and Analyses)

CSI Geo, the project's geotechnical engineer, collected and analyzed soil and sediment samples from a 534-acre project area (Appendix B, Figures 1 and 2). CSI Geo prepared a written report summarizing its findings (Khosrozadeh et al., 2013).

General Geotechnical Investigation for the Project Area:

CSI Geo collected 10 sediment core samples that provided the approximate depth and thickness of the muck layer and the top of competent lake bottom within the proposed dredging area. Core samples were evenly spaced throughout the proposed dredging area (Appendix B, Figure 1). CSI Geo collected three sediment grab samples, for use in column settling tests, from different locations within the proposed dredging area. CSI Geo classified all sample data in general accordance with accepted ASTM standards.

As noted above, CSI Geo and Degrove, the project's bathymetric surveyor, compared survey techniques to the results of bathymetric data collection on site and then calibrated and refined their techniques for obtaining depths to the underlying silt layers.

Finally, CSI Geo selected representative samples of the muck sediment to perform laboratory analyses. In general, the laboratory analyses of the muck sediment included grain size analyses including hydrometer, moisture content analyses, organic content analyses, Atterberg limit analyses, specific gravity analyses, and column settling tests.

Geotechnical Investigation for Sediment Barrier Area:

CSI Geo also collected preliminary geotechnical data along the proposed sediment barrier areas, which consisted of two centerlines each starting from either side of the proposed dredge area near shore and extending out into the lake to the proposed dredge limits. CSI Geo collected standard penetration test (SPT) borings that provide preliminary information on the soil beneath the competent lakebed. CSI Geo aligned the SPT borings along the approximate area of the project intended for use as a sediment barrier. Each SPT boring extended to a minimum depth of 20 ft below the competent lakebed and at least 30 ft below the top of muck sediments. CSI Geo collected eight SPT borings on 2,000-ft intervals. This provided preliminary subsurface data within the approximate area of the project intended for use as a sediment barrier.

Based on physical structure, Pollman et al. (1988) classified the sediments within Lake Apopka into six major groups — unconsolidated flocculent sediments (UCF), consolidated flocculent sediments (CF), peat, sand, clay, and marl.

Geotechnical Sediments Assessment and Analyses:

CSI Geo collected core samples throughout the proposed dredging area. CSI Geo used the collected samples to delineate the thickness of the layer of fine-grain, organic-rich sediment referred to as muck (UCF and CF). CSI Geo found that the muck consisted of mostly organic material with organic contents ranging from 8.0% to 78.0%. The solids content and specific gravity of the material range from 2.0% to 67.0% and 1.6 to 2.7, respectively. Typically, the upper layer of the muck (UCF) was a suspended, unconsolidated material with a solids content ranging from about 2.0% to 6.0%.

The thickness of the muck layer varied with the distance of the sample location from the shoreline. A detailed summary of index testing on the muck layer is located in the "Summary of Laboratory Test Results for Core Samples in Appendix 5" (Khosrozadeh et al., 2013). Farther away from the shoreline, core samples had a muck thickness between roughly 5.5 and 10 ft thick. Closer to the shoreline, core samples had a muck thickness between roughly 24.5 and 32 ft (these were the thickest layers of muck recorded). The two core samples, collected closest to the shoreline, had muck thicknesses of roughly 18 ft and 14.5 ft, respectively. Appendix B, Figure 2 provides a profile of the muck thickness through the center of the data collection area.

Schelske (1997) describes a series of data collection points used to establish a morphometric map grid of the lake. Data collected from each grid point indicted a minimum averaged thickness of the UCF layer as 10 cm 1968, which increased to 32 cm in 1987 (Reddy & Graetz, 1991) and in 1996 to 45 cm (Schelske, 1997). Reddy & Graetz (1991) and Schelske (1997) provided an interpretation of this data. They indicate that the flocculent sediments represent the remains of dead algal cells deposited in the lake since 1947.

Pollman et al. (1988) and Thomas (2009) have presented detailed historical descriptions and spatial distributions of each sediment horizon in Lake Apopka. Based on our review of these and other reports, the consensus is that the UCF layer is virtually lake-wide (95% of the sediment surface according to Reddy et al., 1991) and that the UCF layer overlies the more consolidated lake sediments (CF, peat, sand, clay, and marl).

While the actual thickness of UCF sediments throughout the lake is not important to the average boater, the virtual lake-wide presence of the sediments at shallow depths is. Furthermore, a review of the Upper Ocklawaha River Basin, provisional water level data for the Lake Apopka and Apopka Beauclair Spillway indicate that since December of 2011 Lake Apopka has been at least 1 ft to 2.5 ft below the desired minimum lake elevation of 65 ft NAVD 88. Exacerbating this condition is the fact that wind-driven waves and boater disturbance frequently resuspend this muck layer (Mehta et al., 2009).

5.0 RESULTS

5.1 Alternative I (Dredging Only)

Alternative I involves of determining the best depth for dredging a small area of Lake Apopka along the shoreline near the Newton Park boat ramp on Lake Apopka to provide access through the shallow waters at the Newton Park boat ramp to deeper areas of the lake. The review also included determining the most appropriate area for the District to dredge, and providing an estimate of the maximum amount of material that the District can expect to dredge from the project area, given the District's established project budget of $2,740,000.

Dredging Plan:

As shown in Appendix C, Figure 1 and 2, the selected contractor will dredge sediments from the proposed dredging template and pump the severed dredged material approximately 4.5 miles to the sediment dewatering and disposal area located within the North Shore Restoration Area for disposal.

As shown in Appendix C, Figure 3, the average elevation of the lake within the 4,000 ft long by 500 ft wide proposed dredging template is 60.98 ft NAVD 88. The average existing elevation of the proposed dredging template at each cross-section is 60.69 ft NAVD 88 at cross section A, 61.10 ft NAVD 88 at cross section B, and 61.13 ft NAVD 88 at cross section C. This clearly demonstrates the generally shallow flat existing conditions in this end of Lake Apopka.

The average thickness of muck sediments (UCF and CF) within the 4,000 ft long by 500 ft wide proposed dredging template is 14.89 ft (Appendix C, Figure 4 and 5). At cross section A, the thickness of muck is 15.10 ft. At cross section B, the thickness of muck is 15.31 ft. At cross section C, the thickness of muck is 7.14 ft (Appendix C, Figure 6).

The thickness and nature of the muck makes removing all of the muck sediments within the dredging template impractical and cost prohibitive. However, Taylor Engineering has designed the construction of a relatively shallow dredge template within a wide channel to provide the district with its desired operational depth with a reasonable dredging maintenance cycle.

Dredged Material Management Area Plan:

Appendix C, Figure 7 shows the proposed sediment dewatering and disposal area located within the North Shore Restoration Area. A similar dredged material management area (DMMA) is currently in use for the Lake County Water Authority (LCWA) dredging of Lake Beauclair.

In that project, the dredger transports dredged material via pipeline along the Apopka Beauclair Canal where the dredged material deposits into field units F and G of West Marsh, located west of the Apopka-Beauclair Canal. Similar to the Lake Apopka sediments, the Lake Beauclair dredged material has about 4% solids and Dunne et al. (2009) anticipate that the Lake Beauclair dredged material will have much lower pesticide concentrations relative to the in situ soil at the disposal area. Therefore, Dunne et al. (2009) anticipate that depositing dredged material on top of West Marsh will contribute to reducing pesticides in the soil-water environment of F and G field units. Taylor Engineering understands that the

District will perform a similar analysis for the Lake Apopka dredged material, to augment previous evaluations performed by Segal et al. in 1992, prior to disposing the dredged material within the North Shore Restoration Area.

Taylor Engineering staff contacted Ron Mincey, the project manager of LCWA's contractor, Jahna Dredging, and Ron Hart, the LCWA's Water Resource Program Manager, in relation to the ongoing Lake Beauclair dredging project. Following Taylor Engineering's discussions, along with our on-site review of the active dredging project, Taylor Engineering does not foresee any impediments to the Lake Apopka project use of the selected North Shore Restoration Area DMMA, based on the current Lake Beauclair dredging event.

The District is currently working through permitting issues related to the use of this area, including temporary impacts to natural resources necessitated by the need to bring the dredge pipeline out of the lake and up into North Shore Restoration Area DMMA (Appendix C, Figure 7).

<u>Sediment Shoaling Rate Estimation</u>:

Based on a review of Mehta et al. (2009), Taylor Engineering determined that the listed observational data of water velocities were insufficient to provide accurate velocity conditions in the local project area. In addition, the report contained insufficient data to describe accurately the transport of sediments found in the local project area.

In addition to the modeling products summarized in Mehta et al. (2009) the District also provided Taylor Engineering with suitable (½ hourly) lake stage data from a District recording stage gauge located on the south shoreline of the lake near Oakland along with similarly timed wind velocity data (speed and direction) from the Lake Apopka center lake station. Again, this proved insufficient data to describe accurately the transport of sediments found in the general project area.

Thus, Taylor Engineering is primarily basing its estimate of sediment shoaling rate within the project area on the general UCF sediment behavior described in Mehta et al. (2009) and the settling characteristics of suspended fine-grained muck layers sediment performed by Khosrozadeh et al. (2013). To this, we have added a review of the project area bathymetry between the 2013 Degrove bathymetric survey and the February 2008 Morgan & Eklund bathymetric survey. Finally, we are working under the District's directive that we assume a minimum lake elevation of 65 ft NAVD 88 and an anticipated maximum lake elevation of 67 ft NAVD 88 for our review of the current and future lake conditions. Therefore, as noted previously, fluctuations above and below these elevations will have significant impacts on any proposed dredging template, sediment shoaling rates, project lifespan, and the project maintenance interval.

Taylor Engineering calculated a shoaling rate of 10,000 to 12,500 cubic yards per year (cy/year) for the first maintenance cycle (dredging event) and a sustainable shoaling rate of 7,500 to 10,000 cy/year for the continued maintenance cycles (subsequent dredging events). Taylor Engineering provides these shoaling rate estimates under the proviso that the District will maintain a minimum lake elevation of 65 ft NAVD 88 and an anticipated maximum lake elevation of 67 ft NAVD 88 for future lake conditions.

A note of caution, severe winds, such as during the passage of Hurricane Jeanne in 2004 (with a peak wind speed of 121 miles per hour (mph) over the lake), caused even the CF sediment layer to serve as a physical source of resuspended matter in the lake (Mehta et al., 2009). If the lake levels are low during such an event, dramatic lake bottom bathymetric changes could occur.

Order of Magnitude Construction Budget:

Taylor Engineering calculated an order of magnitude dredge area based on the project construction budget of $2,740,000 and the project criterion listed above. Appendix C, Figure 3 shows the proposed dredging template.

Project Lifespan Estimate:

Alternative I , determining the best depth for dredging a small area of Lake Apopka along the shoreline near the Newton Park boat ramp on Lake Apopka to provide access through the shallow waters at the Newton Park boat ramp to deeper areas of the lake does not require any structures, and thus no project lifespan estimate is required.

Project Maintenance Interval:

Taylor Engineering based our estimate for the project maintenance on the District's directive that a minimum lake elevation of 65 ft NAVD 88 and an anticipated maximum lake elevation of 67 ft NAVD 88 be used to review of the current and future lake conditions. As noted previously, fluctuations above and below those elevations will have significant impacts on any proposed dredging template, sediment shoaling rates, project lifespan, and the project maintenance interval.

If the District is able to maintain these water depths, Taylor Engineering calculated a shoaling rate of 10,00 to 12,500 cy/year for the first maintenance cycle (dredging event) and a sustainable shoaling rate of 7,500 to 10,000 cy/year for the continued maintenance cycle (subsequent dredging events).

The proposed dredging template shown in Appendix C, Figure 3 has a project depth of 57.3 ft NAVD 88. If the District performs the initial construction to this depth, the additional 0.7 ft of overdredging depth would allow the District to maintain a 7- to 12- year dredging cycle for the life of the project. We estimate that during that time the channel will have shoaled in roughly 60,000 to 90,000 cy at a 2012 cost of $590,000 to $880,000.

Taylor Engineering recommends that prior to preparation of final design drawings and construction plans, that the District authorizes the collection of water velocity data near the proposed project area. This data should then be input into a numerical model to simulate forces acting upon the sediments.

A note of caution, severe winds, such as during the passage of large tropical storm or hurricane can cause even the CF sediment layer to serve as a physical source of resuspended matter in the lake (Mehta et al., 2009). If the lake levels are low during such an event, dramatic lake bottom bathymetric changes could occur.

5.2 Alternative II (Dredging Plus a Geotextile Tube Barrier)

Alternative II consists of installing a geotextile tube barrier to hinder infilling of the area created in Alternative I. Our review also included determining the most appropriate area for the District to dredge, and providing an estimate of the maximum amount of material that the District can expect to dredge from the project area, given the District's established project budget of $2,740,000.

Geotextile tubes are large polypropylene or polyester sediment-filled fabric bags of lengths up to several hundred feet. Geotextile tube manufactures design the geotextile tubes to handle pressurized flows. A dredger fills a geotextile tube by pumping dredged material slurry into the individual tubes. The water seeps out of the fabrics leaving the sediments inside. After filling, geotextile tubes are generally oval in cross-section. The geotextile shell is weather resistant and will last many years depending on fabric resistance to puncture and abrasion, fabric degradation in the environment, especially under exposure to ultraviolet (UV) light (U.S. Army Corps of Engineers [USACE], 1984).

The resistance to geotextile fabrics to punctures and abrasion is low. Puncturing the materials with a blunt object is not easy. However, it takes no effort to puncture even the highest strength material with a pointed object, such as a knife. Consequently, in areas where the public has access to the tubes, vandalism often results in damage. Debris (e.g., a stump with sharp roots forced against the geotextile tube by waves or currents can also puncture and abrade the material (Pilarczyk, 1995).

Dredging Plan:

The general dredging plan would not change from Alternative I with the exception that the dredger would direct some of the dredged material away from the North Shore Restoration disposal area to fill the geotextile tubes. Due to the high moisture content of the muck sediments, additional sandy material would also be necessary to increase the weight of the geotextile tube in order to ensure the geotextile tubes are secure against wind-generated waves, currents, and boat wakes (Appendix C, Figure 8).

As part of its investigation, Taylor Engineering located several local suppliers of sandy material suitable for placement in geotextile tube barriers and determined the acceptability of the material based on physical observations and provided grain-size analysis. In addition, Taylor Engineering estimated the cost of trucking suitable sandy material from each supplier to the project site.

Limitation of Geotextile Tubes:

In addition to the concerns listed above, Taylor Engineering's main concern in using geotextile tubes for this project relates to the difficulty in placing a tube precisely on a given alignment and in achieving a consistent crest height along the length of the tube. No matter the skill and experience of the selected contractor, the contractor cannot avoid some variations in the final height of the geotextile tubes. If the contractor stops filling a tube prematurely, because of weather for example, sediment in the tube may stabilize and flatten the tube out. Once that happens it is very difficult to pump the tube higher. In addition, low spots always occur near the filling ports, with other random undulations elsewhere. It is not surprising to find variations of 0.5 ft or more along the length of the tube.

Not only does the height of the tube vary, but the elevation of the bed upon which the tube rests may vary, as well. Hence, if the tube is not placed directly on a given bed elevation, the variations in the bed itself result in variations of the crest elevation. Geotextile tubes are hard to position and hold in place in waves and tidal or wind-driven currents prior to filling. Occasionally, a tube may roll to one side during filling. When this occurs, the tube moves off alignment, it puts the filling ports to the side of the tube instead of on top, and it increases the stress in the fabric (USACE, 1984).

Thickness of Muck Sediments:

As noted previously, the average thickness of muck sediments (UCF and CF) within the 4,000 ft long by 500 ft wide proposed dredging template is 14.89 ft (Appendix C, Figure 4 and 5), with depths of muck running to over 32 ft in some cases (Khosrozadeh et al., 2013).

Khosrozadeh et al. (2013) determined the total estimated settlement of the geotextile sediment barrier based on elastic and consolidation settlements. Khosrozadeh et al. (2013) also calculated elastic or immediate settlement using Schmertmann's method, which determines the deformation of soils upon loading based on the theory of elasticity.

Khosrozadeh et al. (2013) final analyses excluded settlement of the unconsolidated muck sediment layer presently found throughout the site, due to any bearing pressure exerted on it. Therefore, Khosrozadeh et al.'s analyses assume any barrier system would bear on the lake bottom material found below the muck sediment. Based on the analyses, Khosrozadeh et al. (2013) estimated that total settlement would vary from 2 to 60 inches, depending on the location and configuration of the sediment barrier. Khosrozadeh et al. (2013) estimate that approximately 1 inch of this settlement is elastic settlement, which should take place during construction, while the remainder would be primary consolidation of the peat, organic silt, sandy silt, and clay layers.

Given the thickness of muck sediments throughout the project area attempting to secure geotextile tubes in place at a set elevation without incurring, sever settling, resulting in geotextile tubes out of alignment and below the desired consistent crest height along the length of the tube is impractical.

Therefore, Taylor Engineering has removed Alternative II from the project options.

5.3 Alternative III (Dredging Plus a Brush Barrier)

According to Dale Jones of the FFWCC, the lack of suitable habitat is the reason anglers have difficulty locating fish in Lake Apopka. This lack of suitable habitat stretches small populations of game fish over vast areas. The FFWCC has been stocking sport fishes in Lake Apopka, but the FFWCC indicates that the fish attractors are necessary to concentrate the fish populations. The FFWCC has already installed fish attractors within portions of Lake Apopka. Once the District has completed its dredging, The FFWCC will place fish attractors in this area as well. The attractors will be close to access sites to make for convenient fishing. (Tressler, 2013)

Alternative III consists of installing a combination of brush, sediment barrier, and fish attractor instead of the geotextile tube barrier to hinder infilling of the area created in Alternative I. Our review also included determining the most appropriate area for the District to dredge, and providing an estimate of the maximum amount of material that the District can expect to dredge from the project area, given the District's established project budget of $2,740,000.

<u>Dredging Plan</u>:

The dredging plan would not change from Alternative I.

<u>Literature Review</u>:

According to Bolding et al. (2004) and a review of the FFWCC website, artificial structures have been used since the 1930s to modify benthic habitats in freshwater systems in attempts to enhance both sport and commercial fisheries. Since then, the use of artificial structures has become widespread throughout the United States in a variety of waters and fish communities. The FFWCC notes that the proposed advantages of installing artificial structures include increasing angler catch per effort, providing cover to increase survival of juvenile fish, and providing spawning habitat to increase natural production.

The District directed Taylor Engineering to look at structure materials varying from brush piles, evergreen trees, and manufactured plastic forms as a sediment barrier. While our literature review clearly indicated the benefit of these structures to attracting fish communities, none of the literature we accessed indicated any benefit of these structures to preventing muck sediments, which act as a fluid mud, from being transported into a dredged template.

Given the thickness of muck sediments throughout the project area, attempting to secure brush piles, evergreen trees, or manufactured plastic forms as a sediment barrier would have the same inherent issues as attempting to install geotextile tubes. Furthermore, our literature review did not indicate any benefit of these structures to preventing fluid mud sediment transport into a dredged template.

Therefore, Taylor Engineering has removed Alternative III from the project options.

5.4 Alternative IV (Dredging Plus a Sheet Pile Barrier)

Alternative IV consists of installing a sheet pile barrier instead of the geotextile tube barrier to hinder infilling of the area created in Alternative I (Appendix C, Figure 9). Our review also included determining the most appropriate area for the District to dredge, and providing an estimate of the maximum amount of material that the District can expect to dredge from the project area, given the District's established project budget of $2,740,000.

<u>Dredging Plan</u>:

The dredging plan would not change from Alternative I.

<u>Structural Assessment</u>:

The substantial thickness of an existing muck layer within the proposed project area of Lake Apopka hinders the design and construction of an economical steel pile breakwater. The muck layer thickness varies from 5 ft to greater than 32 ft Khosrozadeh et al. (2013) describes the consistency of the material as that of a heavy fluid. Therefore, the preliminary design assumes that the muck material has virtually no engineering strength (i.e., zero shear strength and zero cohesion).

The structural analysis assumes the maximum lake water level occurs at elevation 67.0 ft NAVD 88 and the top of the breakwater occurs at elevation 70.0 ft NAVD 88. For preliminary design, the structural analysis assumes a depth-limited 3.5-ft non-breaking wave as the design wave. The design wave approaches 100% reflection when encountering the breakwater thereby creating a clapotis (i.e. a standing wave). As with most structural analyses, this analysis represents dynamic forces with approximate static forces (a static analysis). Given the unusual nature of the soils, the dynamic nature of the wave loading, and the large deflections allowed in the structure, final design would require a more rigorous dynamic analysis or perhaps physical modeling (Appendix C, Figure 10).

For preliminary analysis, Taylor Engineering divided the breakwater design into three typical soil profiles:

- Muck up to 5 ft thick
- Muck up to 19 ft thick
- Muck up to 32 ft thick

Taylor Engineering applied three soil profiles to analyze the wave-loaded structure, which produced three substantially different designs. For muck up to 5 ft thick, the design requires a relatively light AZ18 steel sheet pile section with a total length of 45 ft Subsequent revisions of the dredging template shortened the channel length and placed the entire breakwater in muck greater than 5 ft thick. Therefore, the preliminary design does not use the AZ18 section and it is not shown in the engineering figures. It is merely noted to here to demonstrate that the thickness of the muck layer controls the design of the breakwater.

The soil profile with muck up to 19 ft thick requires a relatively heavy AZ46 steel sheet pile section with a total length of approximately 70 ft. The soil profile with muck up to 32 ft thick requires a combination type wall (steel sheet pile combined with other structural shapes) because a standard steel sheet pile did not have adequate strength. The designer chose a pipe-pile combination wall due to its large strength to weight ratio.

Corrosion of steel in marine structures is usually addressed by the combined use of coatings and increased steel thickness referred to as sacrificial steel. During the design process, the engineer only utilizes the portion of the steel anticipated to remain after the steel has corroded. The remaining steel is “sacrificed” to corrosion and assumed to not exist on the steel members during the design process. Corrosion testing of soils and water was unavailable at the time of this report, and the scope of work does not include a comprehensive corrosion analysis of the structure. However, based on the designer’s best estimate for preliminary analysis, if an average corrosion rate (with or without coatings) of two mils (0.002 inches) per year is applied over a 50-year life span, preliminary analysis indicates that the AZ46 steel sheet pile would suffice. However, the 1/2-inch thick pipe pile would not have adequate strength using these assumptions. Using the next thicker pipe size available, a 5/8-inch-thick pipe pile would provide the necessary sacrificial steel at an additional material costs of approximately $2.33 million.

Taylor Engineering considers unknown/unfavorable geotechnical conditions and over-water access of heavy equipment as the two most challenging aspects of project feasibility. Preliminary geotechnical investigations did not anticipate the existence of muck layers over 30 ft thick with a resulting breakwater structure requiring approximately 90 ft of embedment into the soil stratum. Preliminary soil data terminates at elevation 22 ft NAVD (about 40 ft into the soil). Unsuitable soils or rock could exist at elevations below the current geotechnical investigation depths, making construction of the steel breakwater un-economical or impractical.

In summary, the substantial thickness of an existing muck layer within the proposed project area of Lake Apopka hinders the design and construction of an economical sheet pile breakwater. Therefore, Taylor Engineering recommends considering all other practical options and comparing costs before utilizing a steel sheet pile breakwater.

Sediment Shoaling Rate Estimation:

Taylor Engineering calculated a shoaling rate of 500 to 1,000 cy/year for the first maintenance cycle (dredging event) and a sustainable shoaling rate of 250 to 500 cy/year for the continued maintenance cycles (subsequent dredging events). These shoaling rate estimates are provided under the proviso that the District will maintain a minimum lake elevation of 65 ft NAVD 88 and an anticipated maximum lake elevation of 67 ft NAVD 88 for future lake conditions.

A note of caution, severe winds, such as during the passage of Hurricane Jeanne in 2004 (with a peak wind speed of 121 miles per hour (mph) over the lake), caused even the CF sediment layer to serve as a physical source of resuspended matter in the lake (Mehta et al., 2009). If the lake levels are low during such an event, dramatic lake bottom bathymetric changes could occur.

Order of Magnitude Construction Budget:

Taylor Engineering calculated an order of magnitude dredge area based on the project construction budget of $2,740,000 and the project criterion listed above. The proposed dredging template is shown in Appendix C, Figure 9. The instillation of the steel sheet pile wall is estimated to add $37,100,000 to the overall project budget.

Project Lifespan Estimate:

The steel sheet pile breakwater should require only limited maintenance. For this type of structure, painting above the waterline and repair of impact damage are the only maintenance items usually required. However, maintenance painting would probably not provide a good benefit-to-cost ratio. Taylor Engineering recommends initial shop painting of approximately the upper 20 ft during fabrication in addition to oversizing the steel members to provide sacrificial steel for corrosion. If the breakwater requires lighting for navigational safety concerns, then the lighting system would require periodic maintenance. The provided design should have a project lifespan of 50 years.

Project Maintenance Interval:

While the installation of a steel sheet pile wall would eliminate the lateral movement of sediment into the dredging template, sediment will still enter the project area through the open mouth of the channel. Based on the nature of the muck sediments, Taylor Engineering calculated a shoaling rate of 500 to 1,000 cy/year for the first maintenance cycle (dredging event) and a sustainable shoaling rate of 250 to 500 cy/year for the continued maintenance cycle (subsequent dredging events).

The proposed dredging template shown in Appendix C, Figure 9 has a project depth of 57.3 ft NAVD 88. If the District performs the initial construction to this depth, the additional 0.7 ft of overdredging depth would allow the district to maintain a 10 to 15 year dredging cycle for the life of the project. We estimate that during that time the channel will have shoaled in roughly 7,500 to 15,000 cy at a 2012 cost of $73,125 to $146,250.

However, given the thickness of muck sediments throughout the project area attempting to install steel sheet piles walls is impractical.

Therefore, Taylor Engineering has removed Alternative IV from the project options.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Taylor Engineering recommends that the SJRWMD not move forward with dredging Lake Apopka until and unless the SJRWMD can consistently keep the lake above an elevation of 65 ft NAVD 88.

Based on our review of the lake-wide bathymetry show on Appendix A, Figures 1 and 2, the current mean depth at a lake elevation of 65 ft NAVD 88 is approximately 4.31 ft. Only 43.8% of the lake is at depth 60 ft or deeper, while only 6.9% of the lake is at 58 ft or deeper. More importantly, the distance from the Newton Park boat ramp to a lake depth of 5 ft is nearly 6,450 ft (1.22 miles).

Finally, a review of the Upper Ocklawaha River Basin, provisional water level data for the Lake Apopka and Apopka Beauclair Spillway indicate that since December of 2011 Lake Apopka has been at least 1 ft to 2.5 ft below the desired minimum lake elevation of 65 ft NAVD 88.

Therefore, dredging alone will only provide access to a very small section of the lake, especially during periods of lower lake elevations.

While the actual thickness of muck sediments throughout the lake is not important to the average boater, the virtual lake-wide presence of the sediments at shallow depths is. Exacerbating this condition is the fact that wind driven waves and boater disturbance frequently resuspend this muck layer

Our alternatives analysis indicates that only Alternative I, determining the best depth for dredging a small area of Lake Apopka along the shoreline near the Newton Park boat ramp on Lake Apopka to provide access through the shallow waters at the Newton Park boat ramp to deeper areas of the lake, is feasible. Furthermore, we estimate that the District can dredge the footprint outlined in Option 1 (Appendix D, Figure 1) within the District's budget of $2,740,000.

We encourage the District to look at other dredging template options that may prove more suitable to the District's overall desire to increase public access to Lake Apopka, including the existing boat ramp at Newton Park. Option 2 (Appendix D, Figure 2) could also be accomplished within the District's budget of $2,740,000 and it would allow greater access to the nearshore area.

If and when the District pursues dredging within Lake Apopka near Newton Park, as detailed in the attached report, Taylor Engineering recommends shoreline dredging and channel dredging near the Newton Park boat ramp on Lake Apopka within the minimal footprint outlined in Option 3 (Appendix D, Figure 3). Because the footprint outlined in Option 3 exceeds the District's project construction budget of $2,740,000, Taylor Engineering recommends either completing the dredging in phases or increasing the District's project construction budget prior to dredging. If the District were to complete Option 3 (Appendix D, Figure 3) as on project, we estimate the District's cost to be $3,270,000.

Taylor Engineering recommends that prior to preparation of final design drawings and construction plans, that the District authorizes the collection of water velocity data near the proposed project area. This data should then be input into a numerical model to simulate forces acting upon the sediments.

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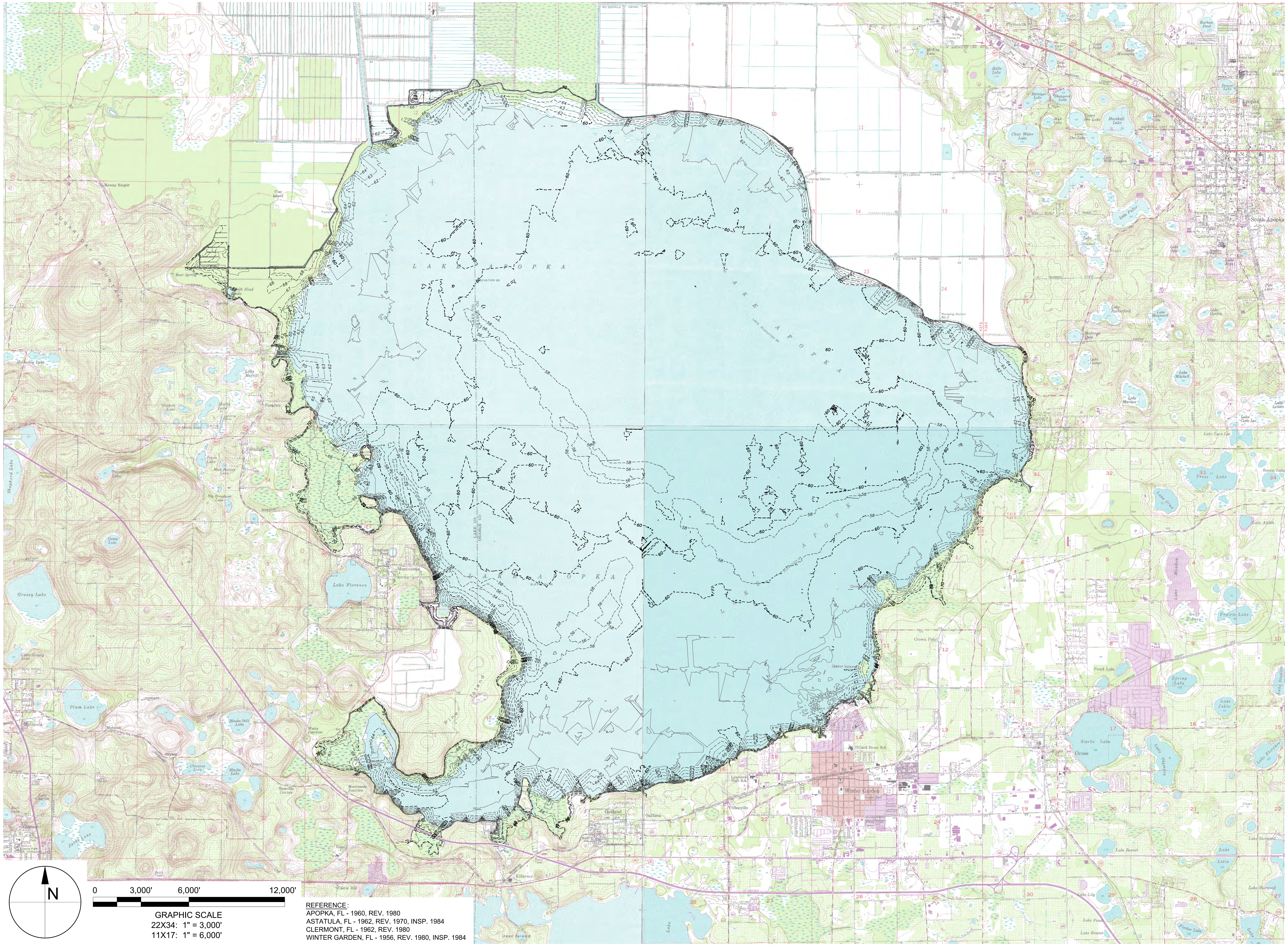
Appendix A

Lake-Wide Depths



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0 3,000' 6,000' 12,000'

GRAPHIC SCALE
22X34: 1" = 3,000'
11X17: 1" = 6,000'

REFERENCE:
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LAKE DEPTH ELEVATIONS

FIGURE 1

SHEET 1 OF 2

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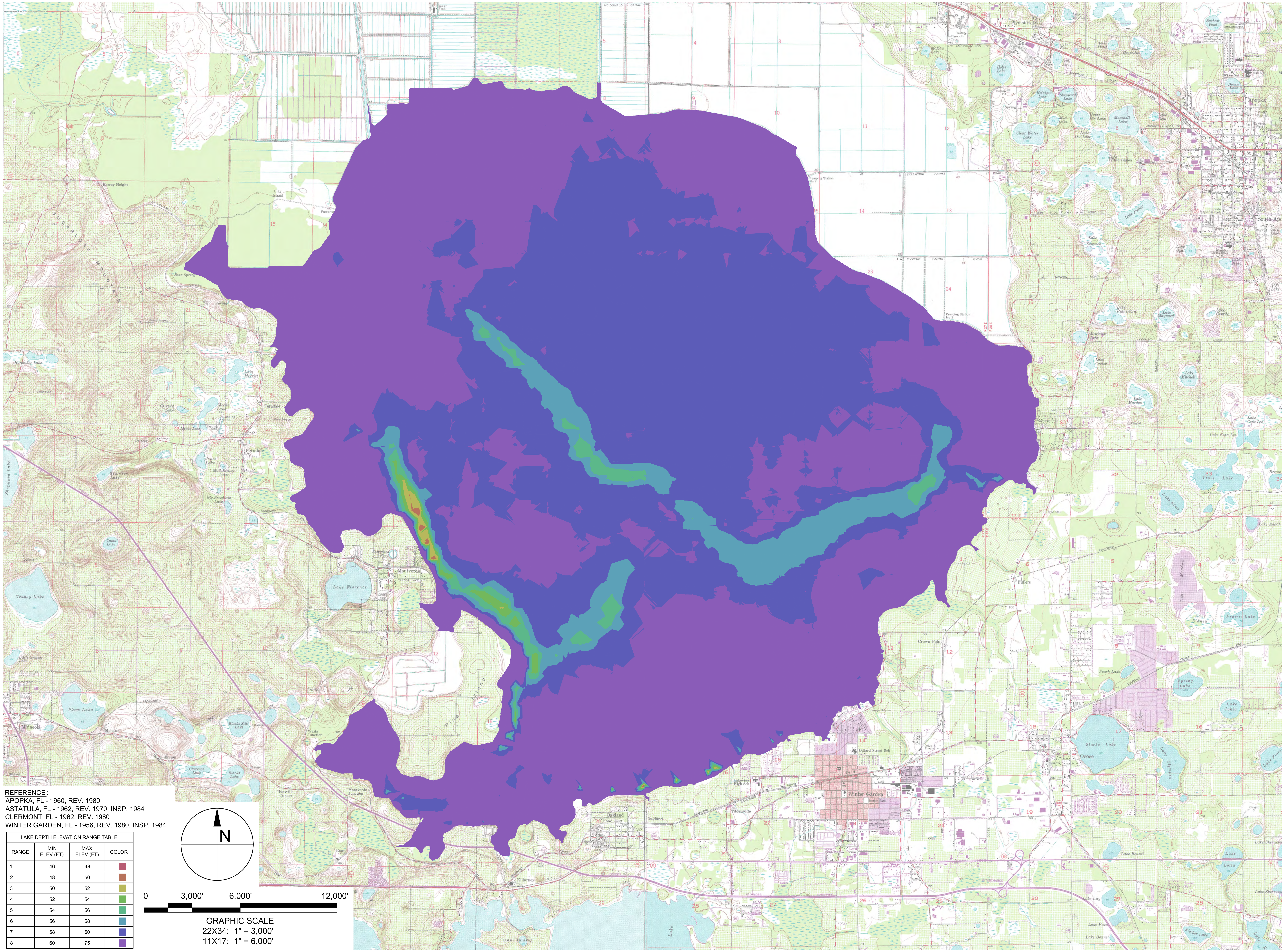

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LAKE DEPTH ELEVATION RANGE TABLE

RANGE	MIN ELEV (FT)	MAX ELEV (FT)	COLOR
1	46	48	
2	48	50	
3	50	52	
4	52	54	
5	54	56	
6	56	58	
7	58	60	
8	60	75	

N

0 3,000' 6,000' 12,000'

GRAPHIC SCALE
22X34: 1" = 3,000'
11X17: 1" = 6,000'

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LAKE DEPTH ELEVATION RANGES

FIGURE 2

SHEET 2 OF 2

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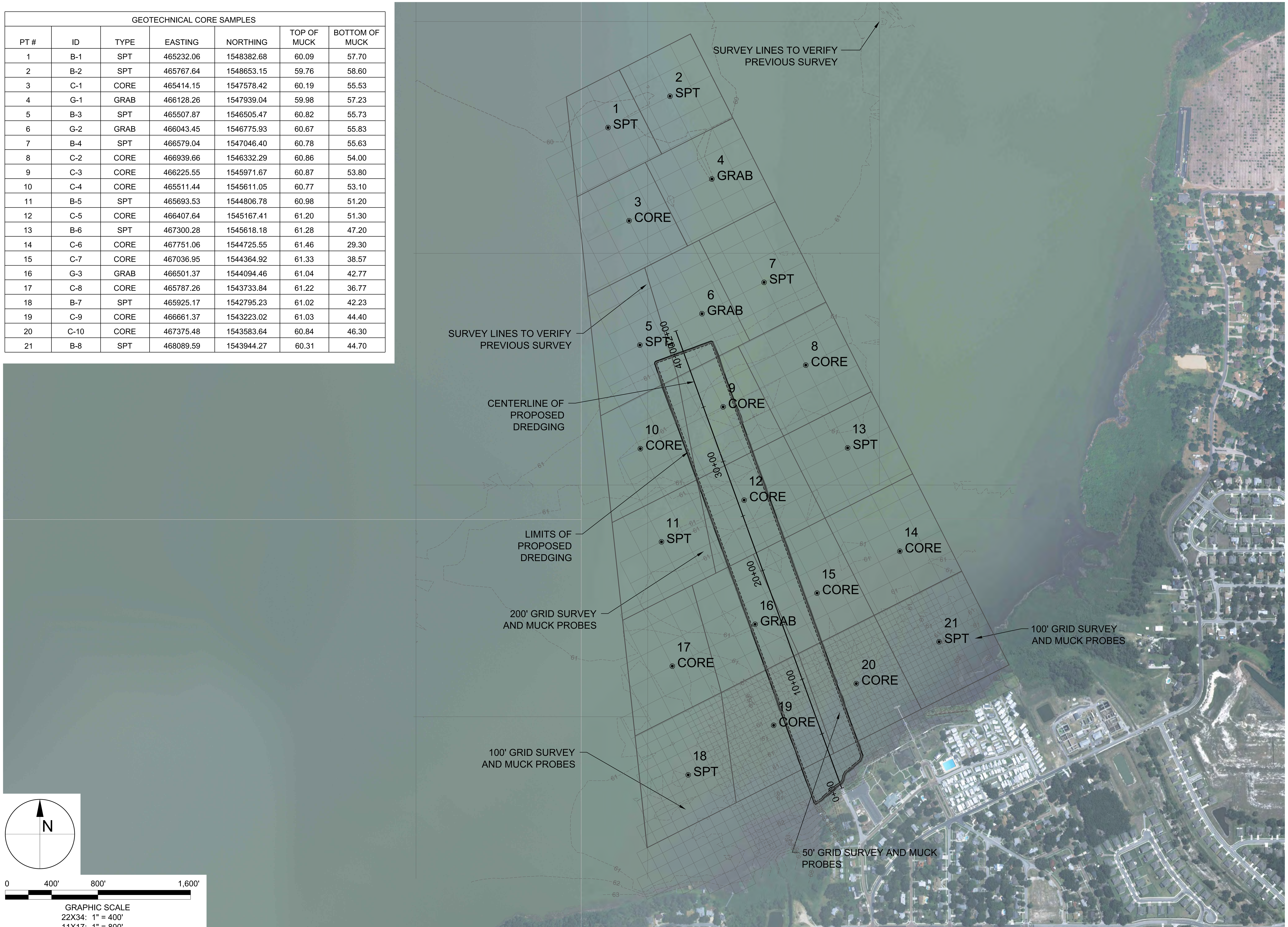
Appendix B

Bathymetric Survey and Geotechnical Data
Collection Area

GEOTECHNICAL CORE SAMPLES

PT #	ID	TYPE	EASTING	NORTHING	TOP OF MUCK	BOTTOM OF MUCK
1	B-1	SPT	465232.06	1548382.68	60.09	57.70
2	B-2	SPT	465767.64	1548653.15	59.76	58.60
3	C-1	CORE	465414.15	1547578.42	60.19	55.53
4	G-1	GRAB	466128.26	1547939.04	59.98	57.23
5	B-3	SPT	465507.87	1546505.47	60.82	55.73
6	G-2	GRAB	466043.45	1546775.93	60.67	55.83
7	B-4	SPT	466579.04	1547046.40	60.78	55.63
8	C-2	CORE	466939.66	1546332.29	60.86	54.00
9	C-3	CORE	466225.55	1545971.67	60.87	53.80
10	C-4	CORE	465511.44	1545611.05	60.77	53.10
11	B-5	SPT	465693.53	1544806.78	60.98	51.20
12	C-5	CORE	466407.64	1545167.41	61.20	51.30
13	B-6	SPT	467300.28	1545618.18	61.28	47.20
14	C-6	CORE	467751.06	1544725.55	61.46	29.30
15	C-7	CORE	467036.95	1544364.92	61.33	38.57
16	G-3	GRAB	466501.37	1544094.46	61.04	42.77
17	C-8	CORE	465787.26	1543733.84	61.22	36.77
18	B-7	SPT	465925.17	1542795.23	61.02	42.23
19	C-9	CORE	466661.37	1543223.02	61.03	44.40
20	C-10	CORE	467375.48	1543583.64	60.84	46.30
21	B-8	SPT	468089.59	1543944.27	60.31	44.70



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BATHYMETRIC SURVEY AREA AND GEOTECHNICAL BORINGS

FIGURE 1

SHEET 1 OF 2

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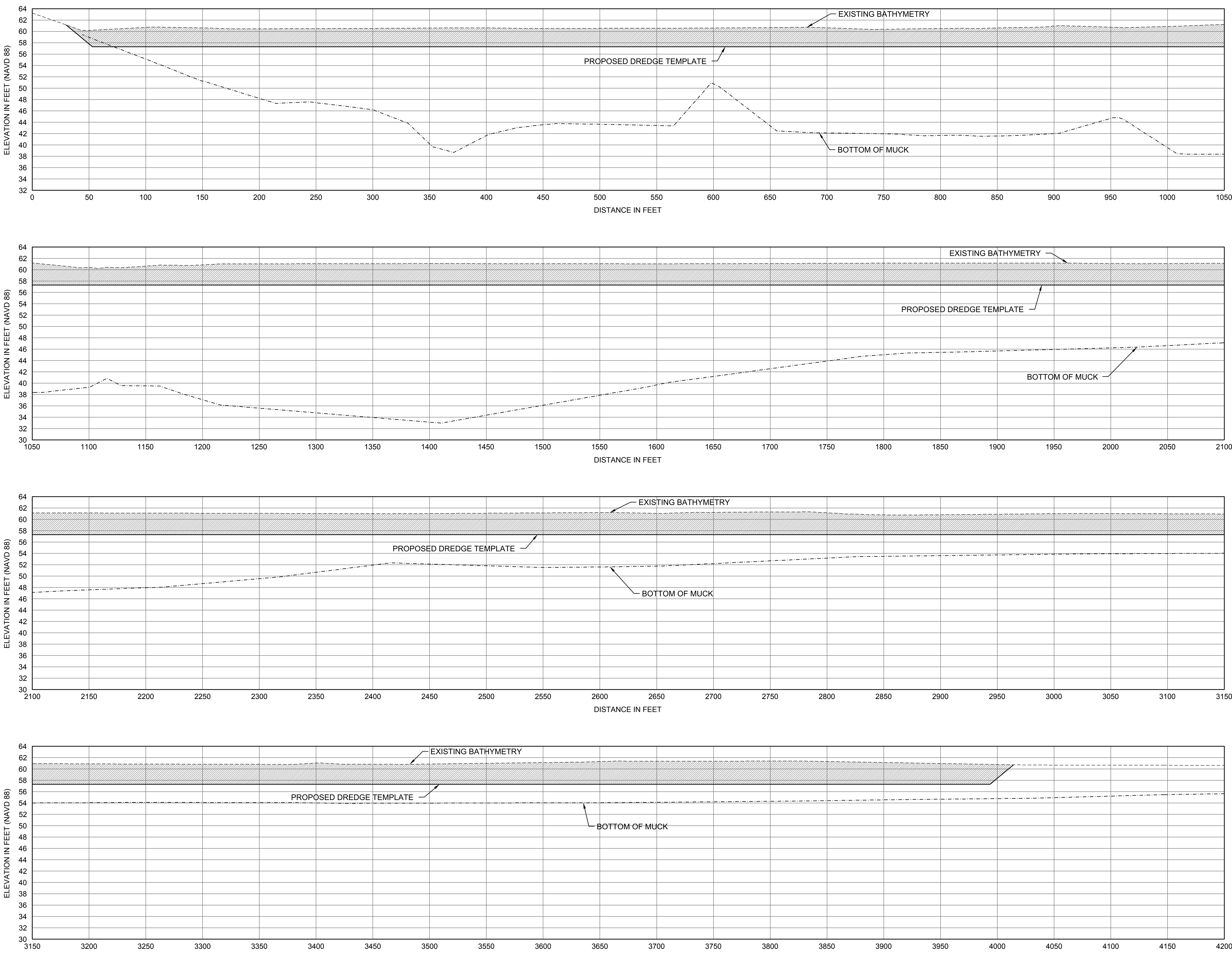

CENTERLINE OF PROPOSED DREDGING PROFILE

22X34: 1" = 50'
11X17: 1" = 100'
V-SCALE: 1" = 12' (22X34)
V-SCALE: 1" = X' (11X17)

0 50' 100'

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GEOTECHNICAL DREDGE TEMPLATE PROFILE

FIGURE 2

SHEET 2 OF 2

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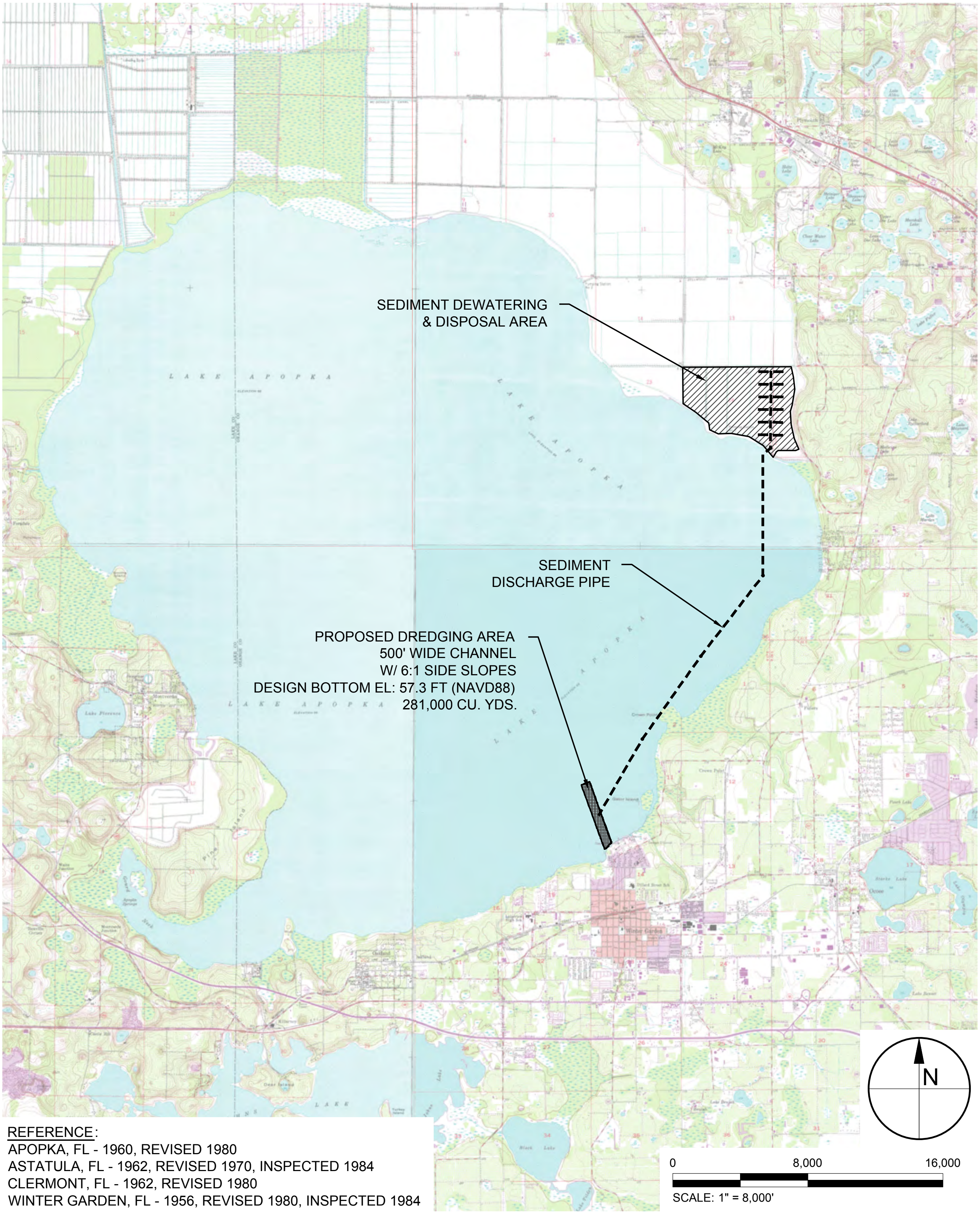
Appendix C

Lake Apopka Dredging Permit Figures



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WINTER GARDEN, FL - 1956, REVISED 1980, INSPECTED 1984

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FIGURE 1
PROJECT LOCATION MAP
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
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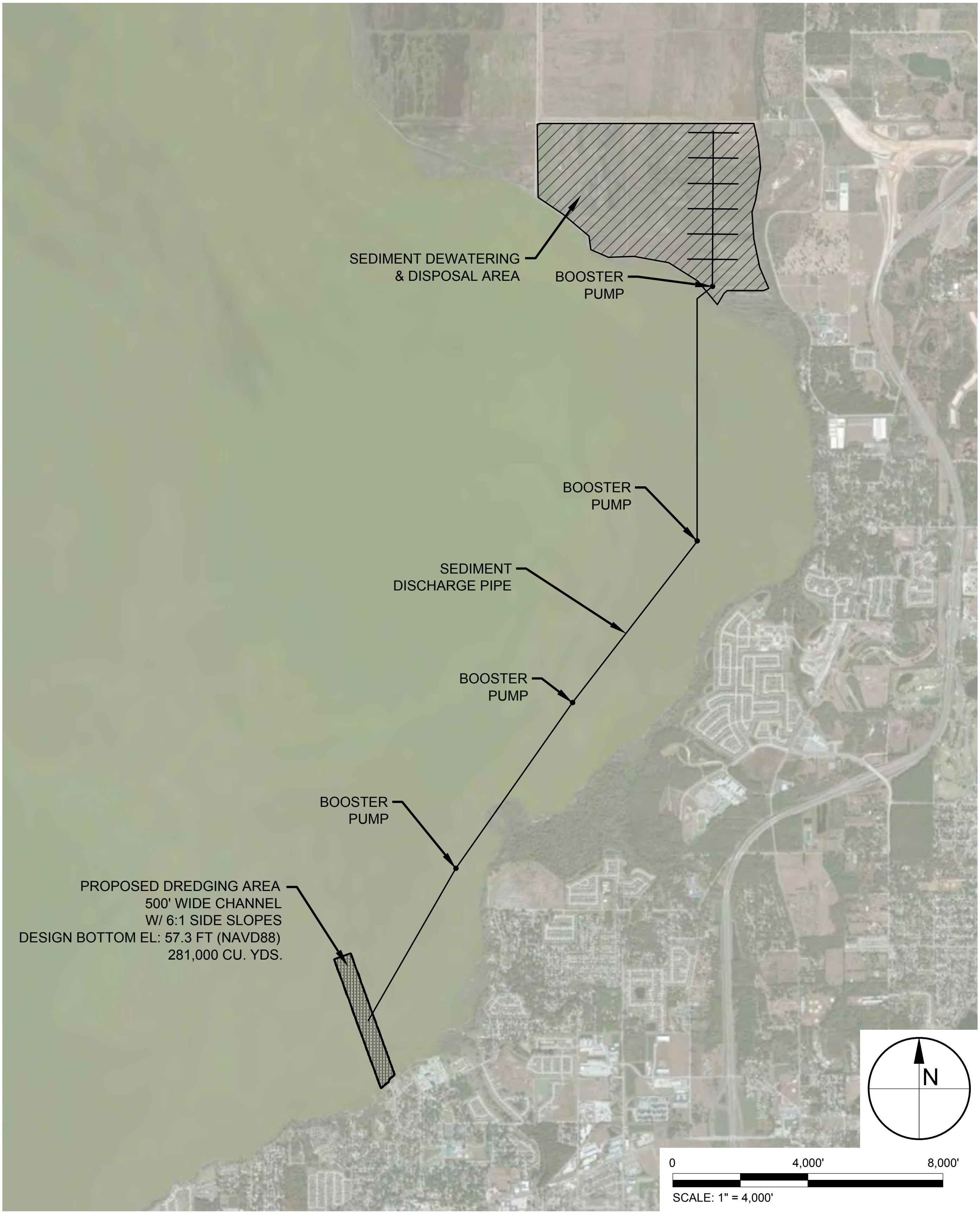

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FIGURE 2
PROJECT OVERVIEW
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
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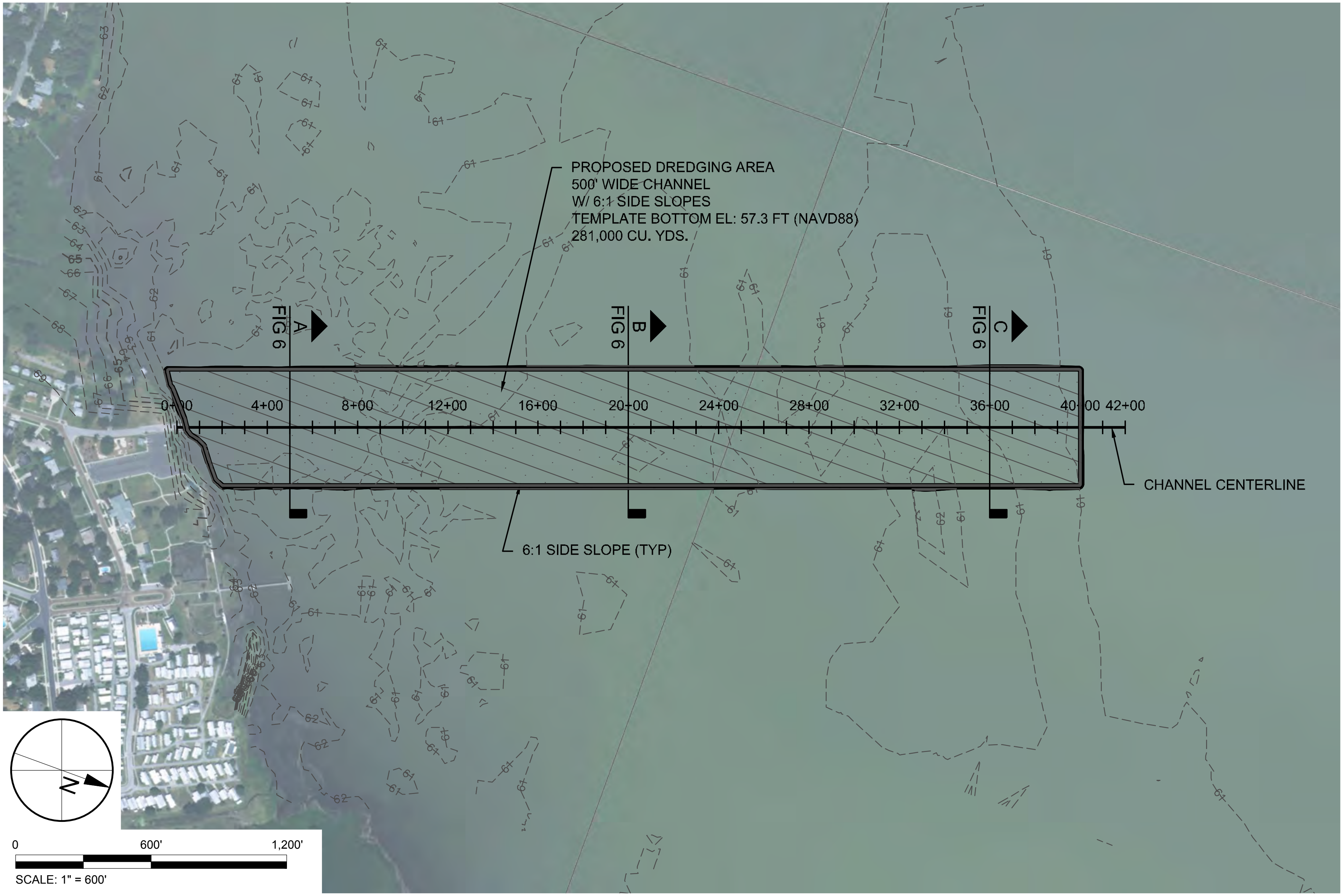

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FIGURE 3
DREDGING SITE PLAN
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
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SHEET	3 of 12
DATE	APRIL 2013

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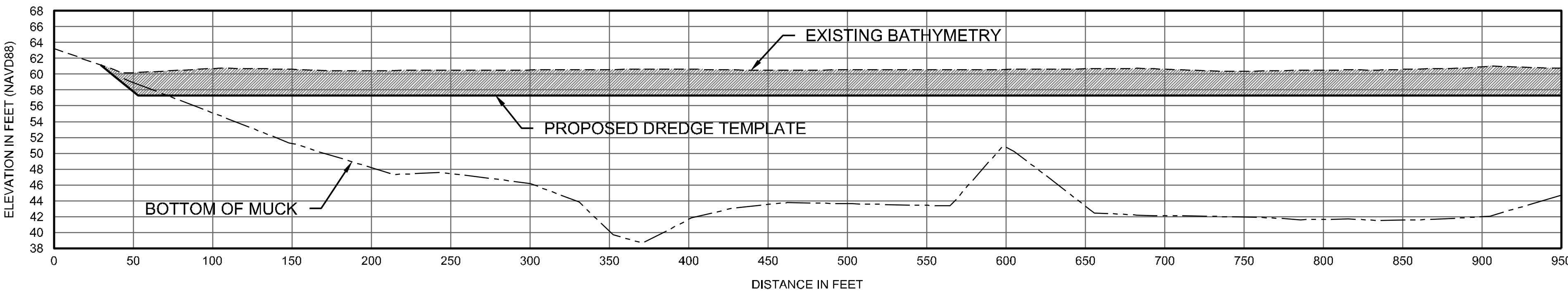

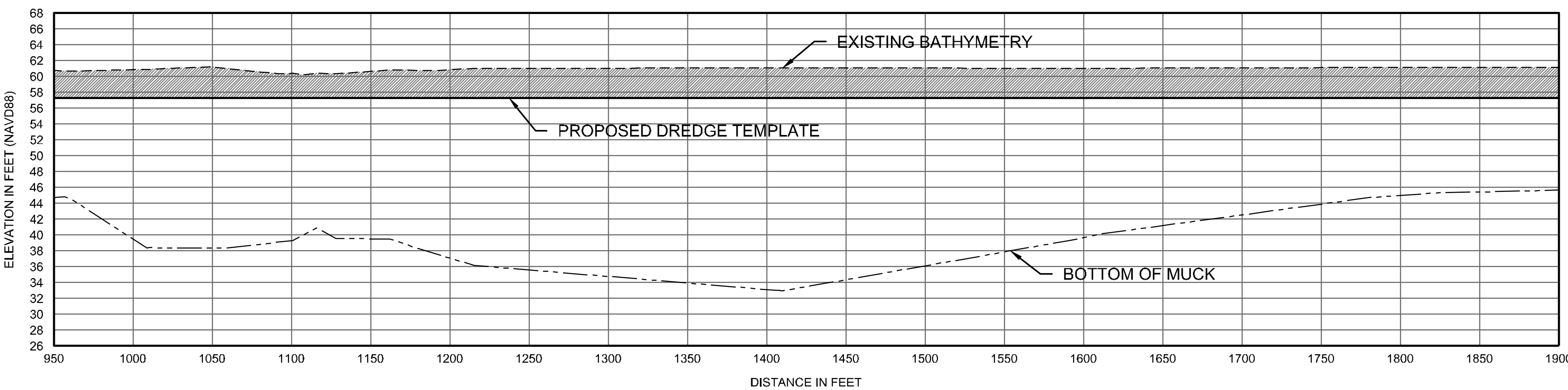

CHANNEL CENTERLINE PROFILE

SCALE: 1" = 100'
V-SCALE: 1" = 20'

0 100'

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FIGURE 4
DREDGE TEMPLATE PROFILE
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

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DATE	APRIL 2013

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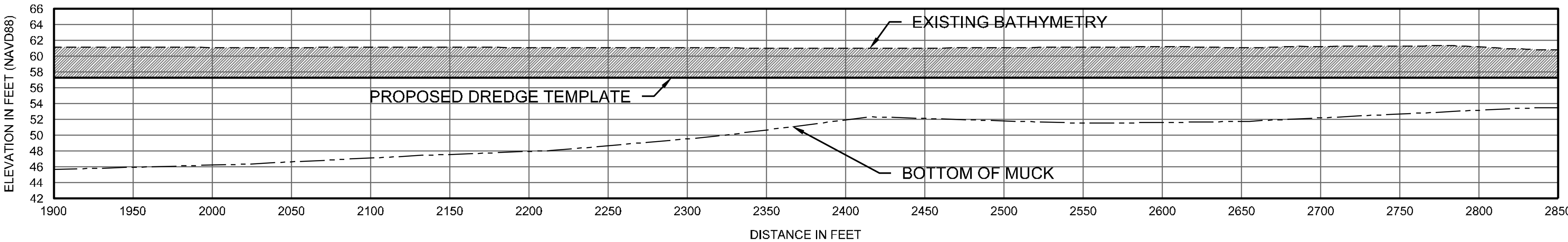

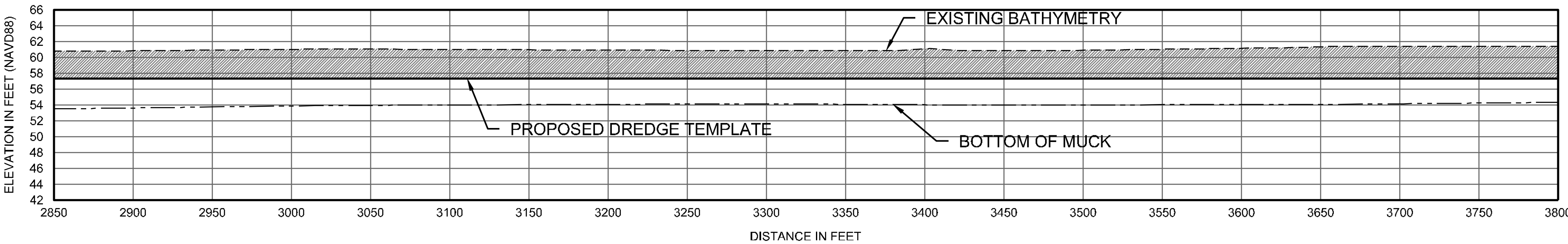

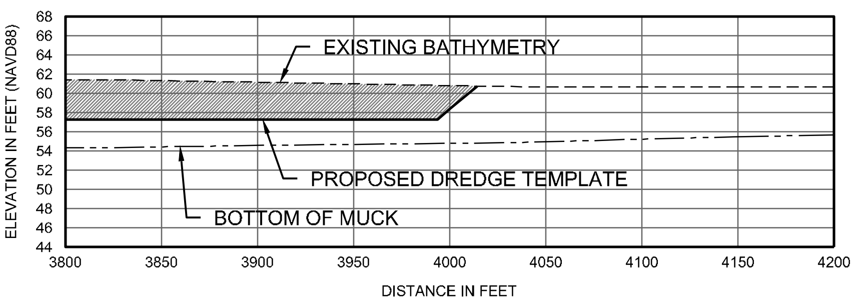

CHANNEL CENTERLINE PROFILE

SCALE: 1" = 100'
V-SCALE: 1" = 20'
0 100'

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FIGURE 5
DREDGE TEMPLATE PROFILE
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
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DATE	APRIL 2013

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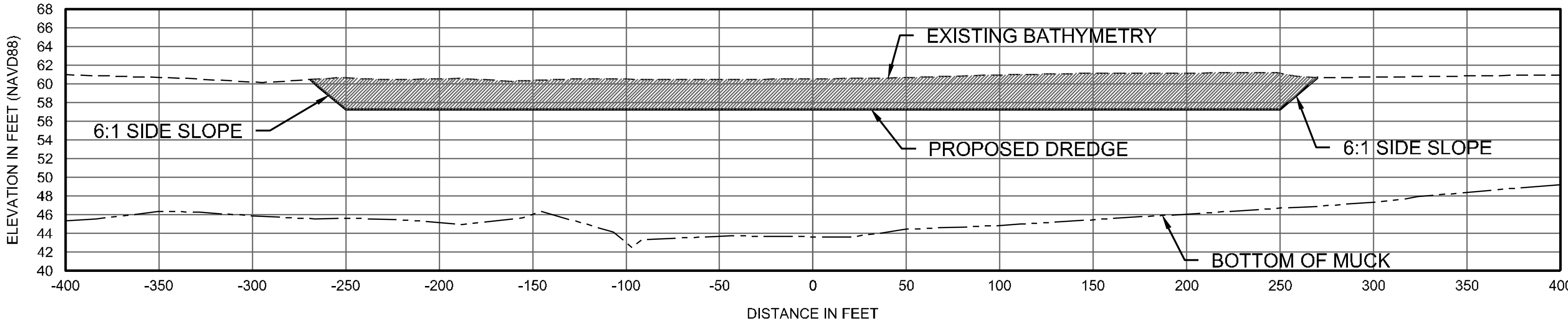

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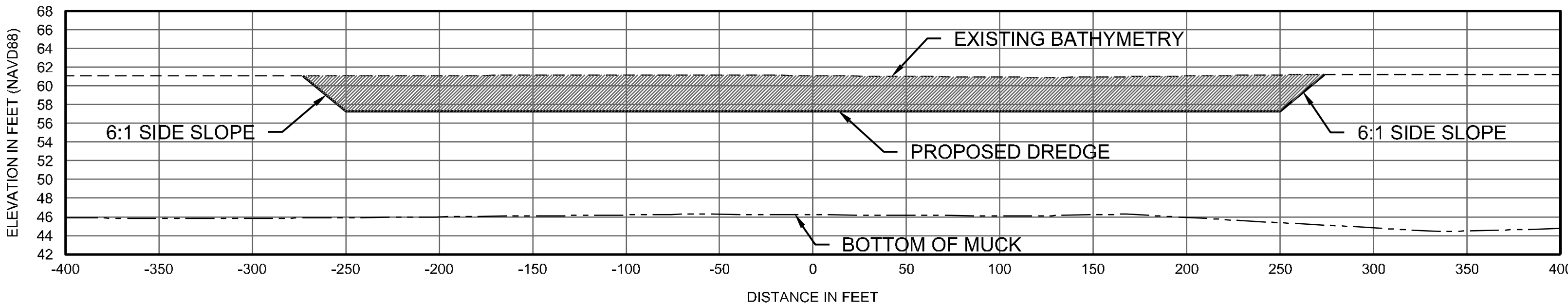

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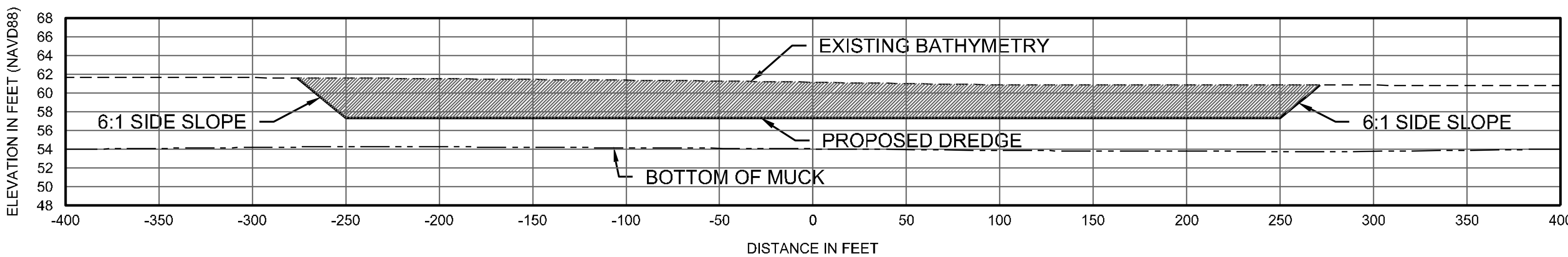

SECTIONS

SCALE: 1" = 100'
V-SCALE: 1" = 20'

0 100'

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FIGURE 6
DREDGING TEMPLATE SECTIONS
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
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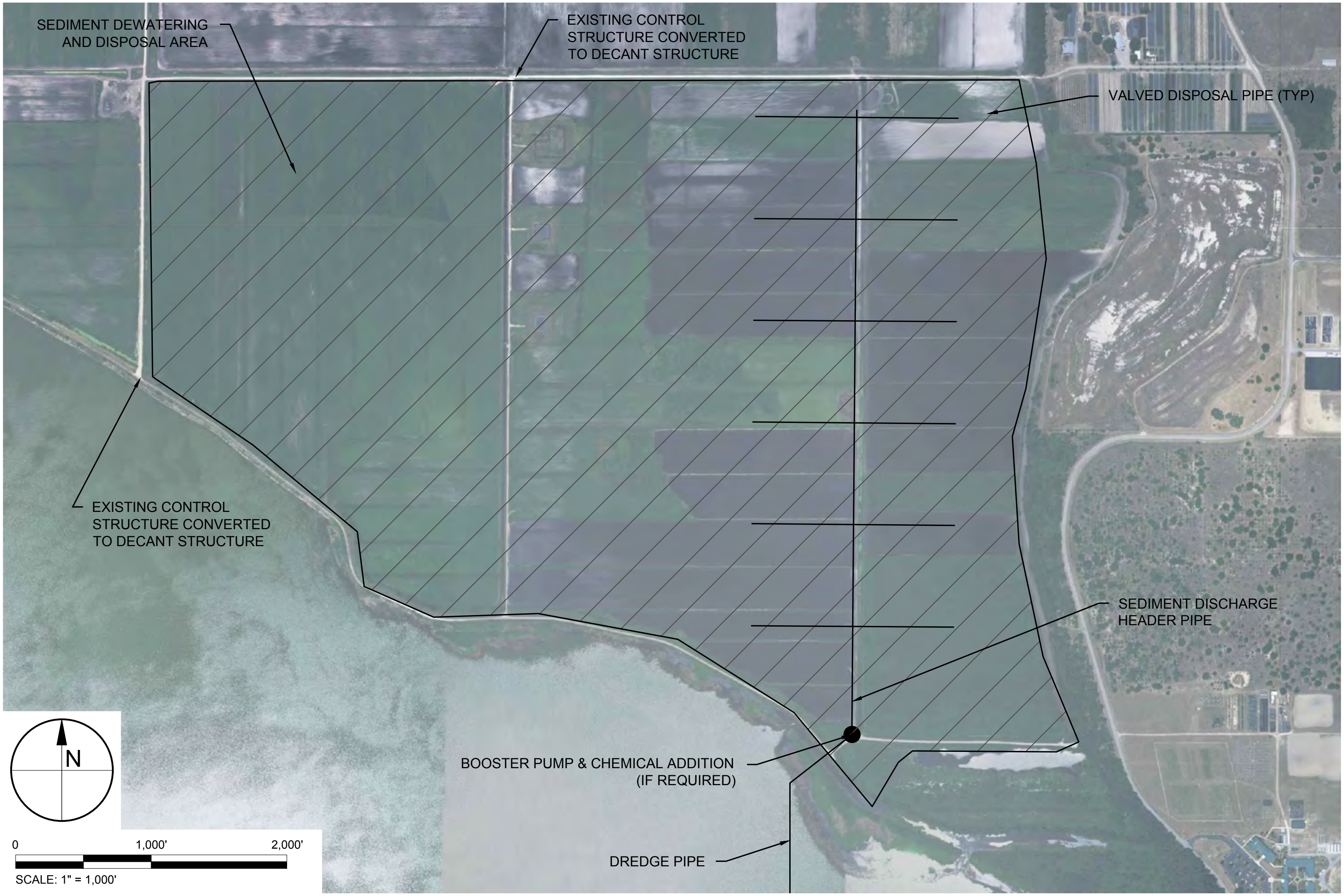

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FIGURE 7
DMMA SITE PLAN
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
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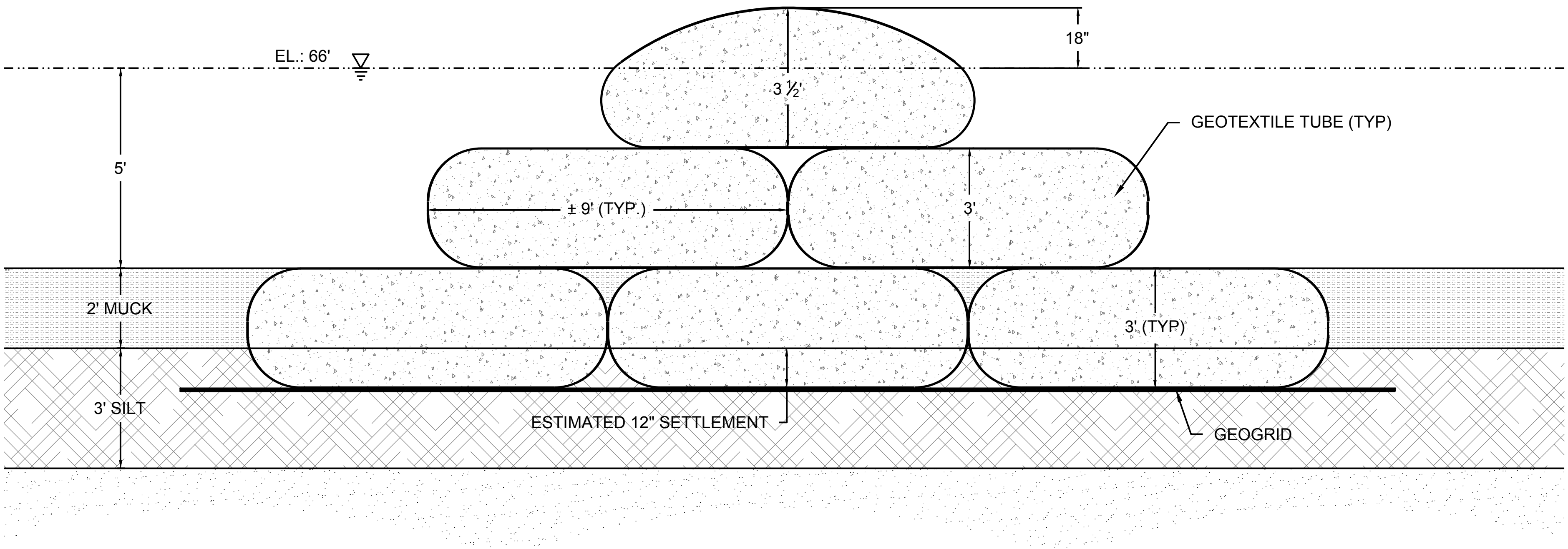
CATHY SHELL X:\SYS\PROJECTS\P2012-098 LAKE APOPKA\FIGURES\P2012-098-F-DMMA SITE.DWG 4/25/2013 1:36:52 PM

NOTES:

1. GEOTUBE BREAKWATER NOT RECOMMENDED FOR LOCATIONS HAVING A MUCK LAYER GREATER THAN 2' THICK.

2. THREE TIER GEOGRID SHOWN. OTHER CONFIGURATION MAY BE REQUIRED TO ACCOMODATE LONG TERM SETTLEMENT.



TYPICAL GEOTEXTILE BREAKWATER DETAIL SECTION

SCALE: 1" = 4'

0 4'

TAYLOR ENGINEERING INC. 10151 DEERWOOD PARK BLVD. BLDG. 300, SUITE 300 JACKSONVILLE, FL 32256 CERTIFICATE OF AUTHORIZATION # 4815	FIGURE 8 TYPICAL GEOTEXTILE BREAKWATER DETAIL SECTION LAKE APOPKA DREDGING PROJECT ORANGE COUNTY, FLORIDA	PROJECT C2012-067	SEAL
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		SHEET 8 of 12	
		DATE APRIL 2013	ROBERT J. WAGNER P.E. # 63028 DATE

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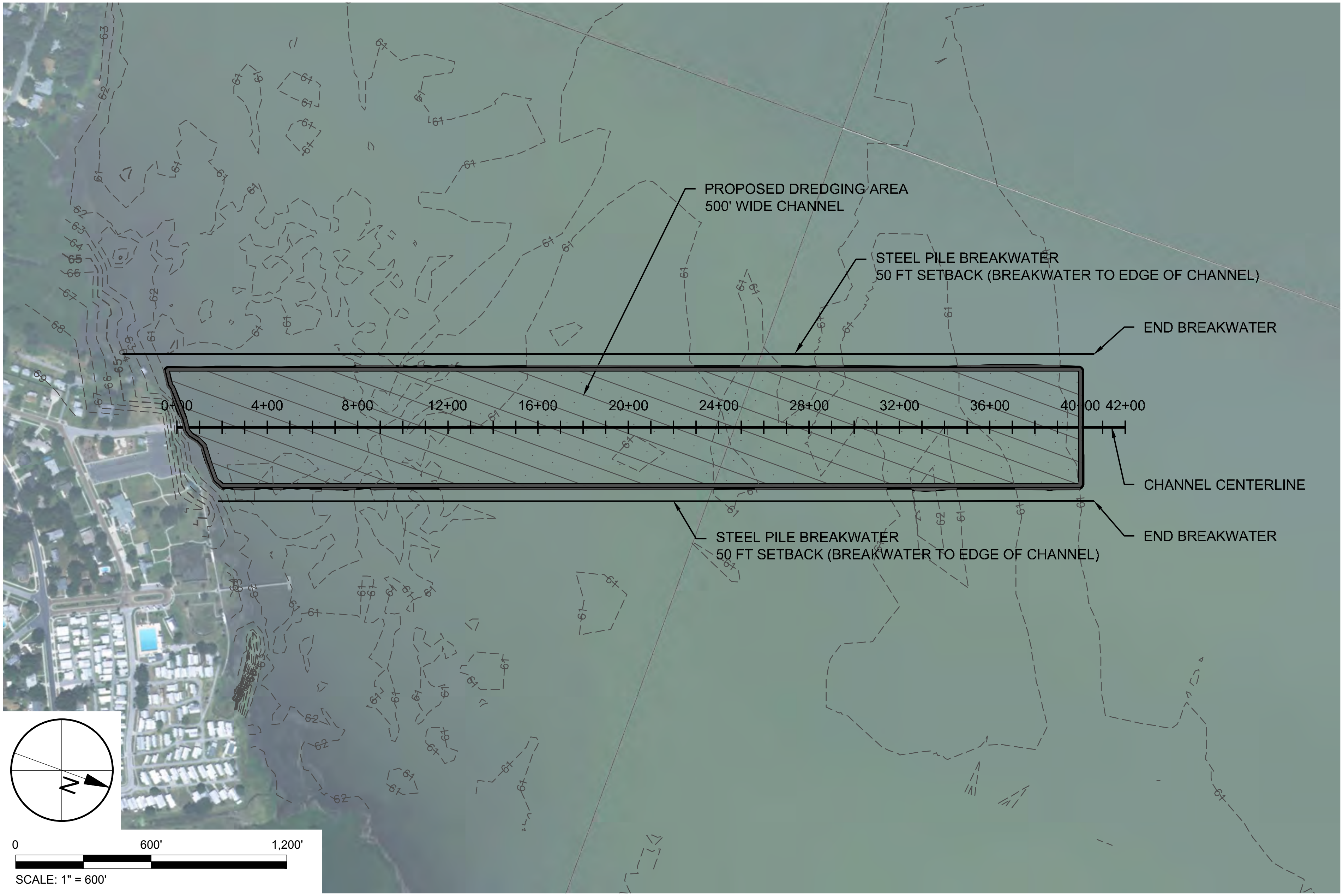

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FIGURE 9
STEEL PILE BREAKWATER PLAN
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
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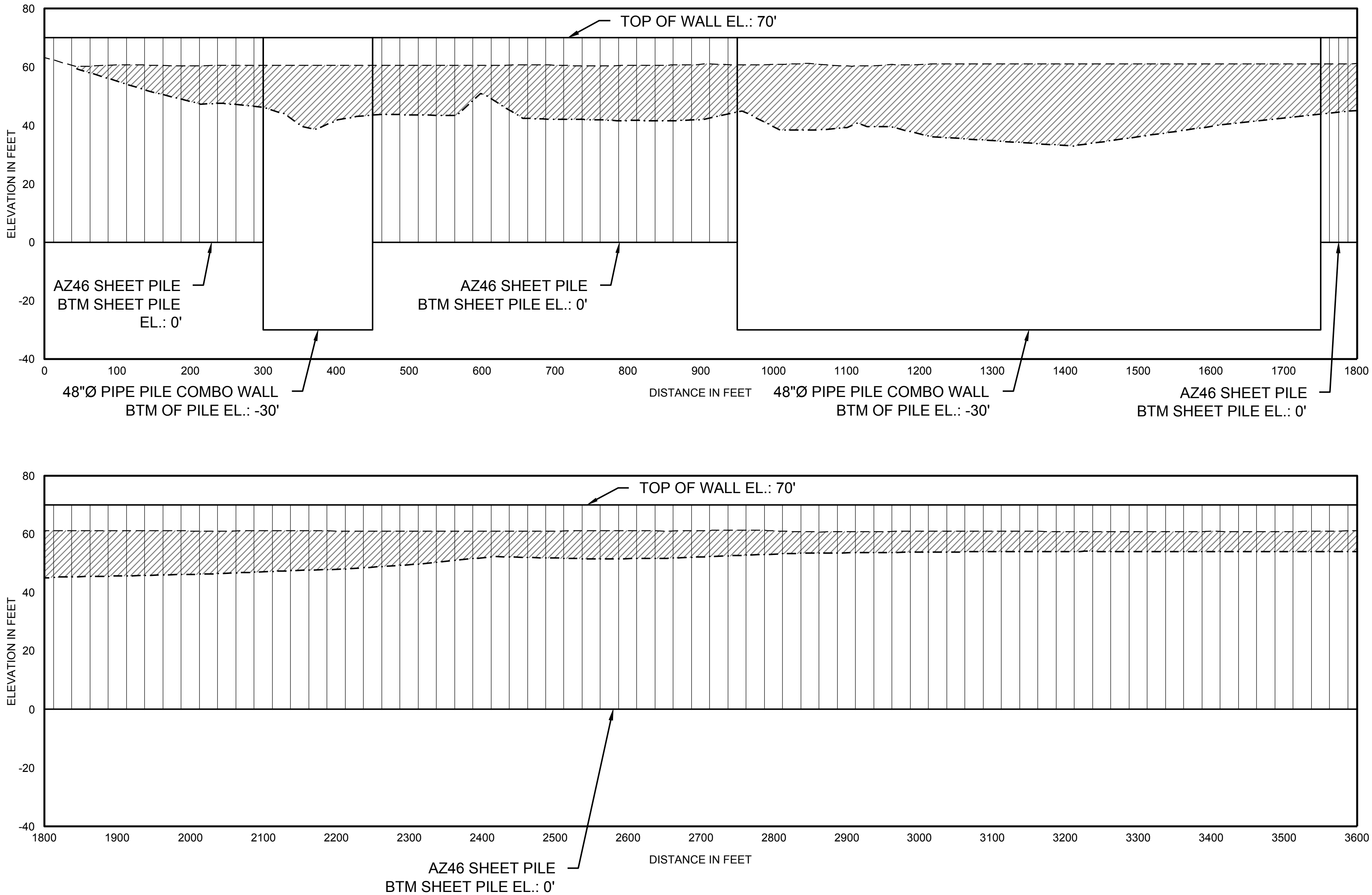

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FIGURE 10
STEEL PILE BREAKWATER ELEVATIONS
LAKE APOPKA DREDGING PROJECT
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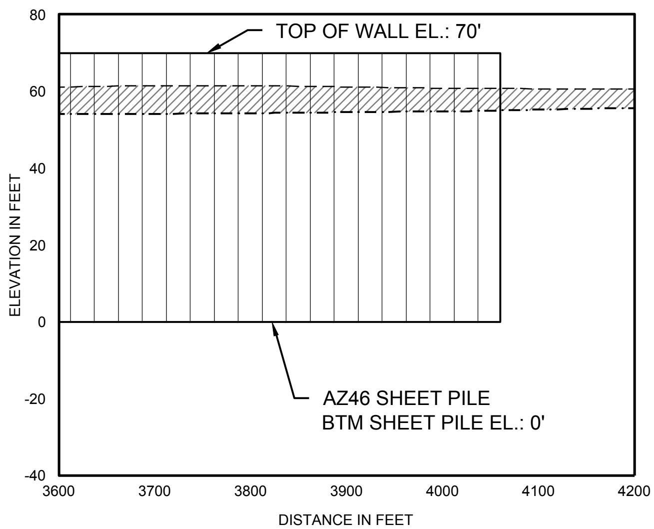

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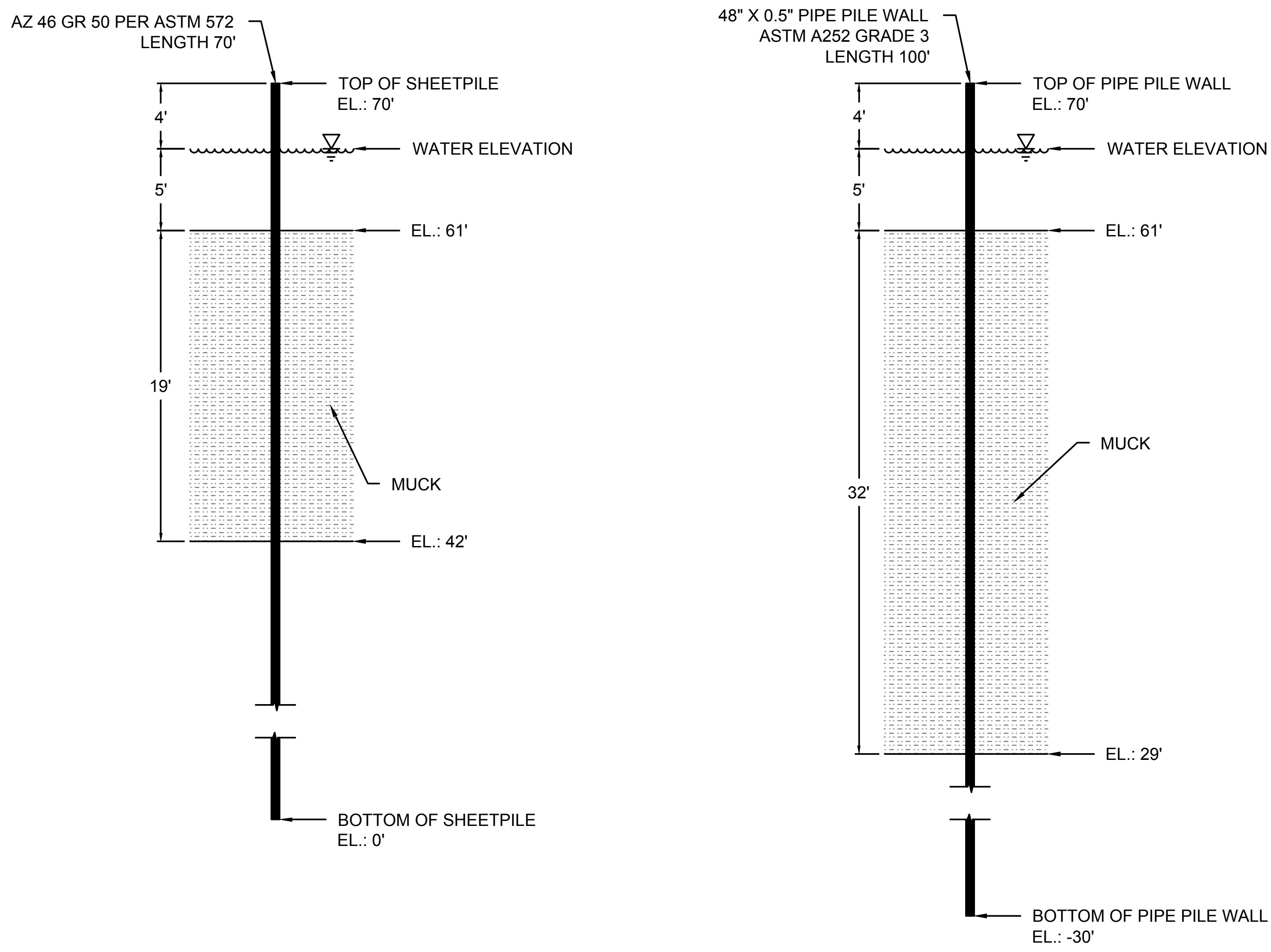
FIGURE 11
STEEL PILE BREAKWATER ELEVATIONS
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
DRAWN BY	RLJ
SHEET	11 of 12
DATE	APRIL 2013

SEAL

ROBERT J. WAGNER P.E. # 63028 DATE



TYPICAL STEEL PILE BREAKWATER SECTION DETAILS ~ PRELIMINARY DESIGN

SCALE: 1" = 10'

0 10'

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FIGURE 12
STEEL PILE BREAKWATER SECTION DETAILS
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
DRAWN BY	RLJ
SHEET	12 of 12
DATE	APRIL 2013

SEAL

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CATHY SHELL X:\SYS\PROJECTS\P2012-098 LAKE APOPKA\FIGURES\P2012-098-F-SHEETPILE SECTIONS.DWG 4/25/2013 1:37:05 PM

Appendix D

Dredging Option Analysis

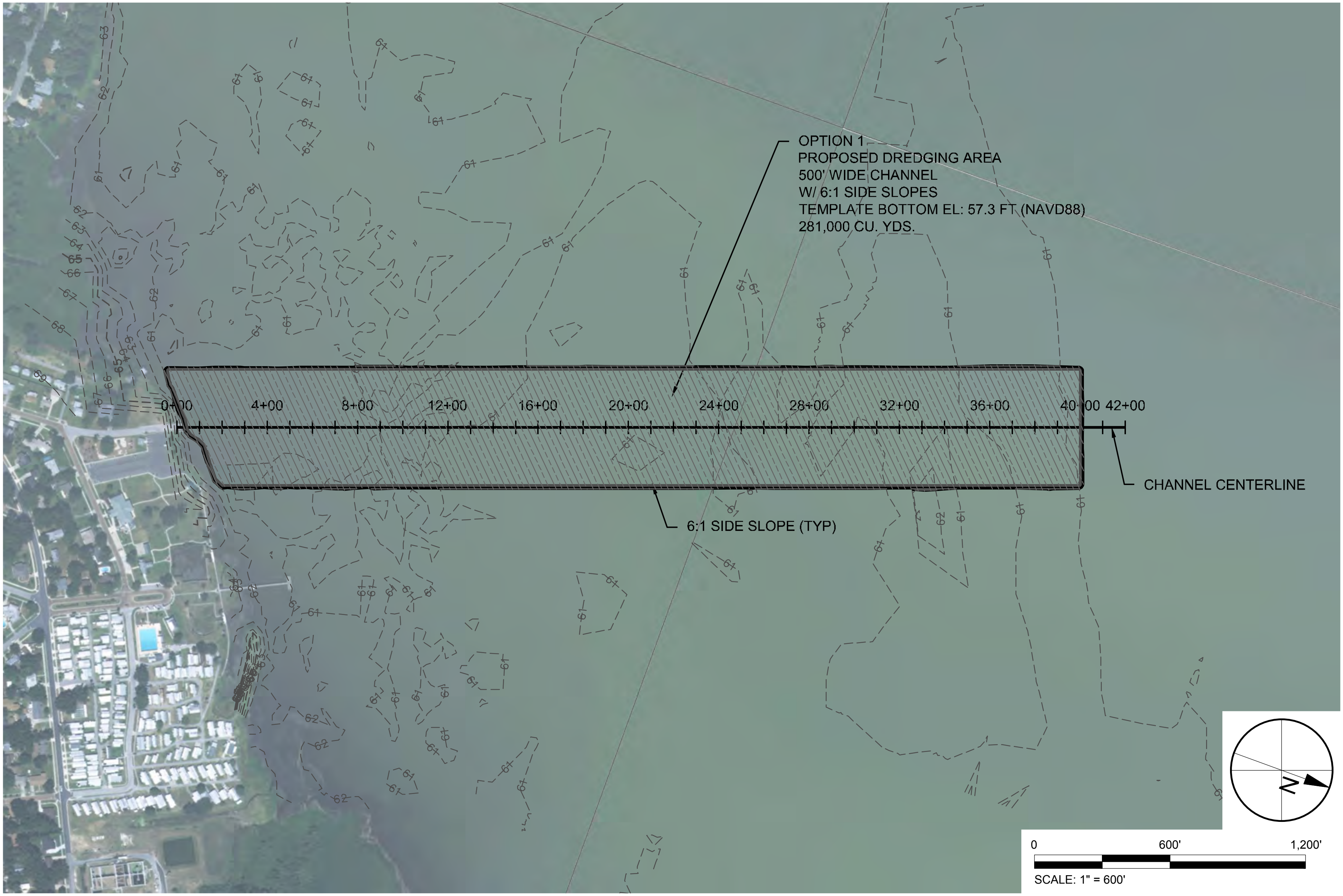

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FIGURE 1
OPTION 1 ~ DREDGING SITE PLAN
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
DRAWN BY	RLJ
SHEET	1 of 3
DATE	APRIL 2013

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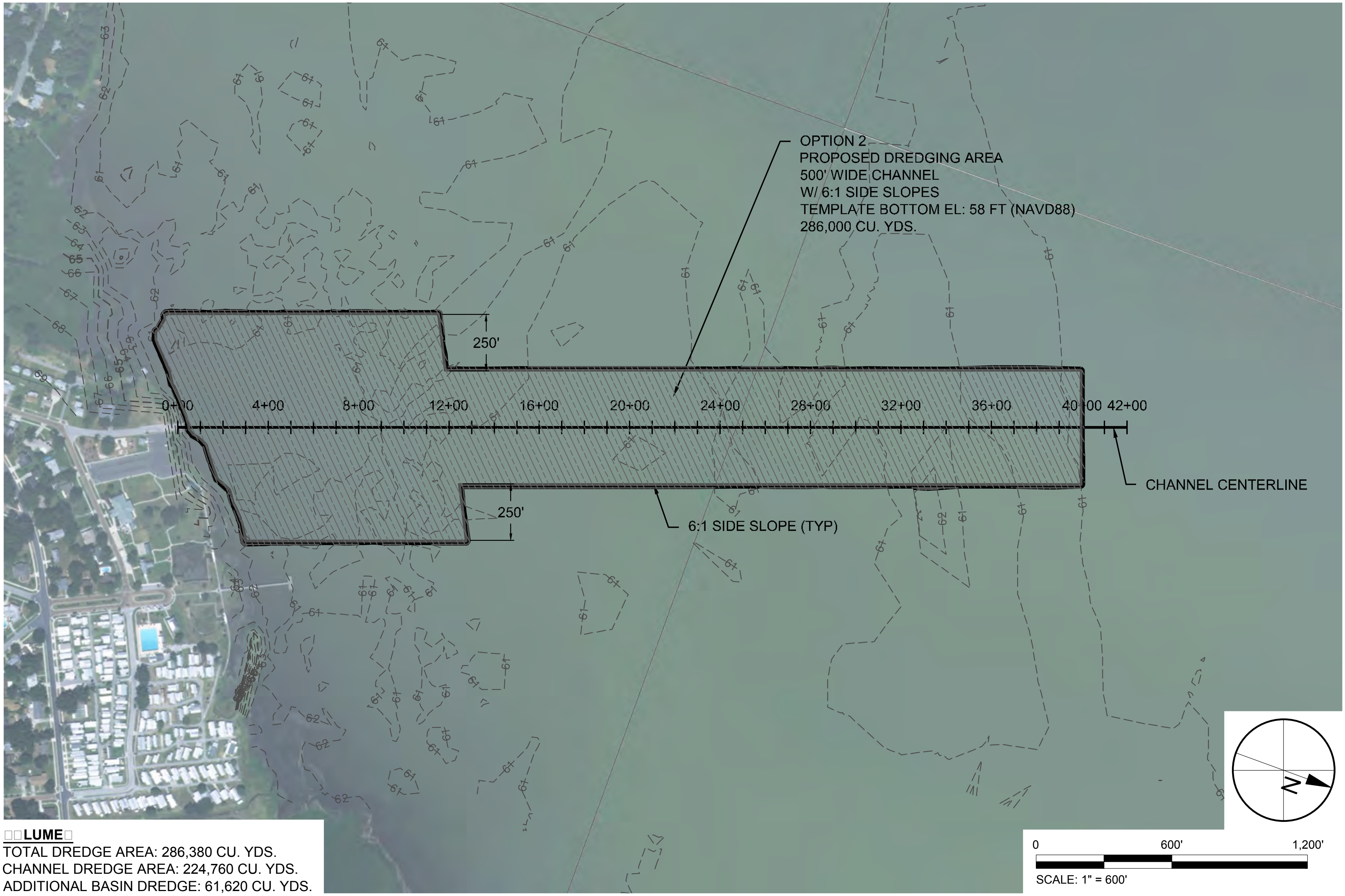

VOLUME

TOTAL DREDGE AREA: 286,380 CU. YDS.
CHANNEL DREDGE AREA: 224,760 CU. YDS.
ADDITIONAL BASIN DREDGE: 61,620 CU. YDS.

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FIGURE 2
OPTION 2 ~ DREDGING SITE PLAN
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
DRAWN BY	RLJ
SHEET	2 of 3
DATE	APRIL 2013

SEAL

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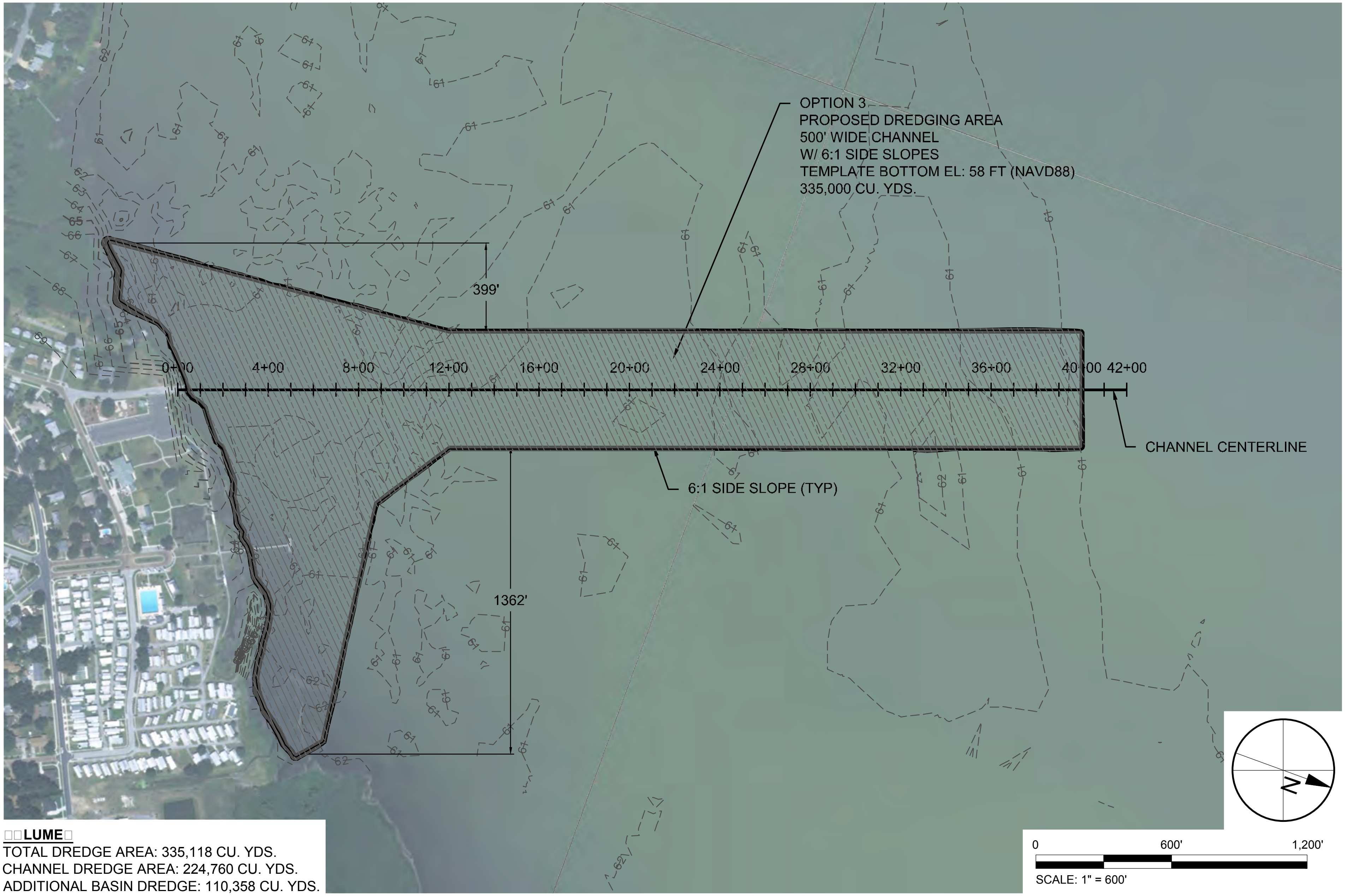

VOLUME

TOTAL DREDGE AREA: 335,118 CU. YDS.

CHANNEL DREDGE AREA: 224,760 CU. YDS.

ADDITIONAL BASIN DREDGE: 110,358 CU. YDS.

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FIGURE 3
OPTION 3 ~ DREDGING SITE PLAN
LAKE APOPKA DREDGING PROJECT
ORANGE COUNTY, FLORIDA

PROJECT	C2012-067
DRAWN BY	RLJ
SHEET	3 of 3
DATE	APRIL 2013

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CATHY SHELL X:\SYS\PROJECTS\P2012-098 LAKE APOPKA\FIGURES\P2012-098-F-DREDGE SITE -OPTION3.DWG 4/25/2013 4:12:23 PM

MEMORANDUM

To: Amy Wright, PE; St. Johns River Water Management District

From: Lori Brownell, PE, Taylor Engineering, Inc.

Date: 1/18/2018

Re: Site Placement Area Alternative Analysis and Recommendation
WO S009190 Task 3B Deliverable
Lake Apopka Newton Park Access Channel Dredging and Dredge Material Placement

---

OBJECTIVE

Based on the information collected in Tasks 1 (Document and Data Review) and 2 (Environmental Site Documentation), Taylor Engineering evaluated the Lake Apopka North Shore (LANS) Phase 3 and Phase 5 as a final placement option for sediments dredged from the Newton Park access channel.

CONCEPTUAL DESIGN

The conceptual design phase includes the following four components: (1) Newton Park dredging template and associated quantities; (2) dredged material placement; (3) expected water quality (phosphorus) in both LANS and Lake Apopka area; and (4) preliminary LANS water budget.

Development of the conceptual design include the following constraints and requirements:

- Total phosphorous (TP) concentrations shall not exceed 0.12 mg/L in the water released from Phase 3 or Phase 5.
- Due to the likelihood of raising Welland Road and the road north of the Unit 2 Pump Basin, the maximum top elevation of Phase 3/Phase 5 shall be set to 61 ft/60 ft NAVD88, respectively.
- The entire 400-acre Phase 3 and 700-acre Phase 5 areas are included in the placement evaluation; however, central flow conveyance canals should be maintained during construction to preserve dewatering routes.
- The St. Johns River Water Management District (SJRWMD) desires a thin-layer cover of dredged lake sediments — between 6 inches and upwards of 3 feet — over the entire placement area; however, SJRWMD will grant some leeway in post-construction tolerances.
- A minimum 1-foot water depth over the sediment surface in the dredged material placement area must be maintained at all times. Inability to achieve that standard (due to drought conditions or otherwise) may invoke temporary cessation of dredging.
- Impacts to interior Phase 3 and 5 vegetation are not a concern and construction equipment will not be hindered from entering either or both cells; however, outright clearcutting of vegetation pre- or during construction is not desired.

A summary of the conceptual design follows below.

NEWTON PARK DREDGING TEMPLATE AND QUANTITIES

Taylor Engineering completed the preliminary dredging design template at the Newton Park Boat ramp for three options: (1) original, April 2013 template with side slopes modified from 6:1 to 20:1; (2) avoidance of identified natural resources; and (3) avoidance of identified natural and potential cultural resources.

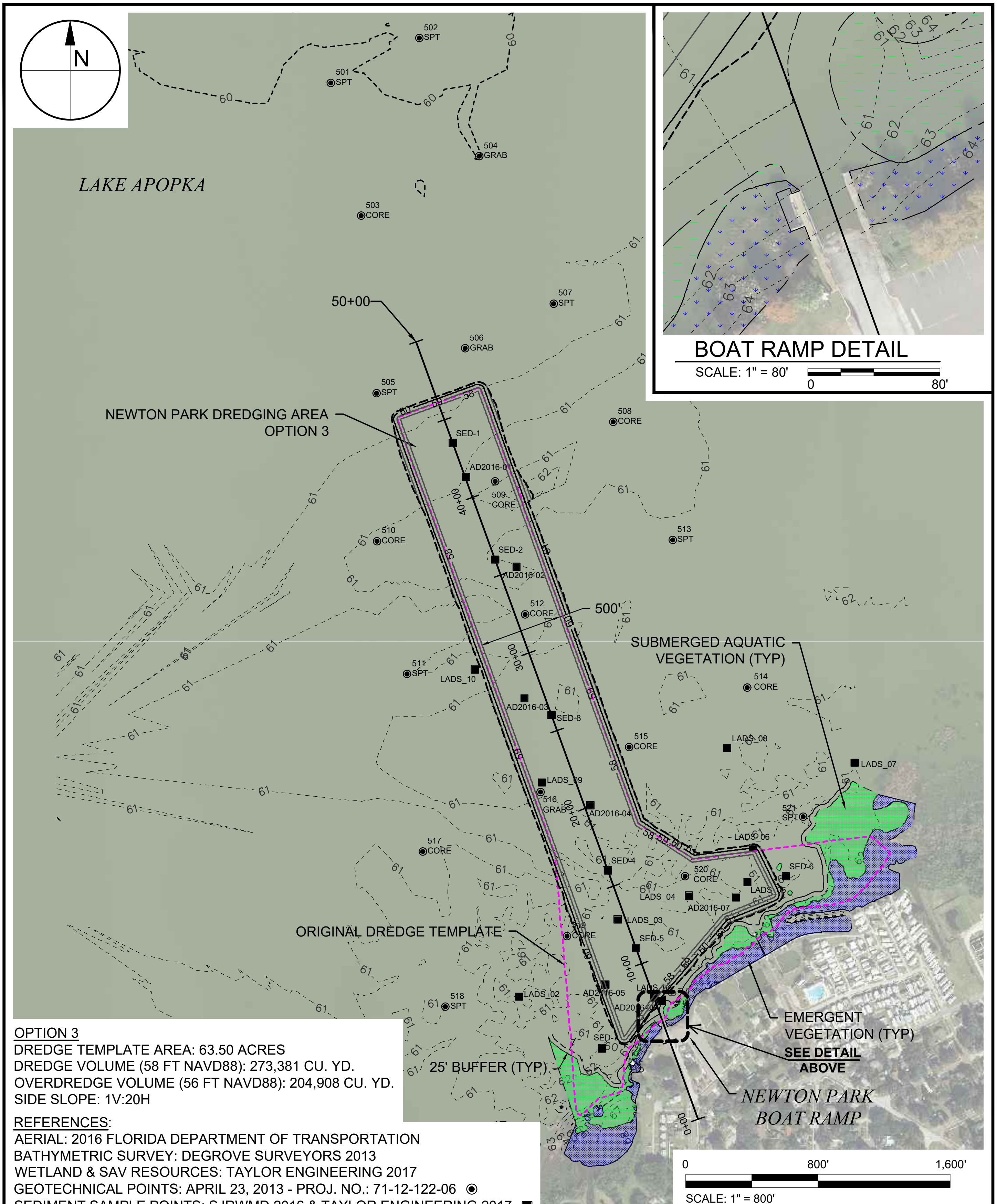
A summary of the expected footprint area, dredging volume — based on a 2013 bathymetric survey and July 2017 wetland delineation, and natural resource impacts for each of the three options follows in **Table 1**. **Attachment A, Figures 1 – 11** (Option 1), **Figures 12-22** (Option 2), and **Figures 23-32** (Option 3) provide plan and cross-section views for each of the three options. The sediment chemistry results — reported in Task 2, Environmental Site Documentation — suggested arsenic levels in exceedance of the residential threshold criteria throughout the template; however, the wide-spread concentrations did not suggest modification of the dredging template options to minimize average arsenic concentrations in the dredged sediment.

Table 1. Newton Park Dredge Template Options

NEWTON PARK DREDGING TEMPLATE OPTIONS	OPTION 1: ORIGINAL TEMPLATE WITH MODIFIED SIDE SLOPES	OPTION 2: AVOIDANCE OF IDENTIFIED NATURAL RESOURCES	OPTION 3: AVOIDANCE OF IDENTIFIED NATURAL AND POTENTIAL CULTURAL RESOURCES
DREDGE TEMPLATE			
Dredged Area (ac)	81.53	70.48	63.50
Volume to Project Depth (cy)	356,629	303,376	273,381
Volume with 2-ft Overdredge (cy)	263,057	227,425	204,908
Total Volume (cy)	**619,686**	**530,801**	**478,289**
NATURAL RESOURCE IMPACT			
Emergent Vegetation (ac)	3.04	--	--
Submerged Aquatic Vegetation (ac)	5.04	0.03[1]	--
Total Impact (ac)	**8.08**	**0.03***	**--**

NOTE: [1]Two small isolated submerged aquatic vegetation patches were identified during the July 2017 site visit; however, these patches could likely be transplanted prior to construction, avoiding impacts.

Volume to project depth (**Table 1**), the pre-dredging estimate — or the design volume of required dredging — reflects the volume of sediment calculated using the 2013 bathymetric survey of the proposed channel and the project design depth of 58 feet NAVD88 as the elevation boundaries. For allowable overdepth dredging (due to the vertical inaccuracy of hydraulic dredging equipment and likelihood of backfill of muck sediments into the dredged template), we have also included an additional volume estimate for 2 feet of allowable advanced maintenance or overdepth dredging to 56 ft NAVD88. The plan for the dredging operation and the bids of the dredging contractors would reflect the total of the project depth and 2-ft allowable overdredge estimate. Based on the shoreline presence of natural resources, potential cultural resources, and limited perceived navigation value of extending the dredging template further to the east and west, the SJRWMD selected moving forward with Option 3 (**Figure 1** and **Attachment A, Figures 23-32**).



OPTION 3
DREDGE TEMPLATE AREA: 63.50 ACRES
DREDGE VOLUME (58 FT NAVD88): 273,381 CU. YD.
OVERDREDGE VOLUME (56 FT NAVD88): 204,908 CU. YD.
SIDE SLOPE: 1V:20H

REFERENCES:
AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
BATHYMETRIC SURVEY: DEGROVE SURVEYORS 2013
WETLAND & SAV RESOURCES: TAYLOR ENGINEERING 2017
GEOTECHNICAL POINTS: APRIL 23, 2013 - PROJ. NO.: 71-12-122-06 ◉
SEDIMENT SAMPLE POINTS: SJRWMD 2016 & TAYLOR ENGINEERING 2017 ■

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FIGURE 1
NEWTON PARK DREDGING AREA - OPTION 3
PLAN VIEW W/ BOAT RAMP DETAIL
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	1 of 4	DEC 2017

SEAL
LORI S. BROWNELL P.E.#60025 DATE

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PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

DREDGED MATERIAL PLACEMENT

Given the sediment material characteristics and distance between the dredging project and placement area, the Newton Park access channel is suited for hydraulic dredging. Sediment placement may occur via conventional open pipe flow of dredged material or thin-layer placement. In general, the term "thin-layer placement" has been used in the context of subaqueous sediment placement and marsh nourishment with sediment to describe placement of sediment in an environmentally acceptable manner to achieve a target elevation or thickness. Thin layer placement projects include efforts to support infrastructure and/or create, enhance, maintain, or restore ecological function. In this case, ecological restoration will be accelerated by burying contaminated sediments and offsetting historical subsidence in the placement areas.

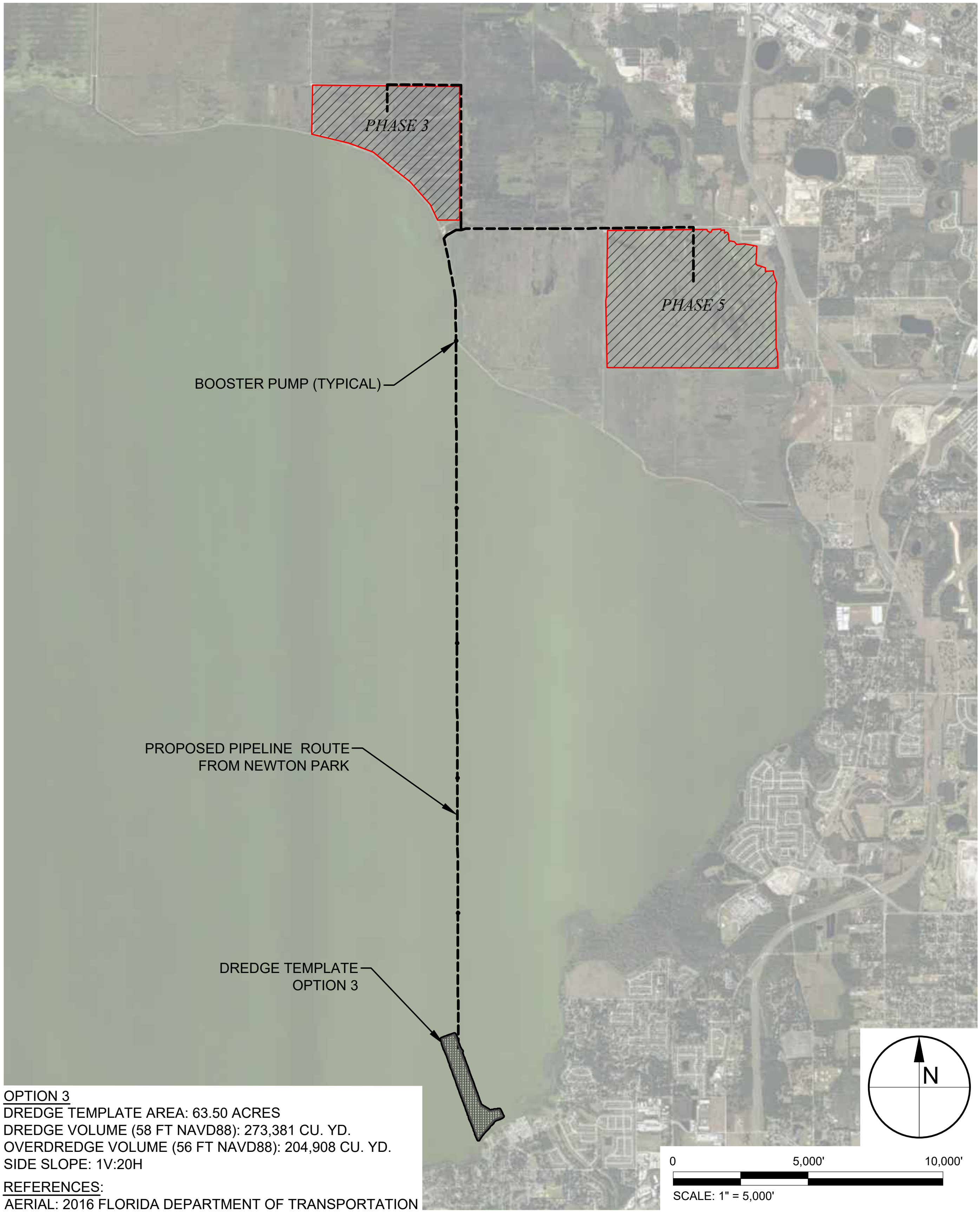
Thin layer placement is achieved controlling the rate and distribution of placed sediment to achieve a uniform coverage over the receiving sediment surface. This can be accomplished by distributing the sediments using pipes or using a high-pressure spray disposal technology system, or other controlled sediment placement methods. Thin layer placement requires additional monitoring of sediment and sediment surface elevations relative to conventional placement. In addition, to facilitate material handling the dredger may reduce the pumping rate below the maximum dredge capability; if pumping rates are too high it becomes difficult to control sediment settling rates to achieve the correct elevations. Decreased pumping rates may result in lower production and higher construction costs than for conventional placement methods.

Regardless of the application method chosen by the contractor or selected by the SJRWMD, the primary project-specific goals of site management during hydraulic dredging operations are to maintain acceptable effluent quality during the sediment placement and decanting process and to control the pattern of deposition. To these ends, the following paragraphs discuss five key aspects of site management to achieve project goals:

(1) Placement and handling of the dredge slurry pipeline
(2) Operation and monitoring of the dredged slurry inlet
(3) Slurry placement operations and adjustments
(4) Monitoring of the released effluent
(5) Inspection of the dike infrastructure
(6) Environmental (vegetation monitoring)

Pipeline Placement

The dredging project will require temporary placement of the dredge slurry pipeline (pipeline) either into Phase 3, Phase 5, or a combination thereof. The return water, as described below in the **Water Budget** section, will route through the LANS and eventually into the Apopka-Beauclair canal and Lake Apopka. In general, the pipeline will traverse the most direct and least environmentally impactful route between the Newton Park navigation project and the placement area(s) (**Figures 2 and 3**). Once entering the LANS, the pipeline will likely be routed along the edge of the existing farm access roads to selected placement areas. To avoid short-circuiting flow and maximize the effective settling time, sediment inflow points will be placed as far as possible from the outlet weirs for an area. The dredging contractor will be responsible for controlling the flow rate into and out of the placement area and relocating the pipeline, as necessary, in the placement area to achieve the specified water quality and deposition criteria. Following completion of dredging, the dredging contractor will remove the pipeline.



OPTION 3
DREDGE TEMPLATE AREA: 63.50 ACRES
DREDGE VOLUME (58 FT NAVD88): 273,381 CU. YD.
OVERDREDGE VOLUME (56 FT NAVD88): 204,908 CU. YD.
SIDE SLOPE: 1V:20H

REFERENCES:
AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION

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FIGURE 2
PROJECT OVERVIEW
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	2 of 4	DEC 2017

SEAL

LORI S. BROWNELL P.E.#60025 DATE

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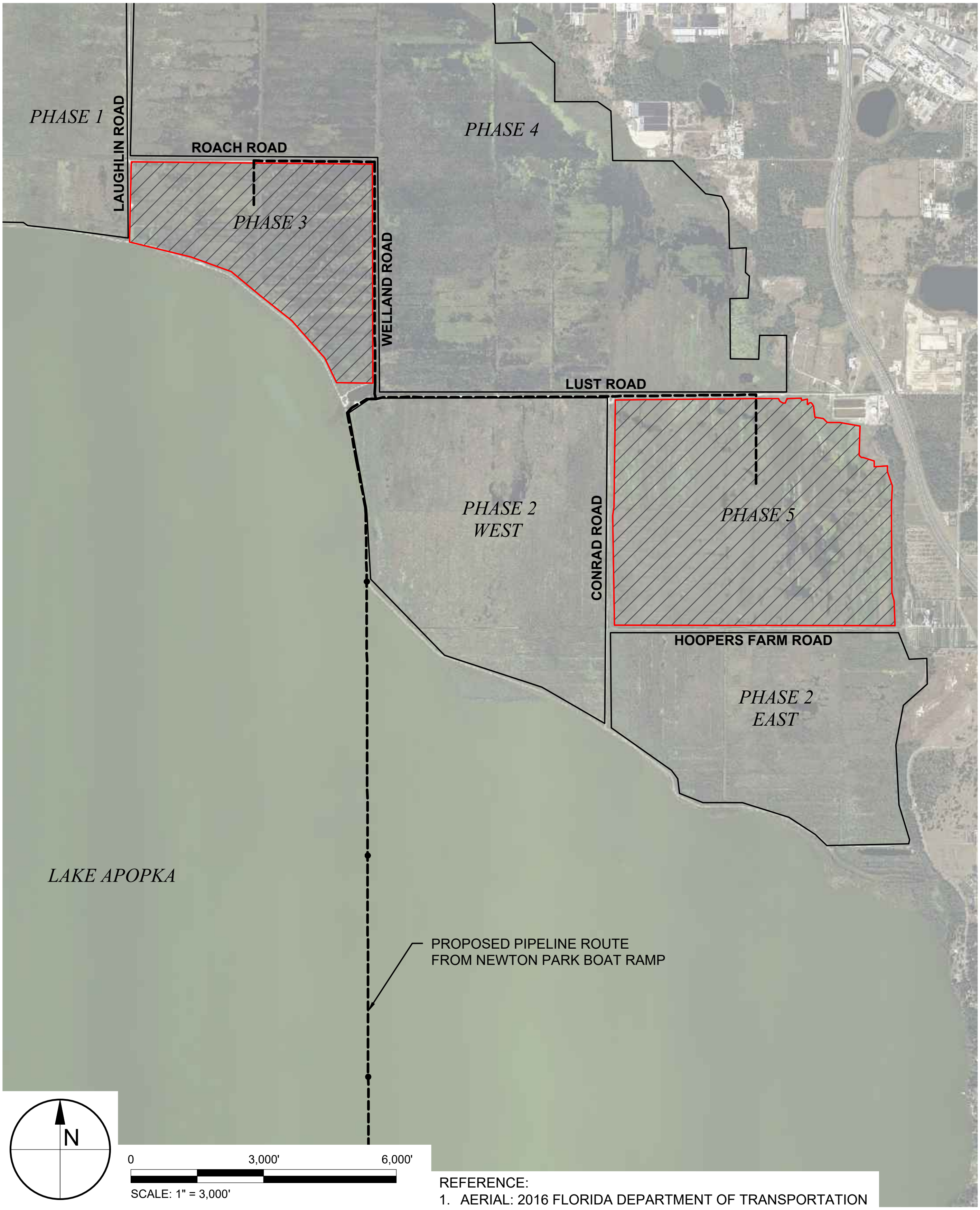

REFERENCE:
1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION

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FIGURE 3
PROPOSED PIPELINE ROUTE
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	3 of 4	DEC 2017

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PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

Inlet Operation

The quality of the dredged sediment, specifically the settling characteristics of the different grain-size fractions, govern the operation of the inlet (i.e., the location where the pipeline releases the slurry into the placement area). The coarsest fraction of material will settle out of suspension most rapidly and often forms a mound near the inlet. Successively finer fractions, characterized by lower settling velocities, will take longer to settle and will deposit between that location and the outlet weir. Absent an inlet operation strategy, the dominant grain-size fraction will determine the distribution of sediment within the basin. For example, if fine-grained sediments dominate (as in the case of the Lake Apopka sediments), a relatively large volume of material will concentrate near the outlet weir. Sediment will be retained elsewhere within the area by differential settling rates and can be partially controlled by sediment deposition management (e.g., turbidity curtains, coir logs, flocculant additives).

Based on the Newton Park dredging template sediment characterization, to minimize mounding of sediments and to achieve more uniform deposition, the inlet location will be moved as necessary during placement operations to maintain even thickness of the sediment. In addition, to prevent erosion or undercutting the interior dike slope, a minimum distance of 100 ft. must be maintained between the inlet and the inside toe of the dike. The resulting deposition pattern should maintain a consistent slope from inlet to weir to minimize dead zones and channelization. An additional, although secondary advantage gained through extending the supply pipe results from shutting down the dredge plant to allow the addition of each extension. These operational intermissions, together with temporary shutdowns to move the dredge, effectively increase the retention time of the containment area, thereby increasing the solids retention efficiency of the basin. However, preliminary analysis of placement area performance (see **Water Budget)** indicates that maintaining adequate effluent quality will not require intermittent dredge operation during a projected 5-day week (daylight only) schedule.

The incoming slurry should be periodically monitored at the placement area inlet to confirm or refine dredge output characteristics, including volumetric output and slurry solids content. These parameters, in combination with the actual duration of dredging, can serve as an independent measure of deposition volume to determine remaining site capacity. Additionally, the computed deposition volume can be used with pre- and post-dredging bathymetric surveys of the channel and, following placement and dewatering of the deposition layer, topographic surveys within the containment basin to refine the bulking factor employed to translate in situ dredging volumes to required storage volumes. The results of this monitoring and analysis will provide a basis for the operational management of containment area performance and efficiency.

Weir Operation

Weir operations to release decanted water — that is, controlling the ponding depth and flow rate over the weirs by adjusting the weir crest elevation — will be critical to maintaining decant water quality during sediment placement. Prior to dredging commencement, the weir crest elevation should be set to ensure sufficient initial retention time and water depth to produce appropriate quality in water released from identified dredged material placement areas. Once dredging begins, the weir crest elevation should be maintained at its initial elevation until the ponded water surface approaches the weir crest. As ponding depth increases above the defined minimum design depth (to be determined in final design), the decision must be made to initiate release of the supernatant (decant water). The decision to release water must be supported with turbidity testing or suspended concentration results analysis showing appropriate surface water quality at least adjacent to the weir(s). If target water quality is not achieved prior to the ponded water surface reaching the initial weir crest elevation, the dredge plant must shut down until the surface water turbidity reaches acceptable limits, or until alternative measures such as the installation of turbidity screens or floating baffles are implemented. If the desired water quality is achieved at a ponding depth less than the initial weir crest elevation, the water surface should still be permitted to rise to the weir crest unless dike integrity is threatened.

Once flow over the weir has begun and the decant water is maintaining acceptable quality as indicated by monitoring data, the hydraulic head over the weir becomes the most readily available criterion for weir operation. Actual operating head over the weir can be measured on site by two methods. First, it can be determined by using a stage gage, located in the basin where velocities caused by the weir are small (at least 10 – 20 ft from the weir), to read the elevation of water surface and subtracting from it the elevation of the weir crest. The static head can also be determined indirectly by measuring the depth of flow over the weir. If the head over the weir, as measured by either method, falls below the site-specific weir design loading, because of unsteady dredge output or intermittent operation, effluent quality should increase. However, if the head exceeds these values, the ponding depth should be increased by adding flashboards or temporarily halting dredging to prevent a decrease in effluent quality.

At all times, each of the weirs must be maintained at the same elevation to prevent flow concentration and a decrease in effluent quality related to an increase in weir loading. Preventing floating debris from collecting in front of the weir sections is also important. An accumulation of debris at the weirs will reduce the effective weir crest length and thereby increase the withdrawal depth. This may increase the effluent suspended solids concentration. The canal receiving the decanted water must be maintained at an elevation that always ensures a free-falling weir condition.

Effluent Monitoring

As discussed in the preceding section, effluent monitoring is an integral part of facility operation. The monitoring program, generally dictated by permit conditions, must therefore continue throughout dredging and decanting operations. Samples should be taken and analyzed for turbidity, total suspended solids (TSS), dissolved oxygen (DO), TP, and dissolved inorganic phosphorus (PO_4) in accordance with SJRWMD discharge quality guidance and stated permit conditions. The minimum recommended sampling frequency is three times per daylight shift, which may range seasonally from nine to twelve hours.

Dike Inspection Monitoring

Dredging operations will require several monitoring procedures related to inlet operations. Ponding depth is a critical parameter for maintaining acceptable containment basin performance. Increased ponding depth improves solids retention performance of the basin by increasing retention time. However, under saturated foundation conditions, unbalanced hydrostatic forces resulting from too great a ponding depth could create the potential for dike failure. Indications of impending dike instability include foundation saturation at the outer dike toe and excessive seepage through the dike’s outer slope, followed by piping and small-scale slumping. Obviously, such conditions must not occur. Therefore, final design must include a review of the existing (and potential future expansion) of the existing pre-, during, and post-construction operating scenarios of the placement area dike foundation to include a detailed review of seepage and slope stability analysis. Throughout all phases of dredging and dewatering, the dredging contractor shall be responsible for additional inspections of the containment facility related to ensuring the integrity and stability of the containment dikes and related structures. The following paragraphs summarize the required critical and supplemental inspections required to monitor dike condition.

Critical Inspections

The contractor shall perform periodic inspections of the containment dikes to check for certain critical conditions that may require implementation of remedial measures. A qualified geotechnical engineer or engineering technician with specific training and experience in performing inspections of earthen dams, earthen reservoirs, or earthen dredged material containment facilities will conduct all inspections. The contractor shall conduct inspections for the items listed below during each day of operation. Any of these items could indicate a critical condition requiring immediate investigation and possible emergency remedial action. Immediately upon identifying a critical condition, the contractor must inform the SJRWMD and its authorized representative and increase the inspection frequency.

The following items are potential indicators of a critical condition:

(1) Seepage with boils, sand cones, or deltas on outer face of the dike or downstream from the dike's outer toe
(2) Silt accumulations, boils, deltas, or cones in the drainage ditches at the dike's base
(3) Cracking of soil surface on the dike's crest or on either face of the dike
(4) Bulging of the downstream face of the dike
(5) Seepage, damp area, or boils in vicinity of or erosion around a conduit through the dike
(6) Any subsidence of the crest or faces
(7) Any failure of the weir structure or its operation
(8) Any leaks or seepage of the supply or return pipelines

Supplemental Inspections
During the critical inspections described above, the items listed below could indicate potential areas of concern that the contractor must then continue to monitor closely during subsequent inspections and perform repairs as necessary. Within 24 hours of identifying an indicator of a potential area of concern, the contractor must also inform the SJRWMD and its authorized representative of the item and any required repairs undertaken.

Indicators of potential areas of concern include the following:

(1) Overgrown patches of vegetation on the inside and outside portions of the dike;
(2) Surface erosion, gullying, or wave erosion on the inside portion of the dike;
(3) Surface erosion, gullying, or damp areas on the outside face of the dike, including the berm and the area immediately adjacent to the outside toe;
(4) Erosion below any conduit exiting the dike;
(5) Wet areas or soggy soil on the outside face of the dike or in the natural soil below dike; and,
(6) Failure of the weir boards, their containing structure, or any blockage or interference of weir operations.

<u>Environmental Monitoring</u>
Environmental monitoring is necessary to verify that the sediment surface is covered by at least a foot of water and that the fish population is healthy (i.e., not dying in large numbers). SJRWMD will task the contractor to perform sediment accumulation and water depth measurements. We also recommend an independent fish and wildlife monitoring effort. The monitoring methods developed and used by SJRWMD for monitoring Cells F and G along the Apopka-Beauclair Canal should be applicable to this project. SJRWMD may desire and permits may require additional monitoring efforts.

For example, daily monitoring of DO — important to maintaining fish populations —should minimally occur at four primary locations (1) at the outfall structure of the cell receiving dredged material; (2) within the cell equidistant from the dredged material inlet point and the outfall structure; (3) at the outflow to Phase 4 on Roach Road; and (4) and at a point at least 1,000 ft into Phase 4 in similar vegetation conditions as the location for DO measurements collected in the Phase receiving the dredged material.

DREDGED MATERIAL PLACEMENT

The dredged material placement analysis included a review of the previous geotechnical investigation and sediment placement considerations.

Geotechnical Investigation

As part of the April 2013 *General Investigation and Feasibility Documentation* for the proposed project, CSI-Geo, Inc. completed a geotechnical exploration and evaluation report (**Attachment B**). To determine the approximate muck layer depth and to characterize and measure the settling characteristics of the proposed dredged material, CSI-Geo staff collected ten core samples (C-1 – C-10), eight Standard Penetration Test (SPT) borings (B-1 – B-8), and three grab samples (G-1 – G-3) for quantitative laboratory analysis testing for moisture content, content of solids, fines, and organic, grain size distribution, plasticity (Atterberg), shear strength, and settling characteristics. ChemTreat, Inc. also analyzed four of the lake bottom core samples for polymer evaluation and testing (**Attachment C**). **Table 2** and **Table 3** provide a summary of the laboratory tests for the core and SPT samples. **Figure 4** provides a summary of the three column settling tests. Key findings from the report follow:

- Muck consists of mostly organic material with ***organic content*** ranging from 1.0% to 89.0% with 30% to 39% total organic carbon in the lower limit of the muck.
- The ***solids content*** of the material ranges from 2.0% to 67.0% — with the upper layer of the muck ranging between 2 and 6% — and ***specific gravity*** from 1.5 to 3.0.
- ***Muck layer thickness*** varied with the distance of the sample location of the shoreline.
  - Further away from the shoreline, core samples C-1 through C-5 had muck thicknesses between roughly 5.5 and 10 feet.
  - Closer to the shoreline, core samples C-6 through C-8 had a muck thickness between roughly 24.5 and 32 feet.
- Due to low shear strength of the muck sediment layer and its inability to maintain a slope, CSI Geo estimated that the sides of the dredge template would equilibrate after dredging to a slope no steeper than 20H:1V.
- ***Column settling tests*** of the muck sediment composite samples indicated that roughly 70% of the in-situ solids content was achieved — without the addition of polymers — between 2 and 3 days.
  - To achieve a NTU of 50 NTU from 1,000+ NTU (without the addition of polymers), settling times for the muck sediment composite samples varied between 1,204 minutes (0.83 days) and 1,419 minutes (0.98 days) for two of the three samples.
  - The third sample took 2,853 minutes (1.98 days) to settle to 10 NTU.
- The ***ChemTreat, Inc. test results*** indicated that for its particular polymers, ChemTreat P-873L achieved optimal dewatering results at a relatively low dosage of 15 ppm for the 10% solid sample.

Although not previously discussed nor considered in the 2013 feasibility report, bulking is another geotechnical consideration for dredging projects. Bulking refers to the expansion of consolidated sediment that occurs as a result of dredging. Hydraulic dredging leads to material bulking by increasing the water content of the dredged material compared to its in situ consolidated state. After dredging and placement for long-term storage, the dredged material will begin to consolidate under its own weight. Given the appropriate conditions and sufficient time, the material may approach its original pre-dredging volume. The degree to which the material expands (bulks) depends on the physical characteristics of the sediment, as well as its relative consolidation before dredging and final placement conditions. Although bulking factors of 2.0 to 2.15 are typically applied for coarse, sandy material for upland placement, the column settling tests indicated that a bulking factor of 1.3 will account for the increase in volume of the muck dredged material compared to its in-situ volume. Thus, multiplying the projected project volume of required dredging by the effective bulking factor of 1.3 yields a projected material management requirement, inclusive of the allowable 2-ft overdredge depth, of 621,776 cy (Option 3).

Table 2. Summary of Laboratory Tests Results for Core Samples (CSI-Geo, 2013)

Core No.	Length from Bottom of Core (in)		Solids Content (%)	Organic Content (%)	Specific Gravity (G_s)	Percent Passing Sieve Size (%)						Atterberg Limits		Soil Classification Symbol
						#4	#10	#40	#60	#100	#200	LL	PI	
C-1	23	66	3	--	1.9	--	--	--	--	--	--	--	--	SM
	11	23	26	34	2.4	--	--	--	--	--	--	--	--	OL
	0	11	58	--	2.7	99	97	96	91	80	74	49	5	OL
C-2	36	73	3	--	2.1	--	--	--	--	--	--	--	--	OL
	17	36	28	29	2.1	--	--	--	--	--	--	--	--	PT
	0	17	55	10	2.7	--	--	--	--	--	--	--	--	OH
C-3	36	73	4	--	2.5	--	--	--	--	--	--	--	--	OL
	12	36	29	17	2.4	--	--	--	--	--	--	--	--	PT
	0	12	66	--	2.7	--	--	--	--	--	--	--	--	SM
C-4	34	96	4	--	2.4	--	--	--	--	--	--	--	--	OL
	14	34	9	--	1.9	--	--	--	--	--	--	--	--	SM
	0	14	54	9	2.5	--	--	--	--	--	--	--	--	OH
C-5	46	96	2	--	2.6	--	--	--	--	--	--	--	--	OL
	36	46	7	69	1.7	--	--	--	--	--	--	--	--	PT
	12	36	11	57	1.9	--	--	--	--	--	--	--	--	PT
	0	12	48	8	2.5	--	--	--	--	--	--	99	25	OH
C-6[1]	36	96	4	--	2.4	--	--	--	--	--	--	--	--	SM
	14	36	7	69	1.6	--	--	--	--	--	--	--	--	SM
	0	14	11	63	1.7	--	--	--	--	--	--	--	--	PT
C-8	48	96	4	--	1.8	--	--	--	--	--	--	--	--	SM
	16	48	6	--	1.7	--	--	--	--	--	--	--	--	SM
	0	16	9	78	1.8	--	--	--	--	--	--	--	--	PT
C-9	24	96	10	57	1.9	--	--	--	--	--	--	--	--	PT
	0	24	67	--	2.6	100	98	96	93	59	3	--	--	SP
C-10	5	96	6	54	1.7	--	--	--	--	--	--	--	--	SM
	0	5	35	--	2.1	96	85	73	69	43	17	--	--	SM
C-1-C-10	**Average**		**22**	**43**	**2.2**									
	Median		**10**	**54**	**2.1**									

NOTE: [1]Core C-7 provided to ChemTreat, Inc.

Table 3. Summary of Laboratory Tests Results for Standard Penetration Tests (CSI-Geo, 2013)

Boring No.	Sample No.	Approximate Depth from Start of Boring (ft)		Natural Moisture Content (%)	Organic Content (%)	Specific Gravity (G_s)	Percent Passing Sieve Size (%)						Atterberg Limits		Soil Classification Symbol
							#4	#10	#40	#60	#100	#200	LL	PI	
B-1	3	4	6	40	3	3	100	100	100	90	67	49	76	51	SC
	6	13	15	29	--	--	100	100	100	95	65	18	--	--	SC
B-2	3	4	6	29	1	--	100	100	98	80	38	6	--	--	SP-SM
	7	18	20	30	--	2.7	100	100	100	79	34	13	--	--	SC
B-3	1	0	2	92	8	2.6	99	98	97	95	92	86	111	60	OH
B-4	1	0	2	47	--	2.7	100	98	94	92	89	86	66	15	MH
	UD[1]	3.5	5.5	82	11	2.5	--	--	--	--	--	81	152	79	OH
B-5	1	0	2	64	4	--	100	98	94	93	91	84	71	25	MH
	6	13	15	90	--	2.6	100	98	96	95	94	93	76	10	MH
	UD	10	12	884	89	1.5	--	--	--	--	--	--	--	--	PT
B-6	2	2	4	92	8	--	100	100	99	98	94	90	108	40	OH
	5	8	10	89	--	2.6	100	99	96	96	94	91	89	26	MH
	UD	11.5	13.5	455	37	2.4	--	--	--	--	--	31	140	51	PT
B-7	4	6	8	19	2	2.5	100	100	100	98	85	44	38	22	SC
	7	8	20	50	--	--	100	100	99	95	92	87	120	93	CH
B-8	4	18	8	70	5	2.4	100	100	100	99	96	82	81	43	OH
	6	13	15	17	--	--	100	100	100	100	89	29	28	12	SC
	UD	13	15	607	47	--	--	--	--	--	--	3	634	344	PT
B-1 – B-8		**Average**		155	20	2.5									
		Median		67	8	2.6									

NOTE: [1]UD = Undisturbed Sample

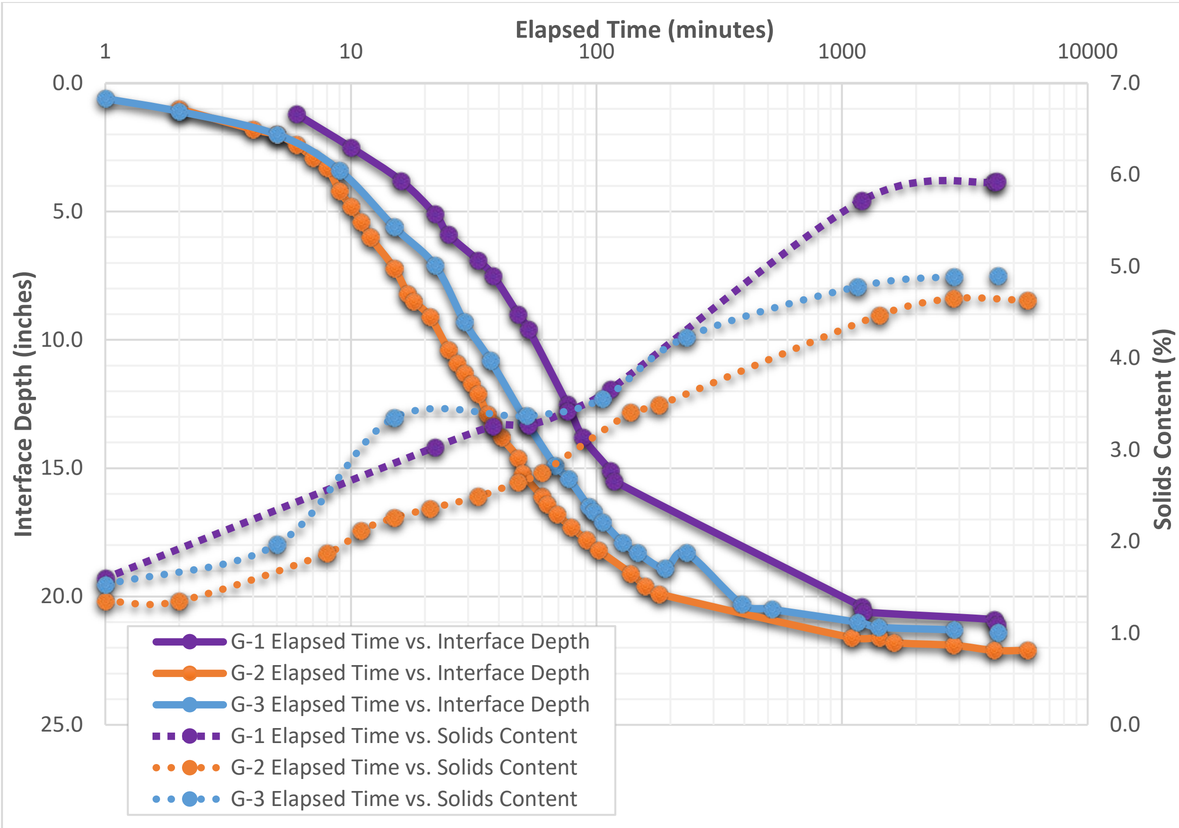


Figure 4. Cumulative Column Testing Results from Composite Muck Grab Samples (CSI-Geo, 2013)

Sediment Placement Considerations

Given the maximum elevation constraints associated with the current infrastructure and adjacent road elevations, Taylor Engineering calculated the available volume capacity in 0.1-ft increments between elevation 59 and 61.5 ft NAVD88 (**Table 4**). Assuming coverage over the entire 394-acre area, Phase 3 can handle dredged material volume for the project depth and the assumed allowable 2-ft overdredge volume (**Table 1**, 478,289 cy) with a final sediment elevation between 61.1 and 61.2 ft NAVD88. However, for a conservative consideration of the 1.3 bulking factor, planning should assume an elevation between 61.4 and 61.5 ft NAVD88. Alternatively, the 700-acre Phase 5 area could handle a minimal portion of the material — up to 3,872 cy at elevation 60 ft NAVD 88 — to supplement the Phase 3 storage requirements, and, more importantly, allow an alternate placement area for receipt of dredged material should Phase 3 become unavailable (due to potential turbidity or water quality issues). Increased placement flexibility (i.e., use of both areas) benefits the dredging operation by allowing more management options to deal with potential water quality (phosphorus, turbidity) and water budget (dredge operation vs. capacity) issues; however, using both areas adds a second area of project-related natural resource impacts and related monitoring efforts.

Table 4. Summary of Available Volume and Percent Coverage for Phase 3 and Phase 5

Elevation (NAVD88)	Volume (CY)	Depth (FT)	Dredged Material Placement Coverage Area (AC)	Target Dredged Volume (CY)
Phase 3				
59.0	32	0.12	0.52	
59.1	196	0.22	1.53	
59.2	563	0.32	3.29	
59.3	1,332	0.42	6.45	
59.4	2,709	0.52	10.76	
59.5	4,846	0.62	16.18	
59.6	8,005	0.72	23.11	
59.7	12,529	0.82	34.87	
59.8	19,576	0.92	53.59	
59.9	30,369	1.02	81.30	
60.0	45,895	1.12	109.64	
60.1	65,379	1.22	130.64	
60.2	87,912	1.32	148.83	
60.3	113,496	1.42	168.65	
60.4	142,447	1.52	190.28	
60.5	174,820	1.62	211.45	
60.6	210,451	1.72	229.97	
60.7	249,020	1.82	248.40	Project Depth = 273,381 cy
60.8	291,105	1.92	273.53	
60.9	337,298	2.02	297.62	
61.0	**386,750**	**2.12**	**315.65**	**Maximum Phase 3 Top Elevation = 61 ft NAVD 88**
61.1	439,157	2.22	332.93	Project Depth + 2-ft Overdepth = 478,289 cy
61.2	494,140	2.32	348.97	
61.3	551,320	2.42	357.97	
61.4	609,437	2.52	362.26	Project Depth + 2-ft Overdepth + Bulking Factor = 621,776 cy
61.5	668,118	2.62	365.01	
Phase 5				
59.0	--	0.00	0.00	
59.1	--	0.00	0.00	
59.2	--	0.00	0.00	
59.3	--	0.00	0.00	
59.4	4	0.08	0.10	
59.5	54	0.18	0.58	
59.6	216	0.28	1.50	
59.7	559	0.38	2.81	
59.8	1,140	0.48	4.52	
59.9	2,164	0.58	8.49	
60.0	**3,872**	**0.68**	**13.00**	**Maximum Phase 5 Top Elevation = 60 ft NAVD 88**
60.1	6,444	0.77	19.14	
60.2	10,093	0.88	26.11	
60.3	14,872	0.98	33.17	
60.4	20,806	1.08	40.46	
60.5	28,208	1.18	52.65	
60.6	38,016	1.28	69.61	
60.7	50,942	1.38	91.52	

Table 4. Summary of Available Volume and Percent Coverage for Phase 3 and Phase 5 (continued)

Elevation (NAVD88)	Volume (CY)	Depth (FT)	Dredged Material Placement Coverage Area (AC)	Target Dredged Volume (CY)
60.8	68,108	1.48	123.39	
60.9	90,777	1.58	156.21	
61.0	118,485	1.68	187.83	
61.1	151,814	1.78	226.99	
61.2	192,525	1.88	279.39	
61.3	241,383	1.98	323.92	Project Depth = 273,381 cy
61.4	296,438	2.08	357.69	
61.5	356,629	2.18	387.67	

Water Quality

SJRWMD has identified a total phosphorus (TP) concentration target of 0.12 mg/L in the water leaving the placement areas (i.e., Phase 3, Phase 5) within LANS. Management to meet this target is influenced by the expected water quality in the LANS and the expected water quality of the dredged material slurry. This section details pertinent water quality characteristics in LANS Phase 3 and Phase 5, the lake water, and the sediments proposed for dredging at Newton Park. The lake and sediment data — provided from the SJRWMD and recently collected in 2017 by Taylor Engineering — are used to estimate a TP concentration in the dredged material.

LANS Water Quality

TP and total suspended solids (TSS) concentrations measured during the July 2017 field investigation are listed in **Table 5**. The greatest interior Phase 3 and Phase 5 TP concentrations were associated with the greatest TSS values. All samples in Phases 3 and 4 contained TP below 0.5 mg/L, with most below 0.1 mg/L. Phase 5 samples contained the highest TP concentrations. Within Phases 3, 4, and 5 the highest TP concentrations occurred in samples farthest from the outlet weirs. TP concentrations within the drainage canals averaged 0.12 mg/L and were all below 0.21 mg/L. TSS concentrations generally ranged from 5 to 6 mg/L (5 mg/L is the minimum detection limit for TSS), though greater concentrations occurred in some samples from drainage canals and Phases 3 and 5.

TP values in Phase 3 and Phase 5 varied much more widely, but 4 of 10 values were below 0.1 mg/L, and only 2 values exceeded 1.0 mg/L. The highest TP concentrations occurred in areas of dense vegetation in the interior of a phase. TP concentration at the Phase 5 outlet weir (0.58 mg/L) was not reflected in the downstream drainage ditch values, but the nearest drainage ditch value, at station DWQ1 (0.21 mg/L) was the highest of the five ditch measurements. The water in the areas proposed for sediment placement does not appear to present a significant water quality issue.

Table 5. Total Phosphorus (TP) and Total Suspended Solids (TSS) Concentrations

Sample[1]	Date	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	Location
Drainage Canal				
DWQ1	7/25/2017	0.210	14.0	Lust Road and Pole Road Intersection
DWQ2	7/25/2017	0.100	5.5	Pole Road and Roach Road Intersection
DWQ3	7/25/2017	0.036	10.0	Near South End Laughlin Road
DWQ4	7/26/2017	0.190	5.5	Main Pump Station
DWQ5	7/26/2017	0.076	5.0	Laughlin Road and Interceptor Road Intersection

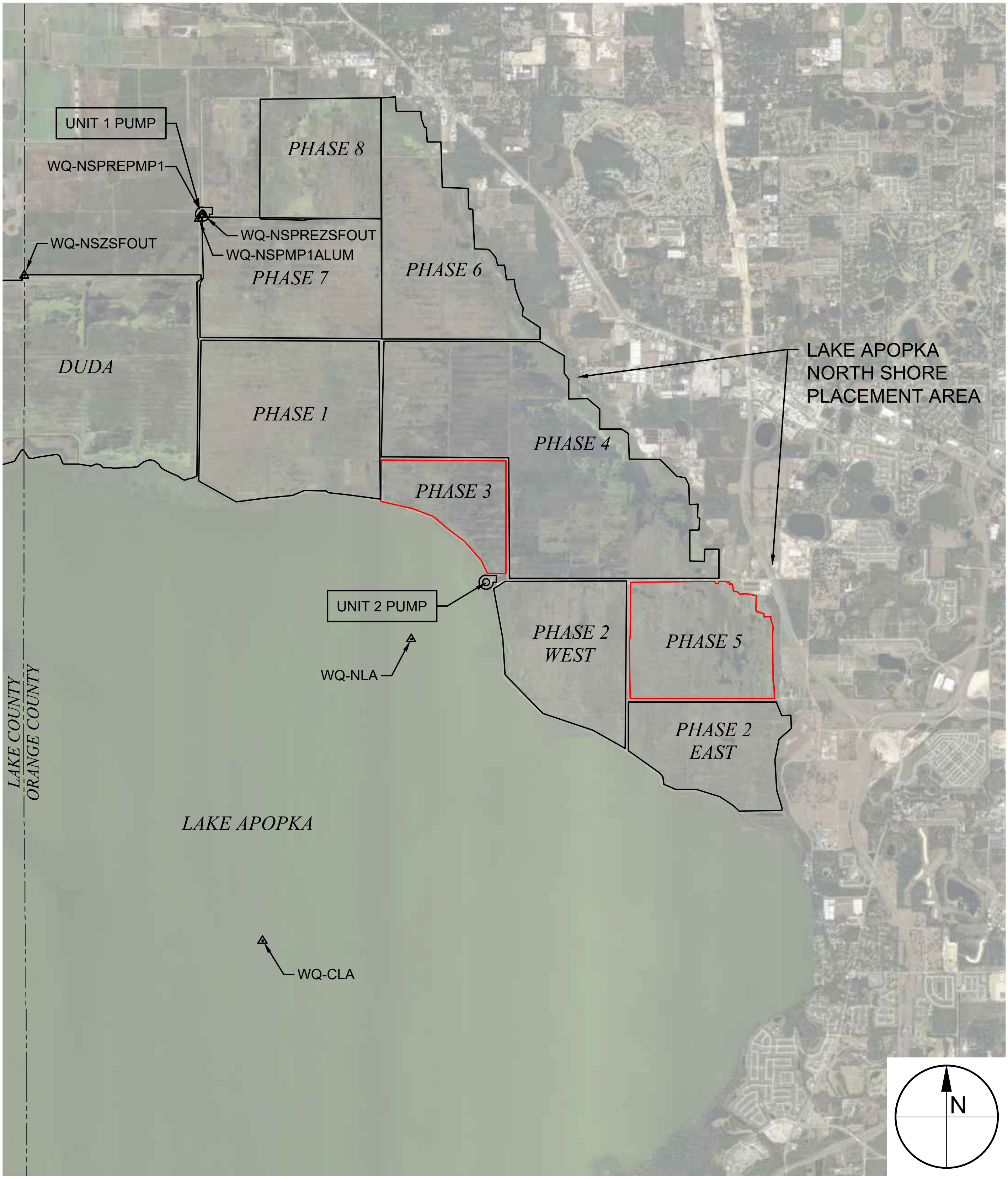
Table 5. Total Phosphorus (TP) and Total Suspended Solids (TSS) Concentrations (continued)

SAMPLE[1]	DATE	TOTAL PHOSPHORUS (MG/L)	TOTAL SUSPENDED SOLIDS (MG/L)	LOCATION
PHASE 3				
P3IWQ1	7/25/2017	0.420	44.5	Interior, northwest
P3IWQ3	7/26/2017	0.030	5.0	Interior, east
P3CWQ2	7/25/2017	0.034	5.0	Outlet Weir, Roach Road
PHASE 4				
P4IWQ2	7/25/2017	0.067	5.0	Interior
P4IWQ3	7/25/2017	0.380	5.0	Interior
P4CWQ1	7/25/2017	0.086	6.0	Outlet Weir, Roach Road
PHASE 5				
P5IWQ1	7/25/2017	1.200	5.0	Interior, northwest
P5IWQ2	7/26/2017	3.000	24.0	Interior, southeast
P5IWQ3	7/26/2017	0.240	5.0	Interior, northeast
P5CWQ4	7/25/2017	0.580	5.0	Outlet Weir, Conrad Road

NOTE: [1]P - Phase, D - Drainage Canal, I - Interior, C – Culvert, WQ - Water Quality

<u>Pump Station Water Quality</u>

SJRWMD provided water quality data obtained between 2011 and 2017 from LANS sampling stations upstream and downstream of their primary LANS pumps station and alum treatment point (**Figure 5, Table 6**). TP at stations located upstream of the pump station and alum treatment system (NSPREZSFOUT) averaged 0.16 mg/L. The SJRWMD has established a TP target concentration of 0.12 mg/L for water released from the sediment placement areas. If necessary, the contractor will treat the decant water to achieve the SJRWMD target TP concentration. TSS and turbidity levels in **Table 6** data varied consistently with the TP concentrations. TSS and turbidity averages of the two stations downstream of the alum treatment (NSPMP1ALUM upstream and NSZSFOUT downstream of the marsh receiving the pump discharges) suggest that the increase in phosphorus between the stations may be primarily associated with the dissolved fraction of the TP leaching from marsh soils. The available turbidity data for waters downstream of the pump and alum station (Table 3) are similar to those in the Apopka-Beauclair Canal (See *Lake Apopka and Apopka-Beauclair Canal Water Quality*, below). When the canal is flowing — which has occurred infrequently in recent years — Apopka-Beauclair waters will likely have higher turbidity levels than that from the LANS. In either case, water from the LANS pump station should meet turbidity standard for discharges to Class III waters, (29 NTU above receiving water body turbidity).



REFERENCES:

1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
2. WATER QUALITY POINTS & PUMP LOCATIONS: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, WATERSHED ASSESSMENT SECTION, SEPTEMBER 19, 2003

0 6,000' 12,000'

SCALE: 1" = 6,000'

CATHY SHELL X:\SYSPROJECTS\C2017-030 FINAL DESIGN-PERMITTING LAKE APOPKA\FIGURES\C2017-030-F-WATERQUALITY-T3.DWG 1/8/2018 12:38:08 PM

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD
BLDG 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 5
WATER QUALITY SAMPLING POINTS
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	4 of 4	DEC 2017

SEAL

LORI S. BROWNELL P.E.#60025 DATE

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

Table 6. Pre-and Post LANS Pump Station Water Quality

STATION	SAMPLING LOCATION	NUMBER OF SAMPLING POINTS	MINIMUM	MEAN	MAXIMUM
TOTAL PHOSPHORUS (MG/L)					
NSPREZSFOUT	Pre-Pump	16	0.06	0.16	0.32
NSPMP1ALUM	Post-Pump + Alum Treatment	10	0.02	0.05	0.14
NSZSFOUT	Post-Pump Downstream of Marsh	18	0.03	0.19	0.67
TOTAL SUSPENDED SOLIDS (MG/L)					
NSPREZSFOUT	Pre-Pump	16	2.23	7.45	20.00
NSPMP1ALUM	Post-Pump + Alum Treatment	6	2.00	4.31	6.25
NSZSFOUT	Post-Pump Downstream of Marsh	2	2.60	4.50	6.40
TURBIDITY (NTU)					
NSPREZSFOUT	Pre-Pump	18	1.28	3.32	6.18
NSPMP1ALUM	Post-Pump + Alum Treatment	9	0.70	2.86	5.78
NSZSFOUT	Post-Pump Downstream of Marsh	16	0.10	1.72	6.11

Lake Apopka and Apopka-Beauclair Canal Water Quality

Lake water quality data from the SJRWMD water quality database for the Lake Apopka CLA station between October 2010 and October 2017 average 0.13 mg/L TP (0.13 ± 0.06 mg/L, n = 68), ranging as high as 0.29 mg/L based on results of a monthly sampling program over that period. TSS averaged 92.31 mg/L (n = 60) with a maximum of 168.75 mg/L. Dissolved TP (TP-D) was very low (average 0.01 mg/L - between the method detection limit and report limit for samples with reported values above the detection limit) and dissolved orthophosphate was not detectable. Apopka-Beauclair Canal is the receiving water body for water flowing from the LANS. TP averaged 0.22 mg/L in monthly values collected between October 2012 and October 2017. TP-D averaged 0.17 mg/L. Turbidity for the same sample set averaged 3.3 mg/L NTU. Note that most of this period there was little if any flow in the Apopka–Beauclair Canal. A sample measuring 28 NTU collected during a recent (2017) period when the Apopka-Beauclair Canal dam was releasing water suggests that when flowing the canal would reflect values closer to those in the lake.

In addition to the SJRWMD TP target, the water released from the LANS also will need to meet the state standard for turbidity of 29 NTU above ambient water (Apopka-Beauclair Canal). The water released from LANS during dredging and sediment placement operations will meet the ambient water quality in the canal, assuming the LANS water turbidity remains below about 33 NTU.

Lake Apopka Sediment Phosphorus

Sediment characteristics reported in several studies (Pollman et al. 1988, Schelske et al 1997, Moore et al 1992, Olila et al 2003, Torres, 2016) and the data reported for this project (Task 2, Environmental Site Documentation) all describe similar sediment conditions: the first meter of Lake Apopka sediments contains 7% solids and about 93% moisture, with the top 10-30 centimeters containing as little as 2% solids. In the first meter of sediment, phosphorus is typically about 40% dissolved (mostly as orthophosphate) and 60% particulate material. A 6% particulate fraction sediment would carry about 2.6 mg TP/g dry sediment (Schelske 1997). Moore et al (1992) estimated that sediment porewater in the first meter averaged 1.55 - 1.75 mg/L "soluble reactive phosphorus" (more or less equivalent to DOP). Torres (2016) identified porewater dissolved reactive phosphorus concentrations up to 13 mg/L at specific levels within the first meter of sediment. Moore et al (1992) found that oxidation of surface sediments decreased soluble phosphorus.

For engineering design purposes, since the project plan calls for a dredging template that removes the first three feet of sediment (plus an allowable over-dredge depth), we assumed a 6% solids solution with 1.0 mg/L TP-D in the porewater and about 0.93 mg/L per unit volume of sediment. The sediments solids carry about 2.6 g/L particulate phosphorus (an approximation not accounting for solids displacement of water, but close enough for these purposes).

- Lake water TP: 0.12 mg/L particulate P + 0.01 mg/L dissolved P
- Sediment TP: 2,600 mg/L particulate P +0.93 mg/L porewater P

Dredged Material TP Concentration (by volume)

The data above allow an estimate (**Table 7**) of total and dissolved phosphorus in the dredge slurry using a 1:39 and 1:79 ratio of sediment to lake water volume. The estimated ratios were based on the estimated 6% in situ average solids content, which mixes with lake water during dredging to produce a slurry with about 2.5% sediment volume (a 1:39 ratio) or 1.25% sediment volume (a 1:79 ratio) per unit volume of dredge slurry.

Table 7. Approximate fractions of Particulate and Dissolved Phosphorus in Dredge Slurry

DREDGE SLURRY SEDIMENT:WATER	PARTICULATE P (MG/L)	DISSOLVED P (MG/L)	PARTICULATE P (%)	DISSOLVED P (%)
1:39	66.78	0.02	99.964%	0.036%
1:79	33.03	0.01	99.964%	0.036%

Some release of dissolved phosphorus may occur as algal cells in the lake water die and release their contents, but under most circumstances that should not greatly alter the ratio of particulate to dissolved phosphorus or the management of decant water phosphorus concentration. While this is very coarse estimate, it clearly suggests that trapping particulate matter in the marsh should be the focus of design to meet the TP target and that active management of TP-D may not be necessary.

WATER BUDGET

Taylor Engineering performed a planning-level water budget analysis for the Phase 3 and Phase 5 dredged material placement areas (placement areas) using hydrologic and hydraulic modeling. The purpose of calculating water budgets is to compare the resulting water levels and retention times of various proposed dredging rates to existing conditions. The paragraphs below present the methodology and results of the analysis. **Attachment D** provides the base documentation figures for the applied model.

Hydrologic Modeling

Taylor Engineering applied U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) version 4.2.1 to execute a year-long continuous simulation of the precipitation and evapotranspiration over the placement areas. Modelers determined the areas from the project boundary survey data. Input to the HEC-HMS model includes area, daily precipitation, and daily potential evapotranspiration. Given the saturated or standing-water conditions of the placement areas no soil infiltration losses or overland flow was modeled with the assumption that the soil's capacity for infiltration is already maximized and precipitation falling within the placement areas falls directly on saturated soil or standing water. Modelers reviewed the District-provided daily precipitation data from various gauges around the placement areas and selected the data from the closest gauge with the latest, continuous year-long period of record for use in the simulation. The selected gauge station, SJRWMD 32614059 NSRA Phase 2 S (RN), has a period of record spanning 1/1/2016 through 12/31/2016 (which defined the simulation period). This period included effects of Hurricane Matthew, which impacted the project area October 6-7, 2016. Modelers obtained daily potential evapotranspiration data for the placement areas from the USGS Florida Evapotranspiration Network dataset for the simulation period. After running the HEC-HMS model, modelers extracted the resultant excess rainfall (net rainfall after accounting for evapotranspiration) for use as input to a hydraulic routing model (discussed in next paragraph). **Figure 6** illustrates the cumulative precipitation, computed cumulative evapotranspiration losses, and computed excess rainfall for each placement area. Excess rainfall is that fraction of total rainfall that accumulates (and thus may be released from) from the placement areas.

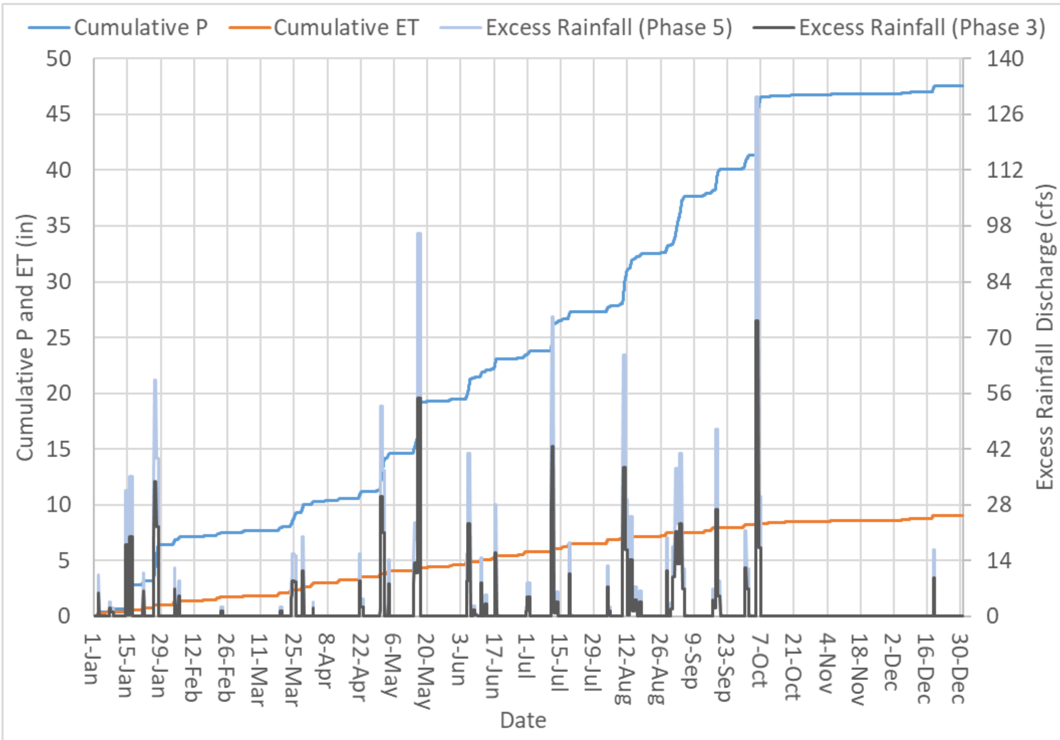


Figure 6. Cumulative Precipitation, Cumulative Evaporation, and Computed Excess Rainfall for Phase 3 and Phase 5 Placement Areas

Hydraulic Modeling

Taylor Engineering applied Interconnected Pond Routing (ICPR) version 3.10 to compare water levels within each placement area for existing conditions and for various proposed dredging rates. Input to the ICPR model includes stage-area relationships for each placement area, water control structure dimensions for culverts and risers, excess rainfall, dredge pump rates , and canal stages. Modelers extracted the stage-area relationships and water control structure dimensions and elevations from project survey data. SJRWMD provided culvert material, length, diameter, and top of riser elevation data. Since the placement areas and connected canal elevations are highly managed, the risers are capable of various weir board elevations, and pumps within the canals are operated by the District, it was not feasible to model an executed operation history for the purpose of this study.

To provide a basis for simulation comparisons, existing condition and all proposed dredge pumping alternative simulations operated under the same set of rules. The model sets the initial weir board elevations for each structure at the placement area low-water criteria elevation in "NRSA Wetland Criteria" spreadsheet; 60 ft-NAVD (Phase 3) and 60.5 ft-NAVD (Phase 5). Initial water levels within each placement area are set to the lowwater criteria to provide sufficient storage capacity and to maximize retention time within each placement area. This provides the greatest potential for successful project performance. Modelers then prescribed an operation schedule for the weir board elevations such when the placement area fills to a depth 2 inches above a weir board elevation, an additional 6-inch weir board is added incrementally up to the top-of-riser elevation. With this operation schedule, the water level within a placement area cannot exceed the weir boards by more than 2 inches at any given time. The existing water control structures contain risers on both ends (within the placement area and on the downstream canal-side). In the model, (and we recommend for operation) weir boards only on the upstream end of the water control structure. This layout will provide the best control of placement area water elevations and the most manageable weir board system. **Table 8** summarizes elevation settings for all modeled water control structures. Any structures noted in the project survey as "plugged" are not included in the models. Also, in Phase 5, a riser structure identified in the documentation drawings, **Attachment D, Figure 17, Detail 13**, is not included in the models even though it is currently operable. This particular structure has a top-of-riser elevation of 59.9 ft-NAVD which is lower than the allowable low water elevation and therefore must be plugged during any dredging activity to inhibit short circuiting through the structure. Additionally, the ICPR model includes the placement area perimeter roads as a model boundary condition.

Table 8. Modeled Water Control Structures

PLACEMENT AREA	STRUCTURE	UPSTREAM INVERT (FT-NAVD)	DOWNSTREAM INVERT (FT-NAVD)	UPSTREAM RISER (FT-NAVD)	DOWNSTREAM RISER (FT-NAVD)	ATTACHMENT D REFERENCE
PHASE 3	36-in. CMP Culvert with Risers	54.6	54.7	Varies 60.0 – 63.1	54.7	Figure 7, Detail 3
PHASE 3	36-in. CMP Culvert with Risers	54.6	54.8	Varies 60.0 – 63.1	54.8	Figure 7, Detail 3
PHASE 5	36-in. CMP Culvert with Risers	55.1	55.1	Varies 60.5 – 63.1	55.1	Figure 14, Detail 10

Modelers applied the HEC-HMS computed excess rainfall and proposed dredge pump rates as inflow boundary conditions to the ICPR models. For canal stages, we assumed a constant stage within the canals equal to the placement area low-water criteria elevation presented in the District-provided "NSRA Wetland Environmental Criteria" spreadsheet (**Attachment E**); 60 ft-NAVD (Phase 3) and 60.5 ft-NAVD (Phase 5). These low-water levels were applied to the model so that gravity flow would occur for the full range of expected water levels within each placement area. However, continuous maintainence of the low-water levels is not necessary provided that water levels in the canal remain lower than placement area water levels. The canal water levels must be lower than the placement area water levels during any dredging activity to maintain free-falling weir flow at all times. The dredge pump rate will depend on the size pipe used to transport the material from the dredge location to the placement areas. Modelers simulated three (3) pumping rate alternatives within: 2,000 GPM, 4,000 GPM, and 8,000 GPM. Based on conversations with various dredging contractors, the ICPR model was set up to simulate a 12-hour day, 5-day a week dredging operation. **Figure 7** and **Figure 8** illustrate water levels for existing conditions and each dredge alternative for Phase 3 and Phase 5 respectively.

The high-water criteria elevations as presented in the District-provided "NRSA Wetland Environmental Criteria" spreadsheet (**Attachment E**) indicate maximum allowable water level of 62 ft-NAVD for Phase 3 and 61.75 ft-NAVD for Phase 5. Comparing the ICPR computed water levels in Phase 3 to the maximum allowable, all modeled dredging alternatives result in water levels less than the maximum allowable elevation. However, for Phase 5, all modeled dredging alternative result in water levels in excess of the maximum allowable elevation at some point in the simulation. **Table 9** provides a comparison of maximum computed water levels and the computed duration that water levels remain below maximum allowable water levels. **Table 10** provides a comparison of computed average retention time within each placement area.

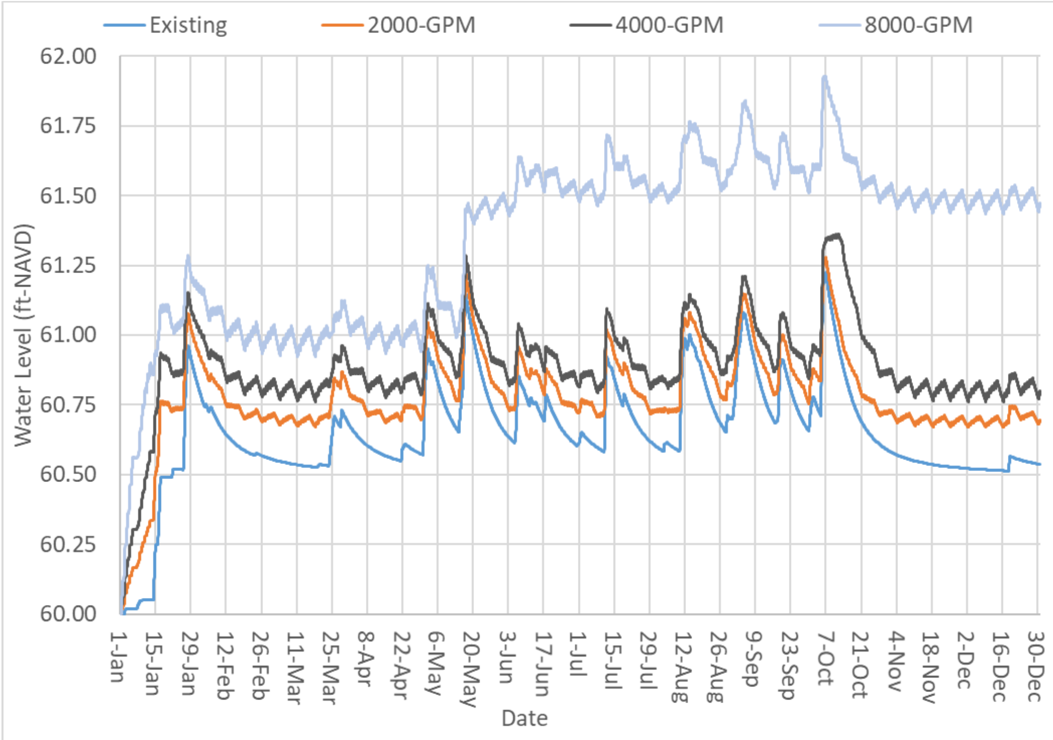


Figure 7. ICPR Computed Water Levels in Phase 3 for Existing Conditions and 2,000 GPM, 4,000 GPM, and 8,000 GPM Dredging Alternatives

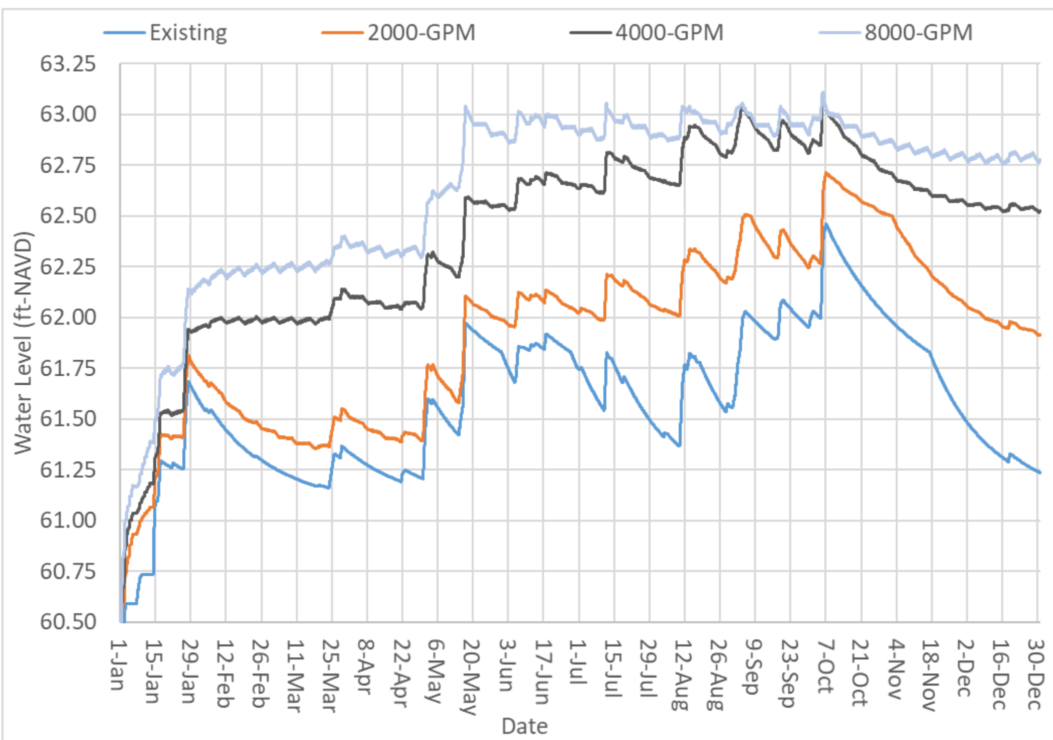


Figure 8. ICPR Computed Water Levels in Phase 5 for Existing Conditions and 2,000 GPM, 4,000 GPM, and 8,000 GPM Dredging Alternatives

Table 9. Comparison of Maximum Computed Water Levels to Maximum Allowable

LANS Placement Area	Scenario	Computed Maximum Water Level (ft-NAVD)	Maximum Allowable Water Level (ft-NAVD)	Duration Water Level Remains Below Maximum Allowable Water Level (days)
Phase 3	Existing	61.23	62.00	365
	2,000-GPM	61.28		365
	4,000-GPM	61.36		365
	8,000-GPM	61.93		365
Phase 5	Existing	62.46	61.75	234
	2,000-GPM	62.71		131
	4,000-GPM	63.10		26
	8,000-GPM	63.11		23

Table 10. Comparison of Computed Average Retention Time

LANS Placement Area	Scenario	Computed Average Retention Time (days)
Phase 3	Existing	297
	2,000-GPM	158
	4,000-GPM	109
	8,000-GPM	67
Phase 5	Existing	109
	2,000-GPM	71
	4,000-GPM	53
	8,000-GPM	35

Water Budget Summary

Based on comparison of Phase 3 and Phase 5 water budgets, Phase 3 is a more favorable candidate for placement of the dredged material. Phase 5 covers a larger areal foot print than Phase 3 but most of Phase 5's volumetric capacity lies outside of the target elevation (i.e. at elevations greater than the maximum allowable water level). Additionally, Phase 5 water control structure dimensions limit operator ability to effectively drain the dredged water before exceeding the maximum allowable water level. Phase 3 can handle dredge pumping rates of 8,000-GPM without reaching the maximum allowable water level of 62 ft-NAVD (Figure 7). Therefore, the dredging operation could be executed continuously for a year's period following the 12-hour day, 5-day week dredging cycle. Pumping at this same cycle in Phase 5 would result in exceeding its maximum allowable water level in only 23 days at 8,000-GPM. Additionally, Phase 3 provides ample water retention time (ranging from 67-158 days) to accommodate settlement of the fine grain dredged material. To effectively achieve similar results during the dredging operation, water elevation monitoring and periodic riser weir boards would be necessary so that as the water level fluctuates within the placement area water elevations do not exceed 2 inches above the weir board elevations. As previously noted, this analysis prescribed an operation schedule for the weir boards such that when the placement area fills with water to an elevation 2 inches above a weir board, an additional 6-inch weir board would be added incrementally up to the top-of-riser elevation.

SUMMARY AND RECOMMENDATIONS

Based on the information collected in Tasks 1 (Document and Data Review) and 2 (Environmental Site Documentation), Taylor Engineering evaluated the Lake Apopka North Shore (LANS) Phase 3 and Phase 5 as a final disposal option for sediments dredged from the Newton Park access channel. The conceptual design phase included evaluation of the (1) Newton Park dredging template and associated quantities; (2) dredged material placement; (3) expected water quality (phosphorus) in both LANS and Lake Apopka area; and (4) preliminary LANS water budget.

Based on the shoreline presence of natural resources, potential cultural resources, and limited perceived navigation value of extending the dredging template further to the east and west, the St. Johns River Water Management District (SJRWMD) selected moving forward with Option 3. This dredged template involves the removal of 478,289 cy of material (273,381 cy at project depth plus an additional 204,908 cy with 2-ft allowable overdredge depth). Given the sediment material characteristics and distance between the dredging project and placement area, the Newton Park access channel is suited for hydraulic dredging. Sediment placement may occur via conventional open flow or thin-layer placement means. Regardless of the hydraulic dredging application method chosen by the contractor or selected by the SJRWMD, the primary objectives of site management — specific to this project — are to maintain acceptable effluent quality (turbidity and phosphorus) during the sediment placement and decanting and to control the pattern of deposition.

The water quality data obtained between 2011 and 2017 from LANS sampling stations upstream and downstream of their primary LANS pumps station and alum treatment point indicate that TP at stations located upstream of the pump station and alum treatment system averaged 0.16 mg/L. The SJRWMD has established a TP target concentration of 0.12 mg/L for water released from the sediment placement areas. . If necessary, alum treatment of the placement area decant water should achieve the SJRWMD target TP concentration. In addition to the SJRWMD TP target, the water entering the Apopka-Beauclair Canal from MacDonald Canal (the channel carrying water from the pump station) also will likely need to meet the state standard for turbidity (no more than 29 NTU above the receiving water). The water flowing from LANS will meet the ambient water quality in the canal, assuming the that water maintains a turbidity below about 33 NTU.

Finally, comparing placement areas Phase 3 and Phase 5 regarding the water budget analysis, Phase 3 is a more favorable single placement area candidate for receipt of the dredged material. While Phase 5 covers a larger areal footprint than Phase 3, most of Phase 5's volumetric capacity lies outside of the target elevation (i.e. at elevations greater than the maximum allowable water level). Additionally, Phase 5 water control structures limit the range of water levels available to effectively drain the decant water before exceeding the maximum allowable water level. The most effective management of the site would require modifying the structures to increase the water elevation control range. Increased placement flexibility (i.e., use of both areas) benefits the dredging operation by allowing more management options to deal with potential water quality (phosphorus, turbidity) and water budget (dredge operations vs. capacity) issues; however, using both areas adds disturbance of vegetation and animal species to the second LANS area.

To develop a final project design as conceived in this memorandum and the related permit application, the project will require the following:

- A detailed Newton Park Boat ramp structure survey to determine exact location of waterfront structures and edge of boat ramp features.
- Confirmation that SJRWMD will raise Welland Road and the road north of the Unit 2 Pump Basin.

- Prior to construction, careful visual geotechnical evaluation of Phase 3 and Phase 5 exterior levees to identify any readily apparent issues.
- Shoreline environmental site documentation survey of the pipeline route and at the pipeline entrance point and from the Newton Park dredge project to the LANS.
- Identification / characterization of the maximum acceptable vegetation impacts of construction activities and any necessary mitigation for those impacts.
- Identification, development, and approval of all biological monitoring plans required / desired by SJRWMD and required by regulatory agencies.

REFERENCES

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Olila, O.G., K.R. Reddy, and W.G. Harris. 1995. Forms and Distribution of Inorganic Phosphorus in Sediments of two Shallow Eutrophic Lakes in Florida. Hydrobiologia 302:147-151.

Pollman, C.D., D. A. Graetz, F.V. Ramsey, K.R. Reddy, and T.J. Sullivan. 1988. Feasibility of Sediment Removal and Reuse for the Restoration of Lake Apopka Final Report. Prepared for St. Johns River Water Management District, Highway 100 West, Palatka, FL 32078. November 23, 1988.

Schelske, Claire L. 1997. Sediment and Phosphorus Deposition in Lake Apopka Final Report. Prepared for St. Johns River Water Management District Contract No. 96W123. From: Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, March 2001

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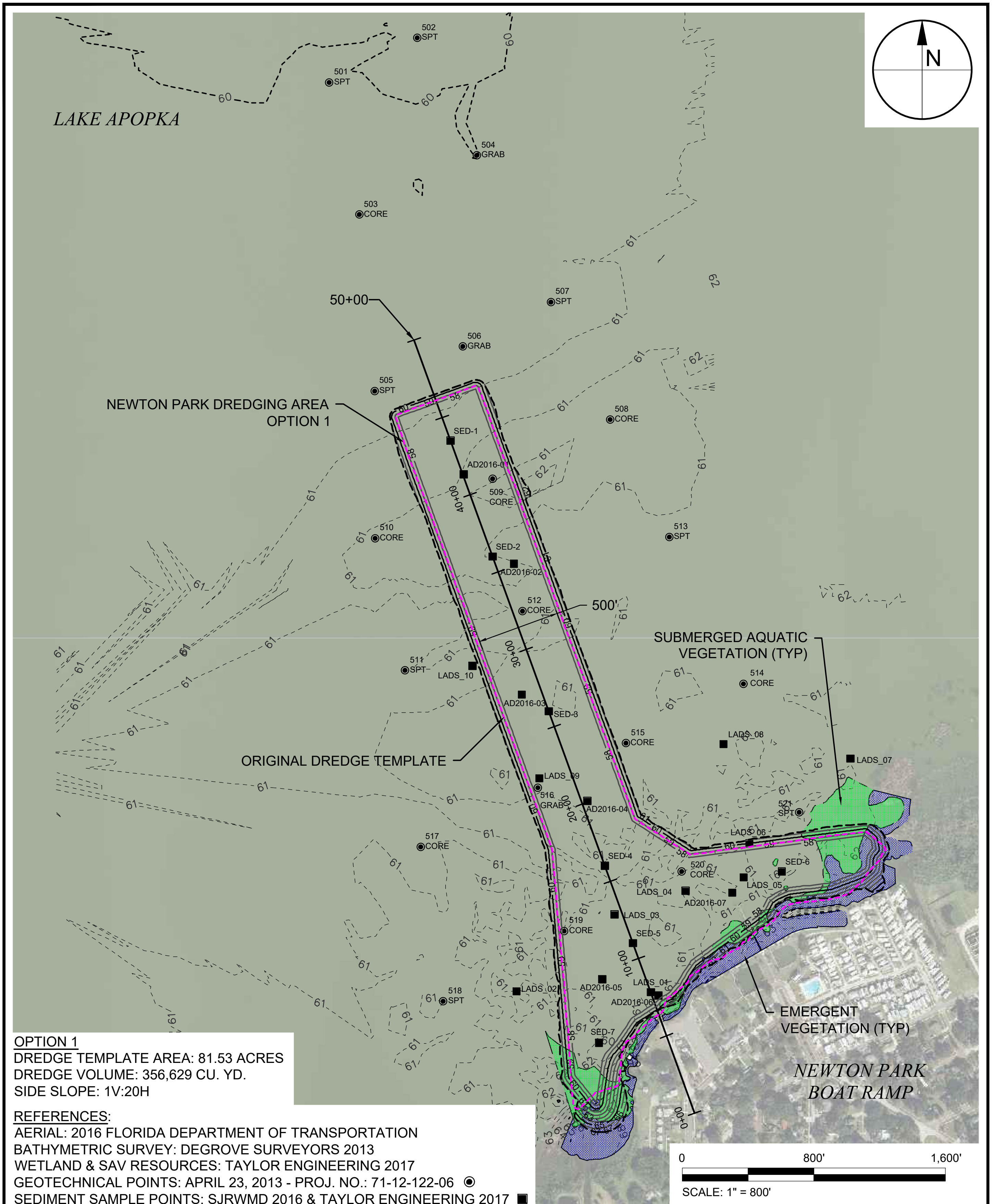
ATTACHMENT A

Newton Park Dredging Template Options



OPTION 1
DREDGE TEMPLATE AREA: 81.53 ACRES
DREDGE VOLUME: 356,629 CU. YD.
SIDE SLOPE: 1V:20H

REFERENCES:
AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
BATHYMETRIC SURVEY: DEGROVE SURVEYORS 2013
WETLAND & SAV RESOURCES: TAYLOR ENGINEERING 2017
GEOTECHNICAL POINTS: APRIL 23, 2013 - PROJ. NO.: 71-12-122-06
SEDIMENT SAMPLE POINTS: SJRWMD 2016 & TAYLOR ENGINEERING 2017

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FIGURE 1
NEWTON PARK DREDGING AREA - OPTION 1
PLAN VIEW
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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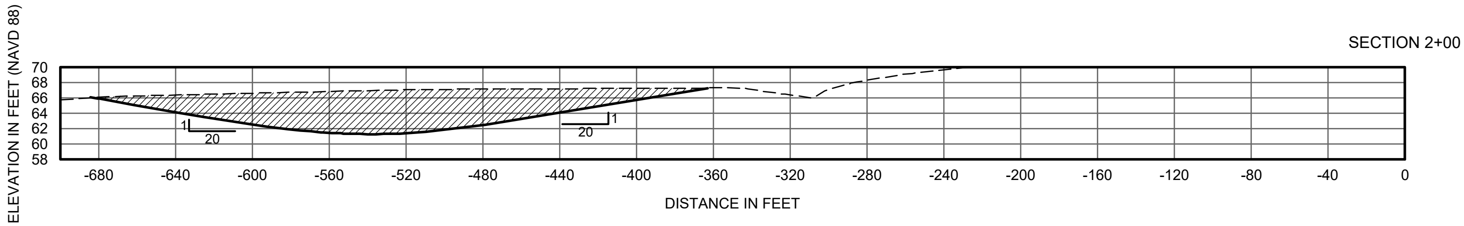

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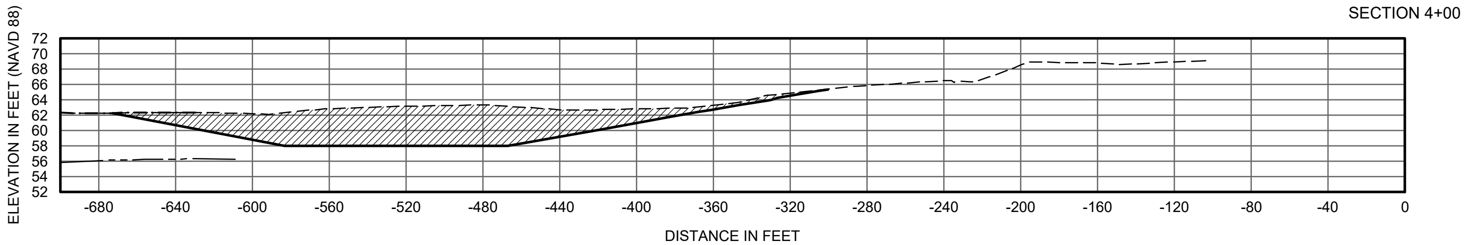

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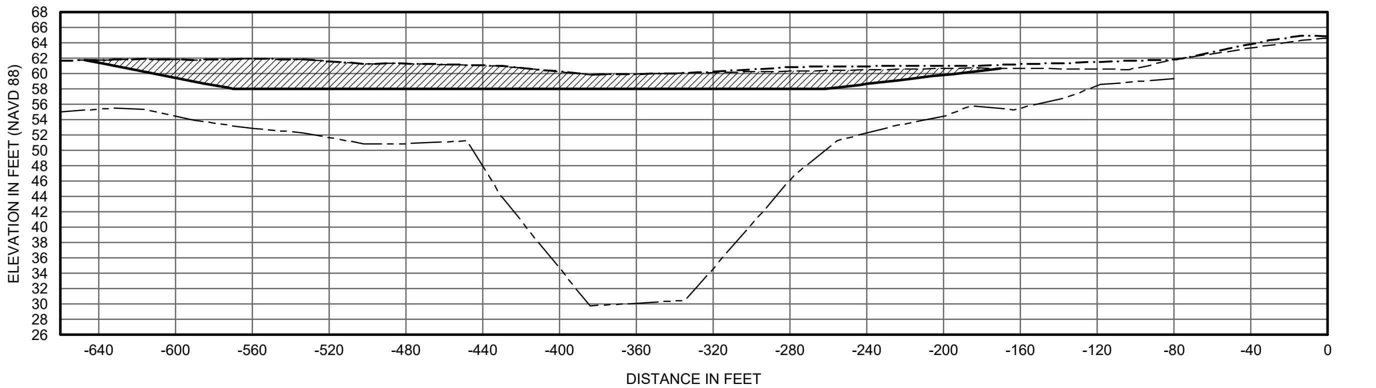

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 2
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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SHEET	2 of 32
DATE	DEC 2017

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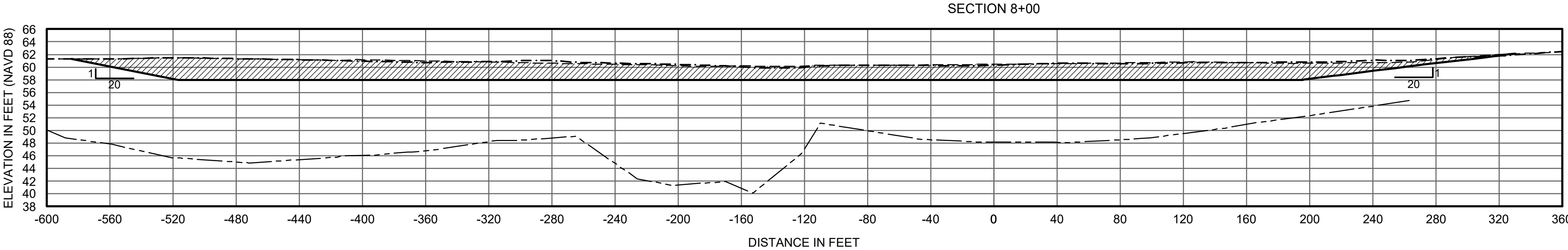

LEGEND

— — — — —	EXISTING GRADE
———————	DREDGE TEMPLATE
—·—·—·—	TOP OF MUCK
— · — · —	BOTTOM OF MUCK
//////////	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

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FIGURE 3
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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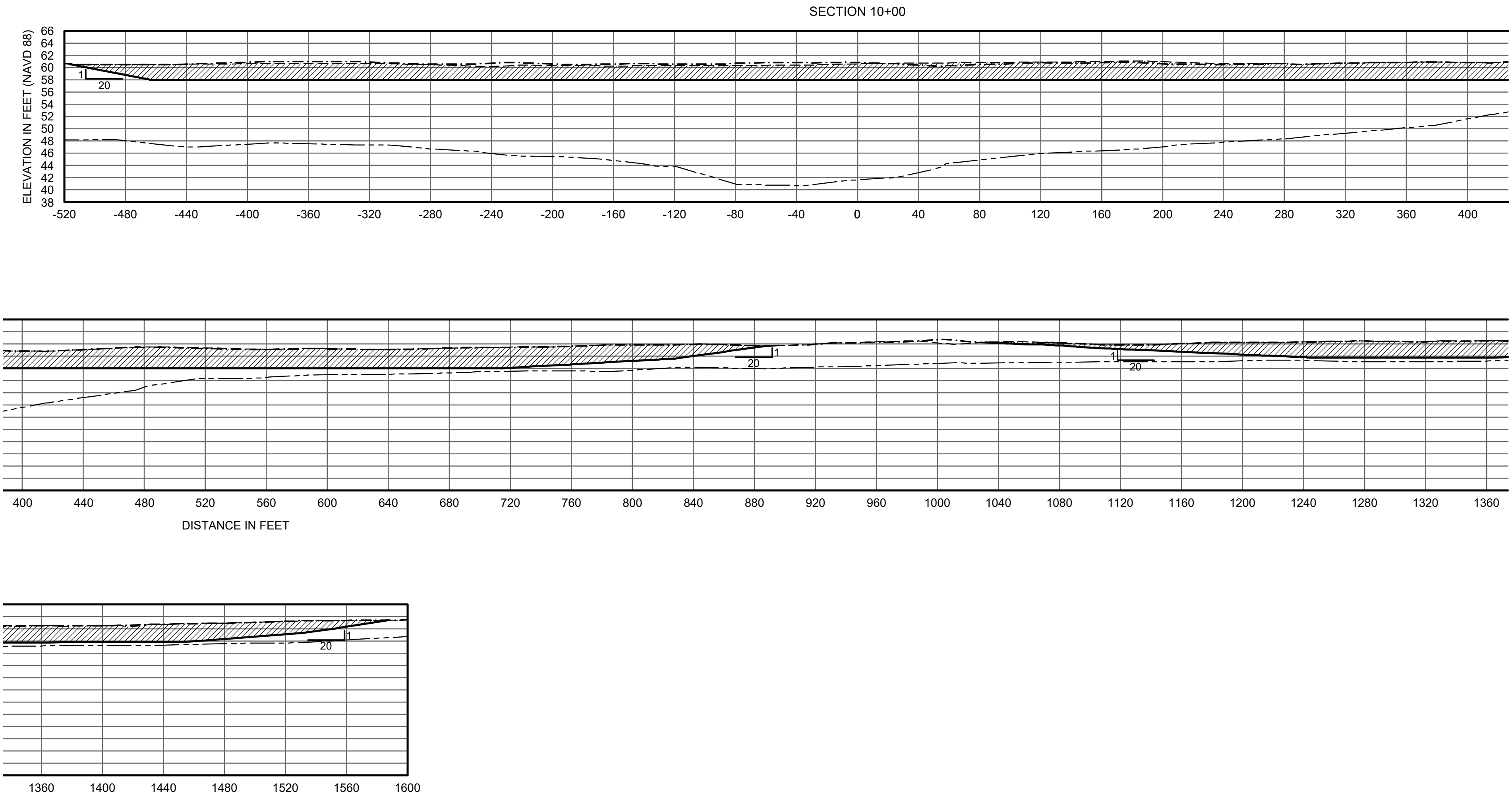

LEGEND

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- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 4
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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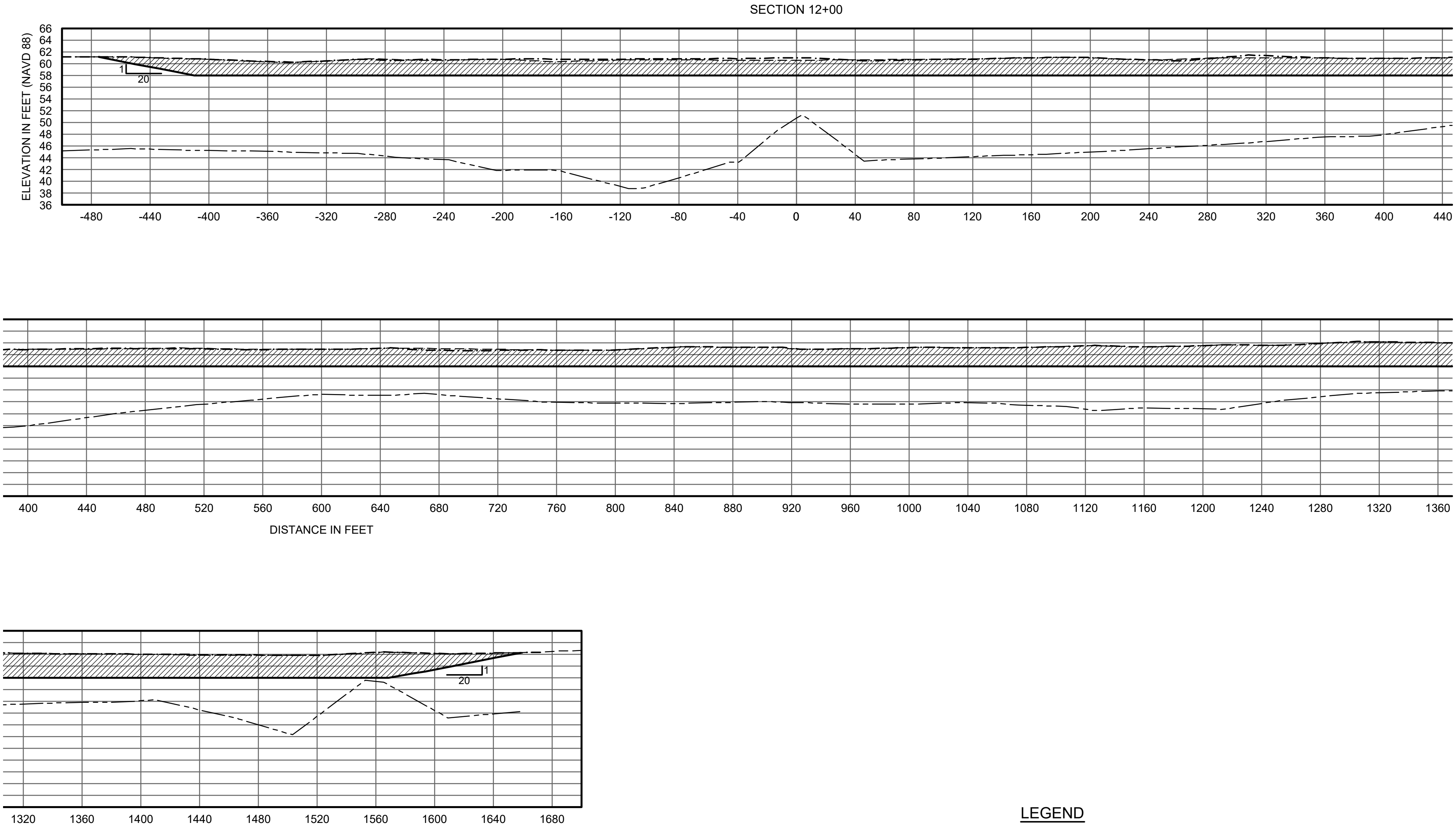

LEGEND

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———————	DREDGE TEMPLATE
—·—·—·—	TOP OF MUCK
— · — · —	BOTTOM OF MUCK
//////////	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 5
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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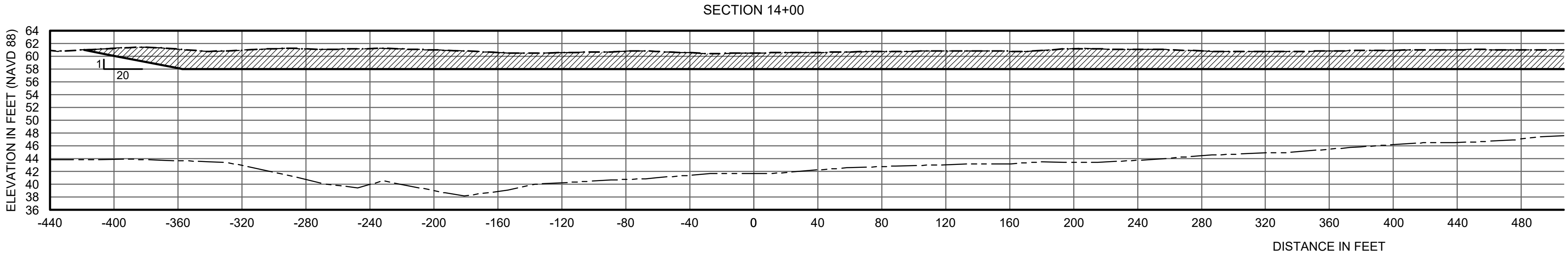

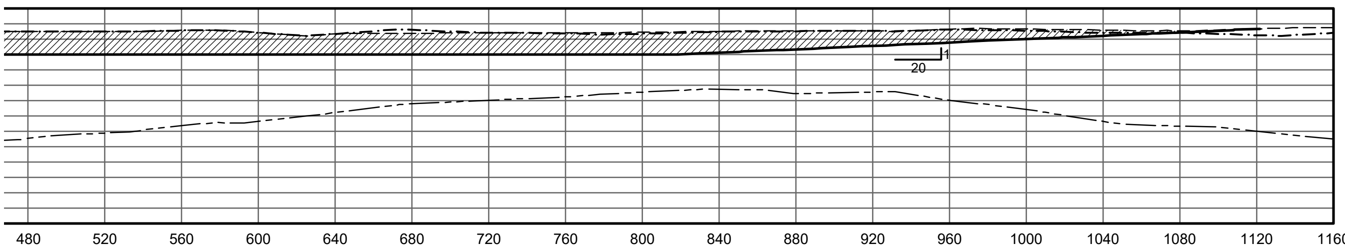

LEGEND

— — — — —	EXISTING GRADE
———	DREDGE TEMPLATE
—·—·—·—	TOP OF MUCK
— - — - —	BOTTOM OF MUCK
(hatched)	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 6
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
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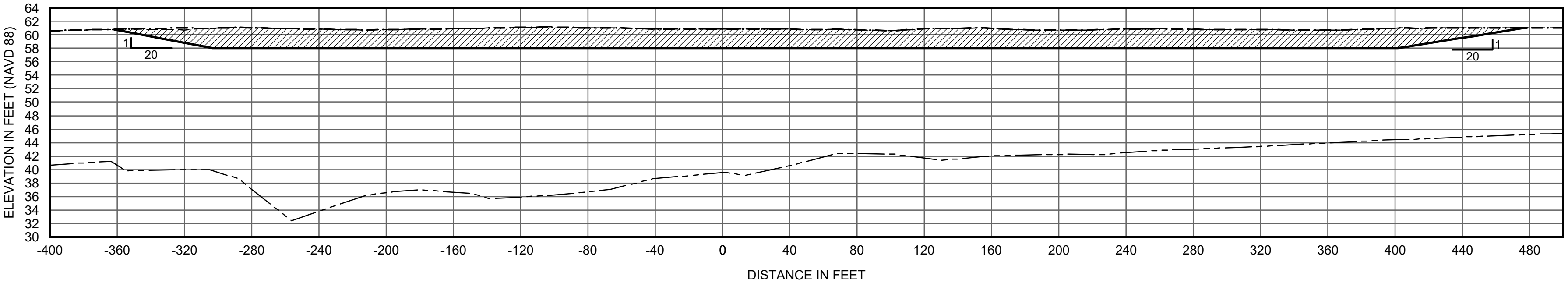

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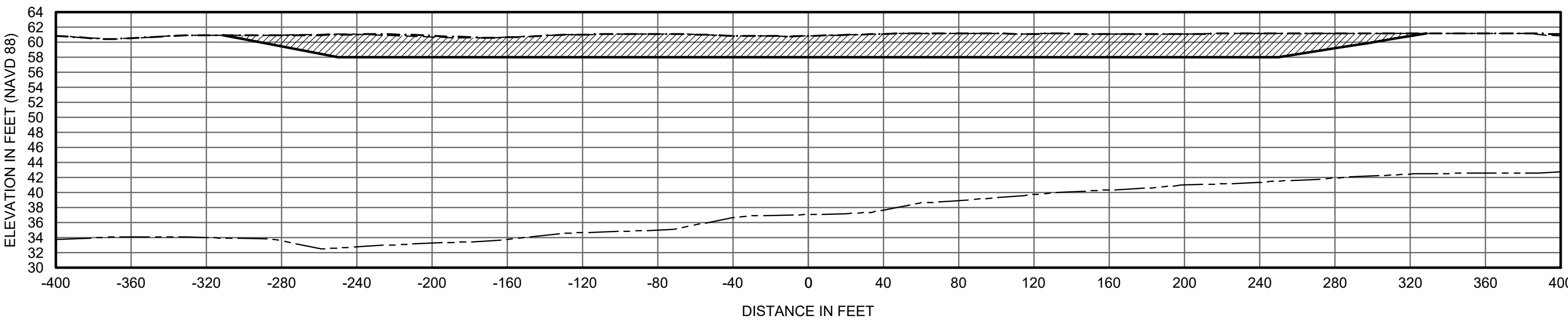

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 7
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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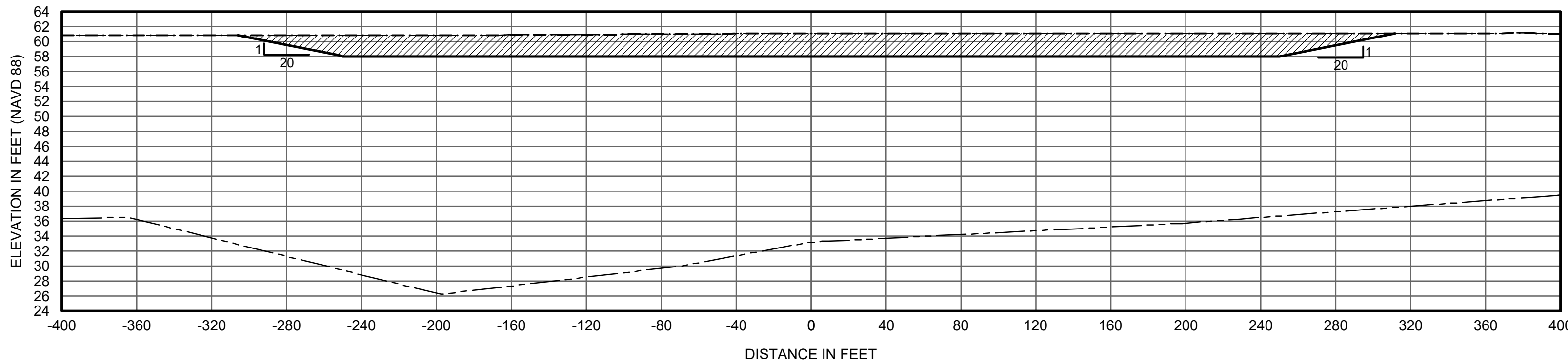

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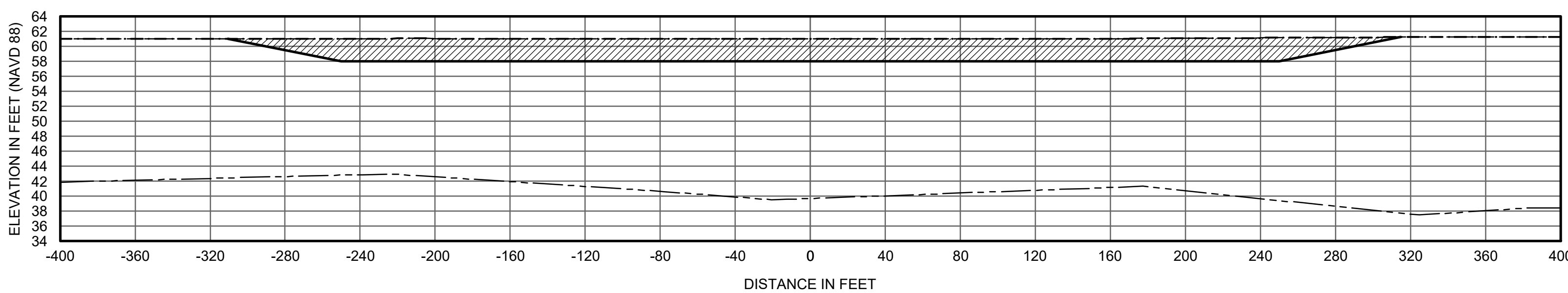

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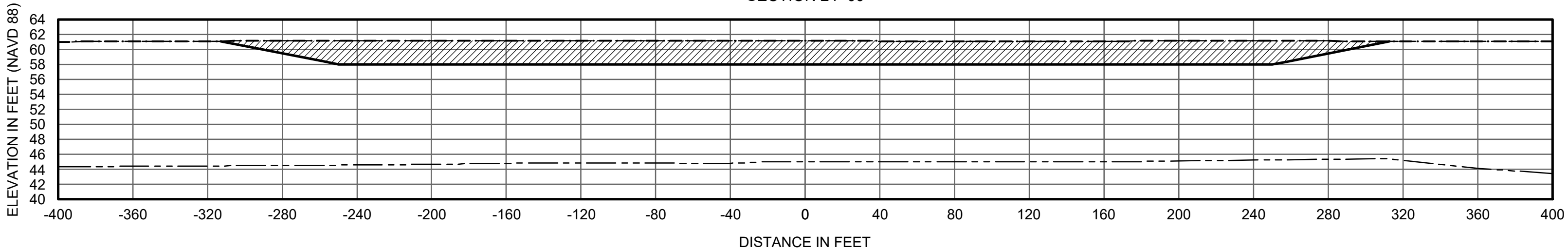

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 8
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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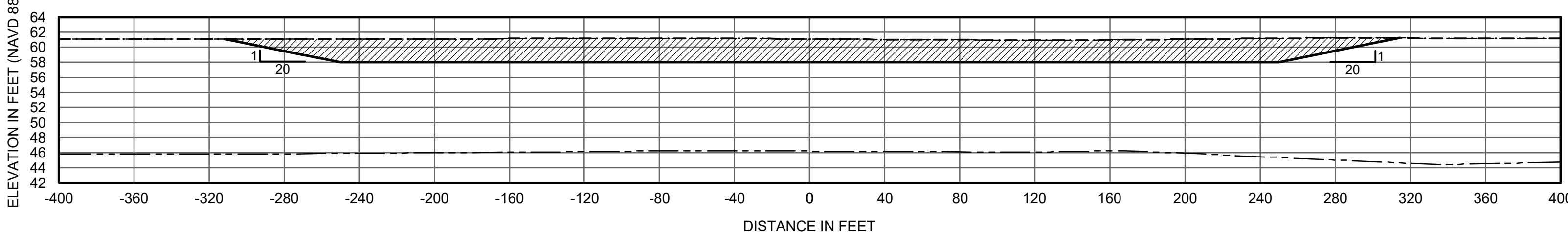

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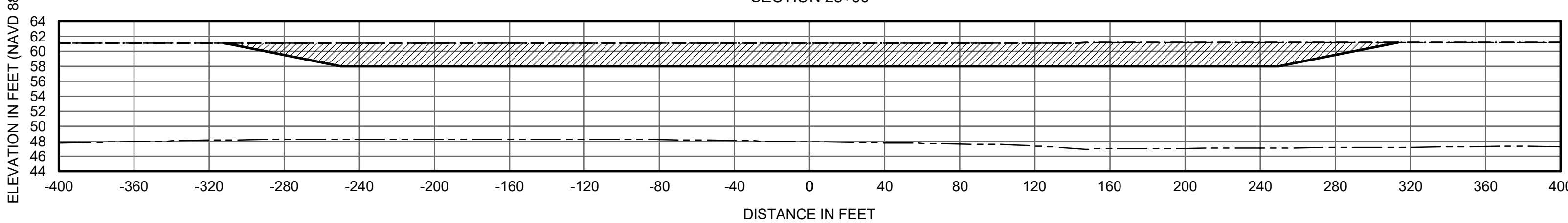
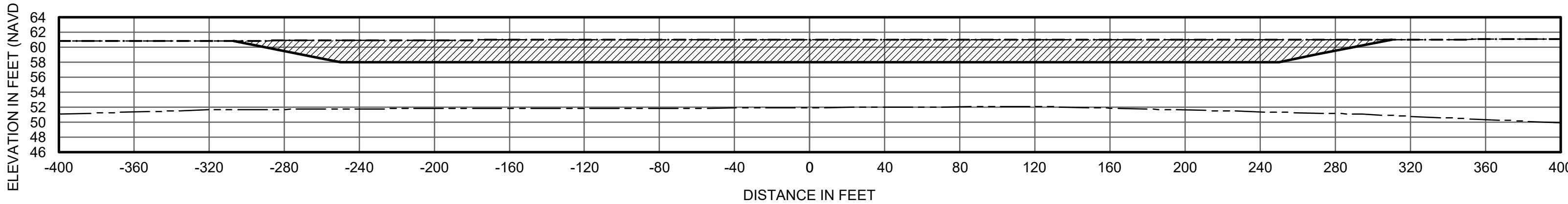
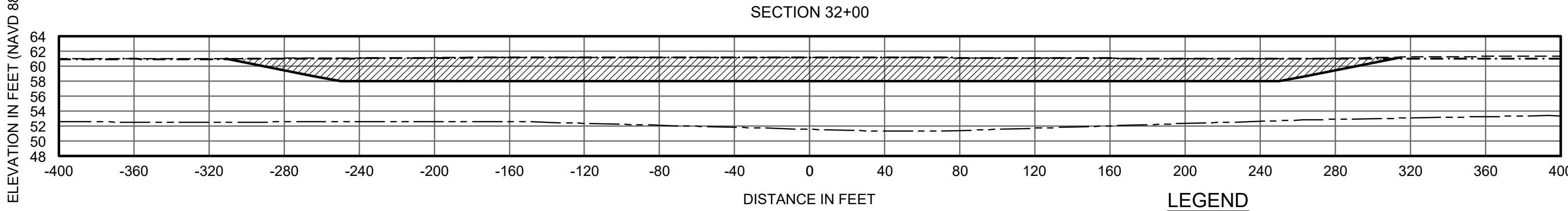


SECTION 30+00



SECTION 32+00



LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 9
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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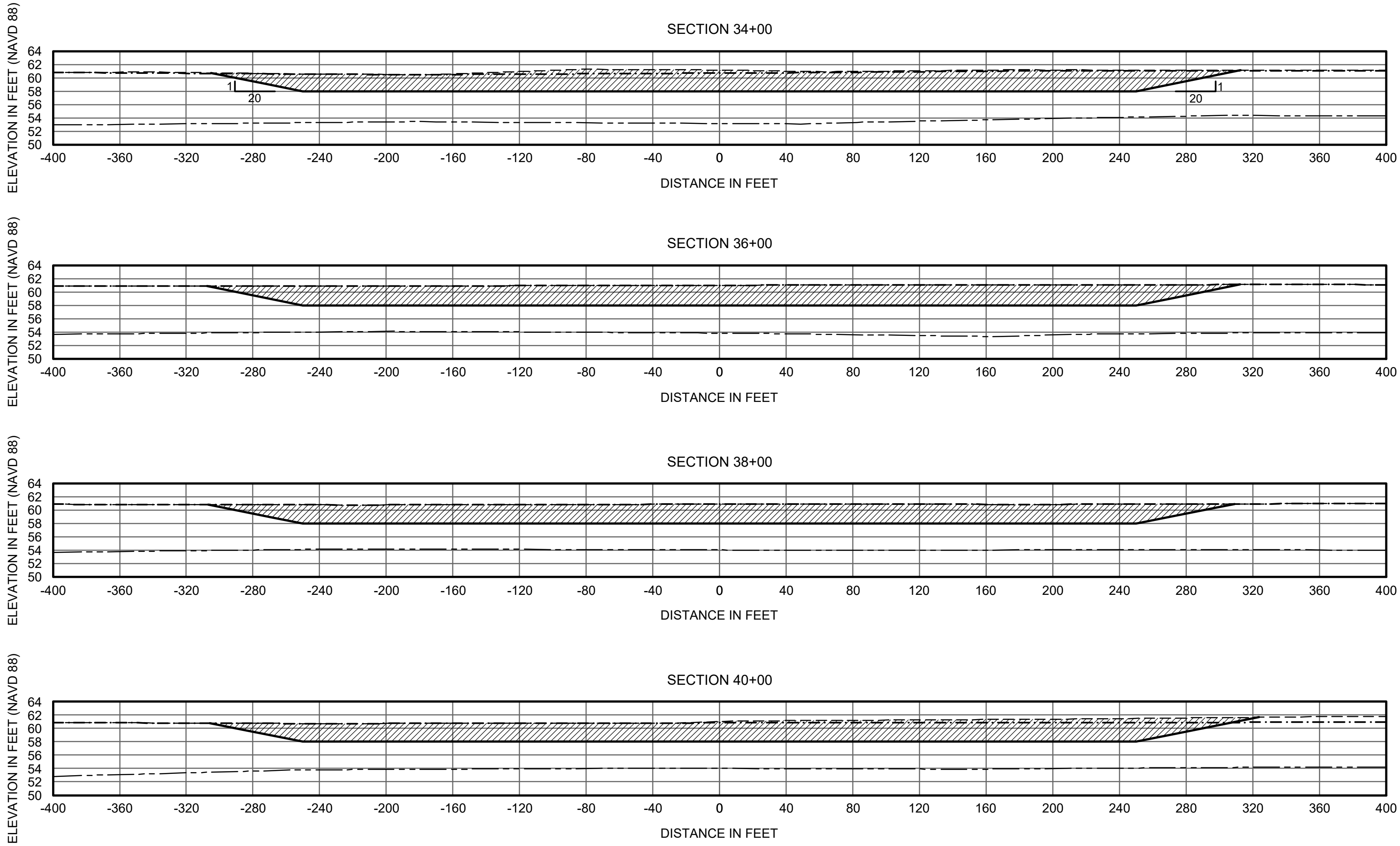

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 10
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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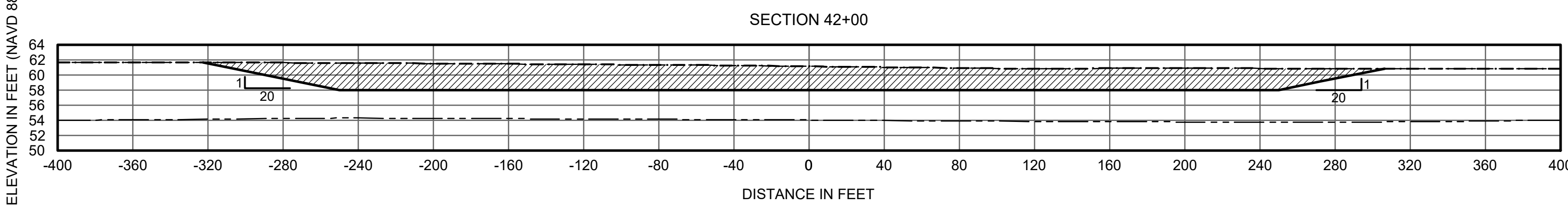

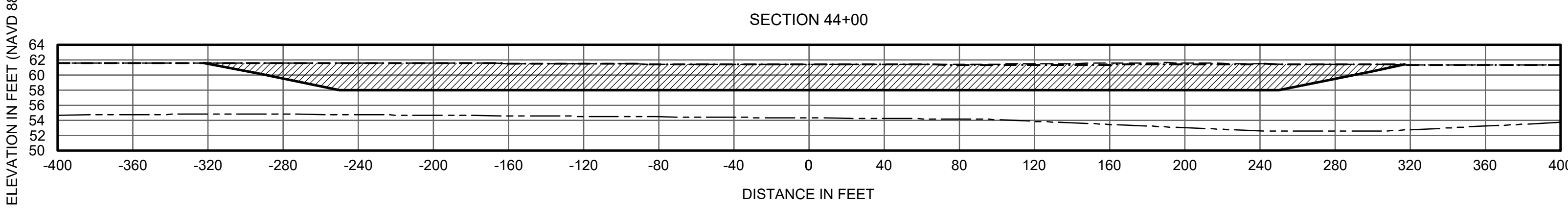

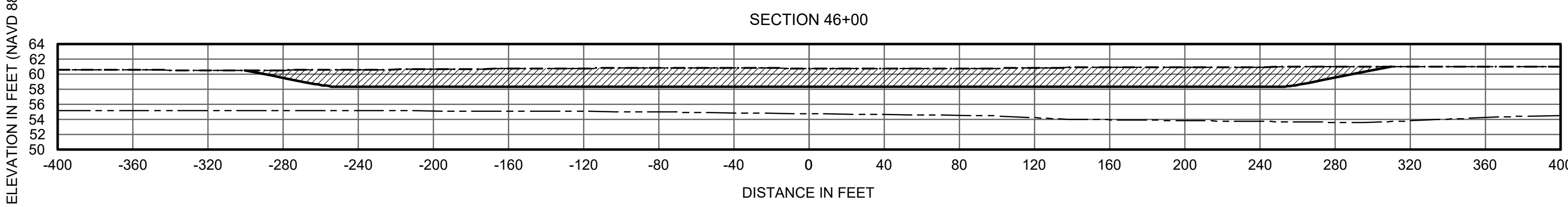

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 1

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 11
NEWTON PARK DREDGING AREA - OPTION 1
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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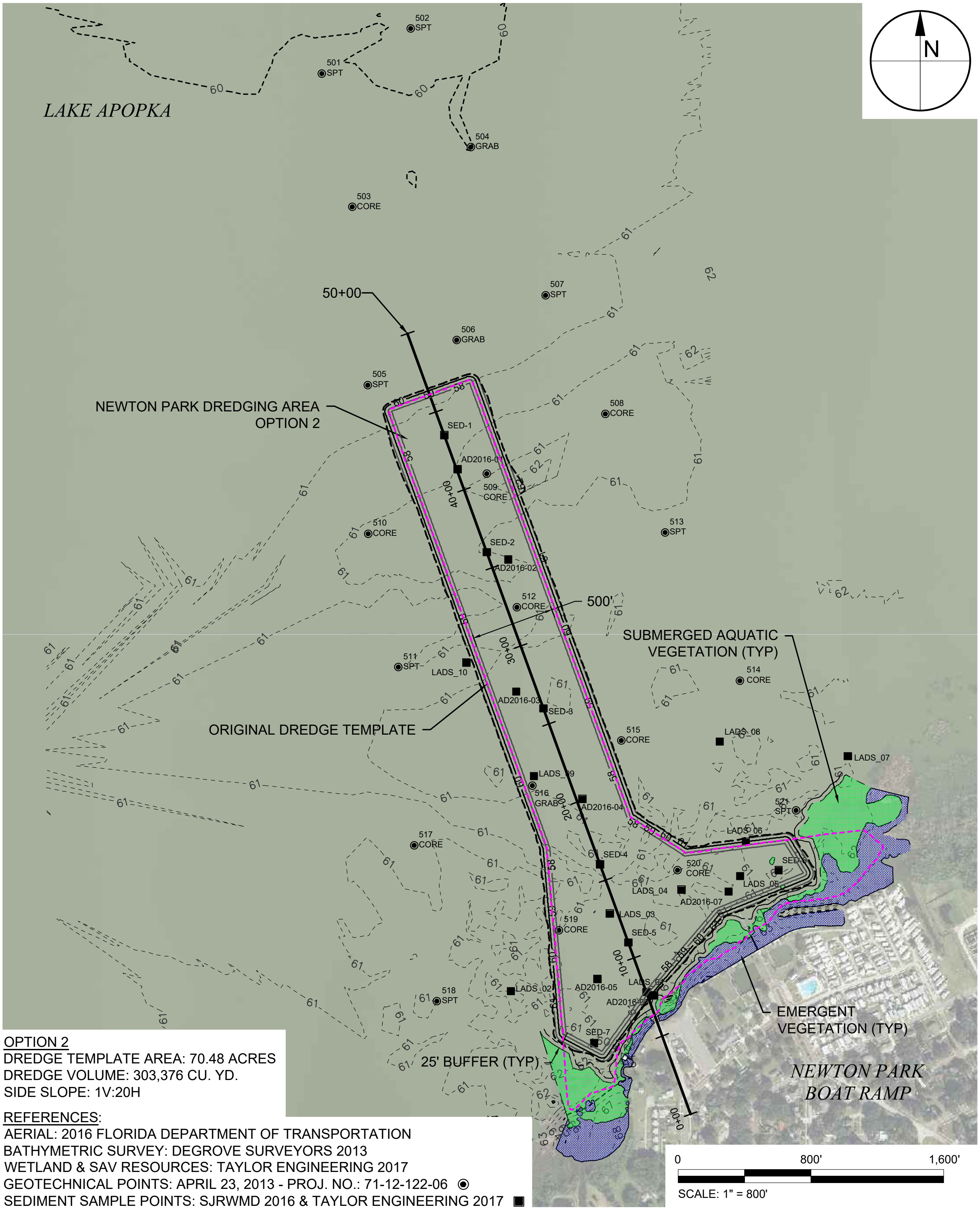

OPTION 2
DREDGE TEMPLATE AREA: 70.48 ACRES
DREDGE VOLUME: 303,376 CU. YD.
SIDE SLOPE: 1V:20H

REFERENCES:
AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
BATHYMETRIC SURVEY: DEGROVE SURVEYORS 2013
WETLAND & SAV RESOURCES: TAYLOR ENGINEERING 2017
GEOTECHNICAL POINTS: APRIL 23, 2013 - PROJ. NO.: 71-12-122-06 ⦿
SEDIMENT SAMPLE POINTS: SJRWMD 2016 & TAYLOR ENGINEERING 2017 ■

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FIGURE 12
NEWTON PARK DREDGING AREA - OPTION 2
PLAN VIEW
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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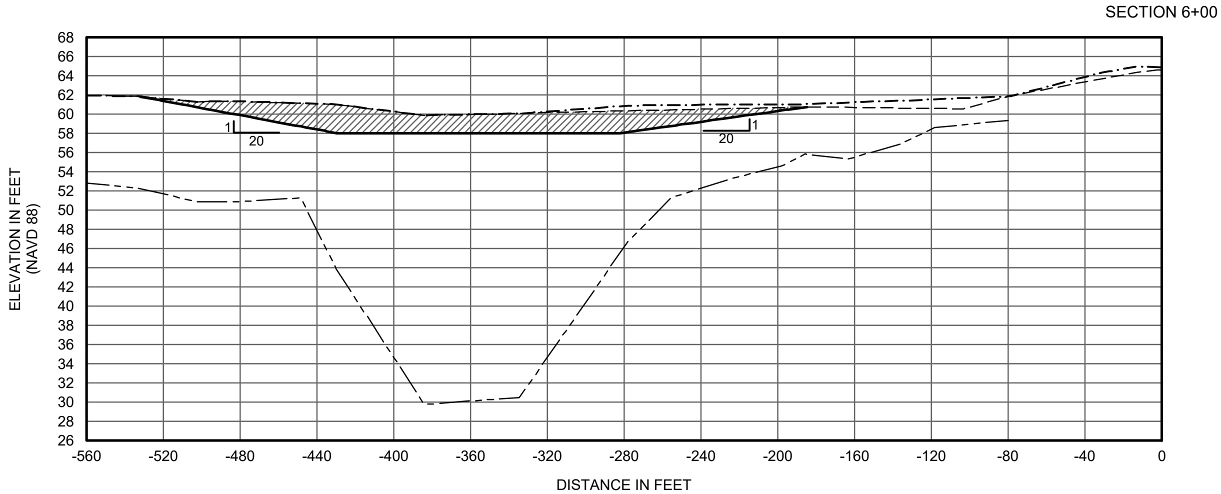

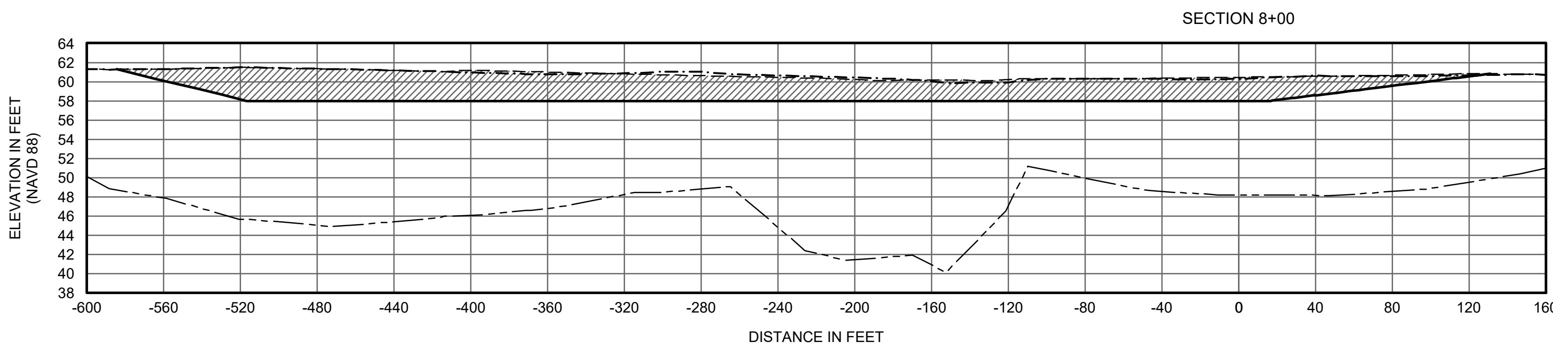

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 13
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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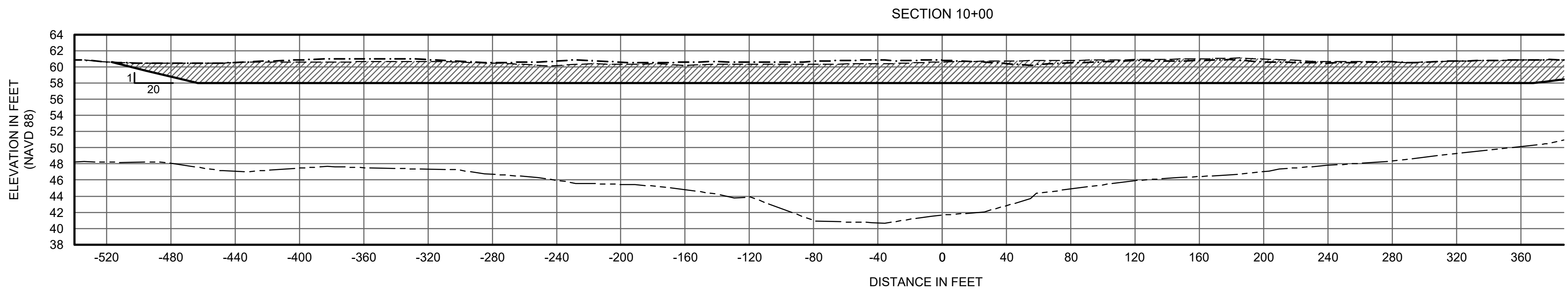

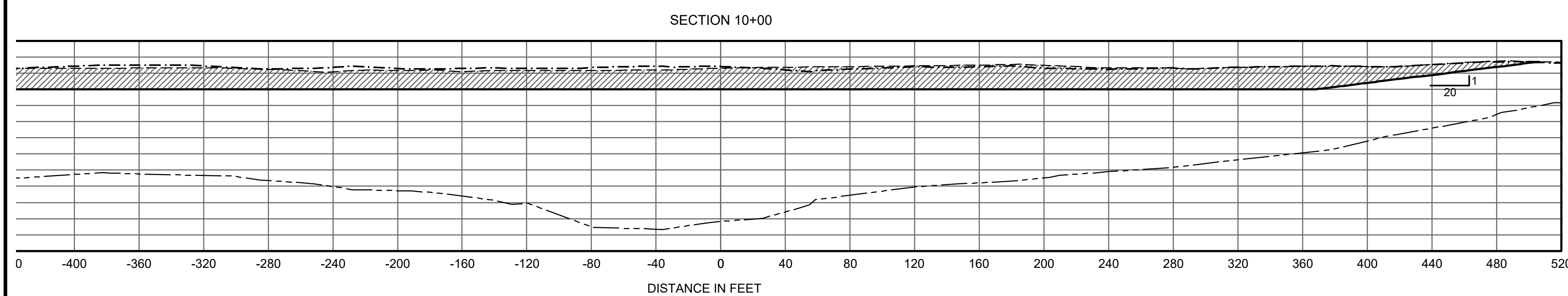

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 14
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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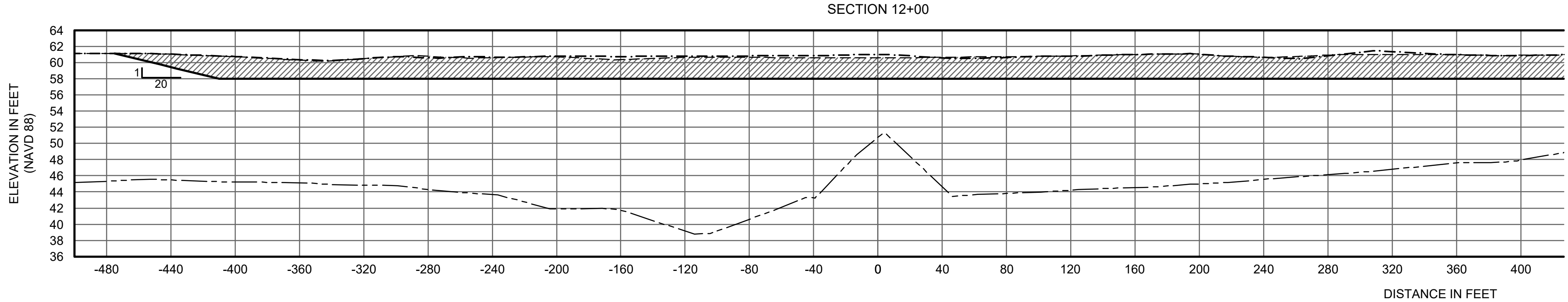

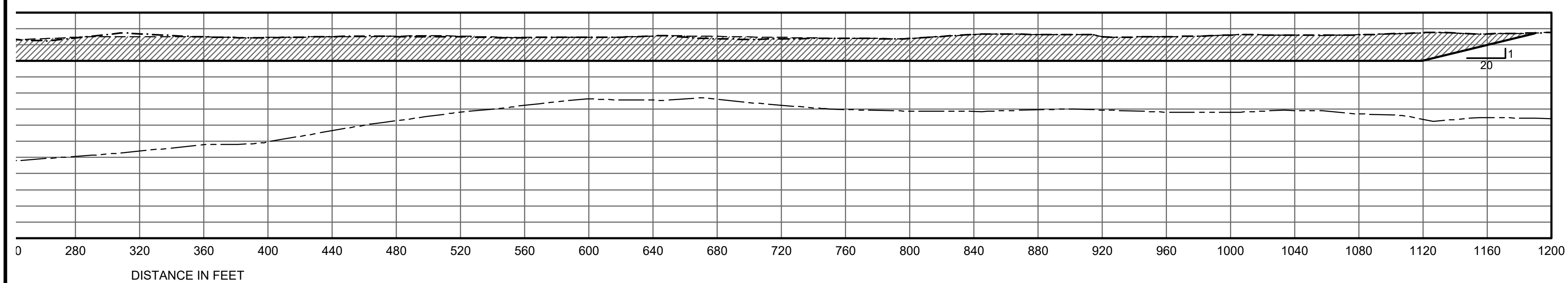

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 15
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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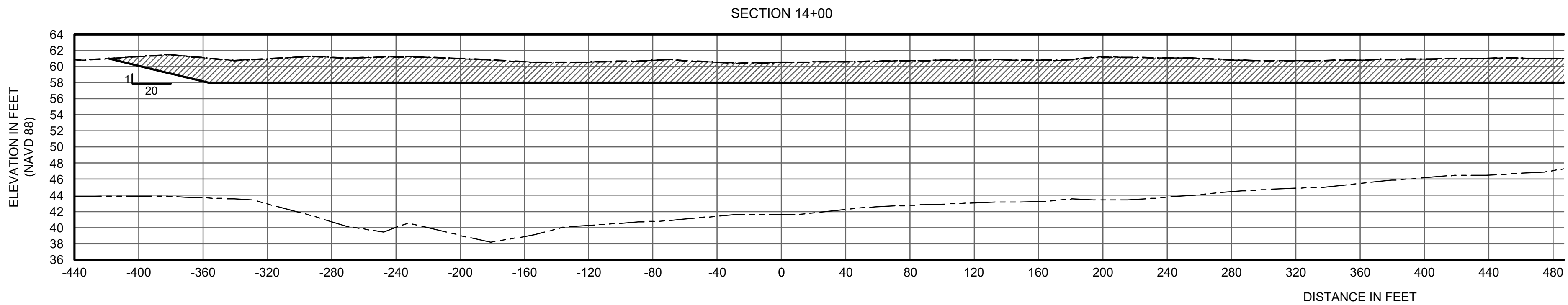

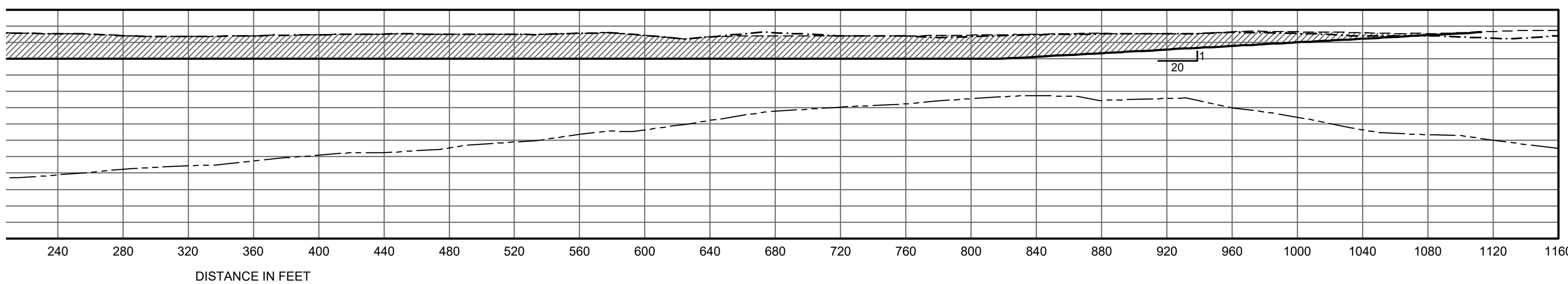

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 16
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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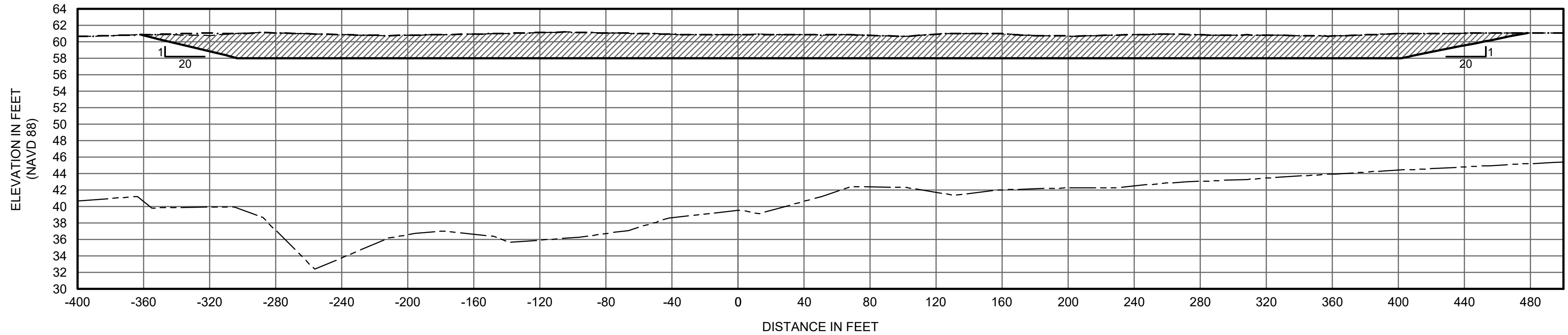
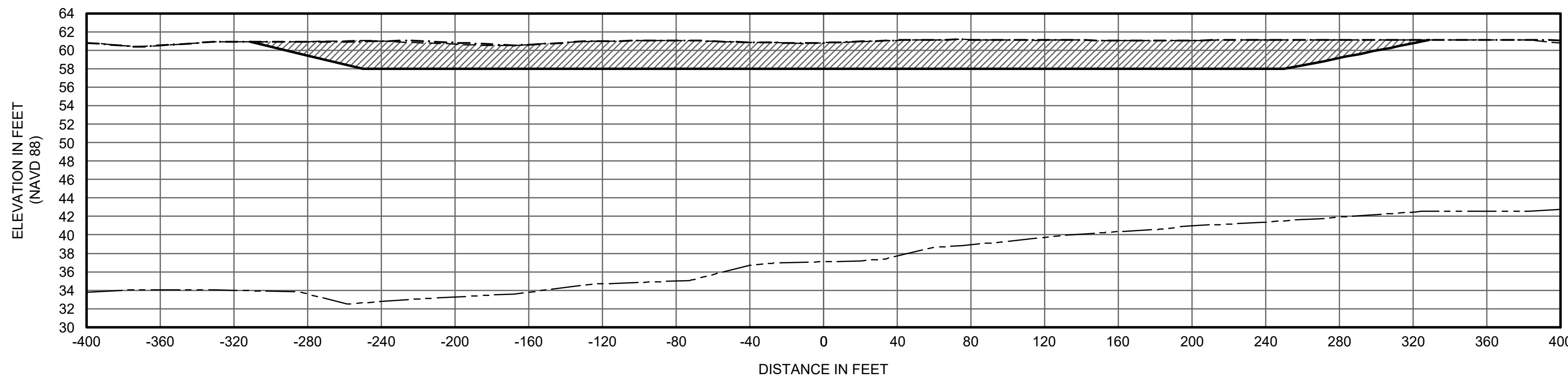
SECTION 16+00



SECTION 18+00



LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 17
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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DATE	DEC 2017

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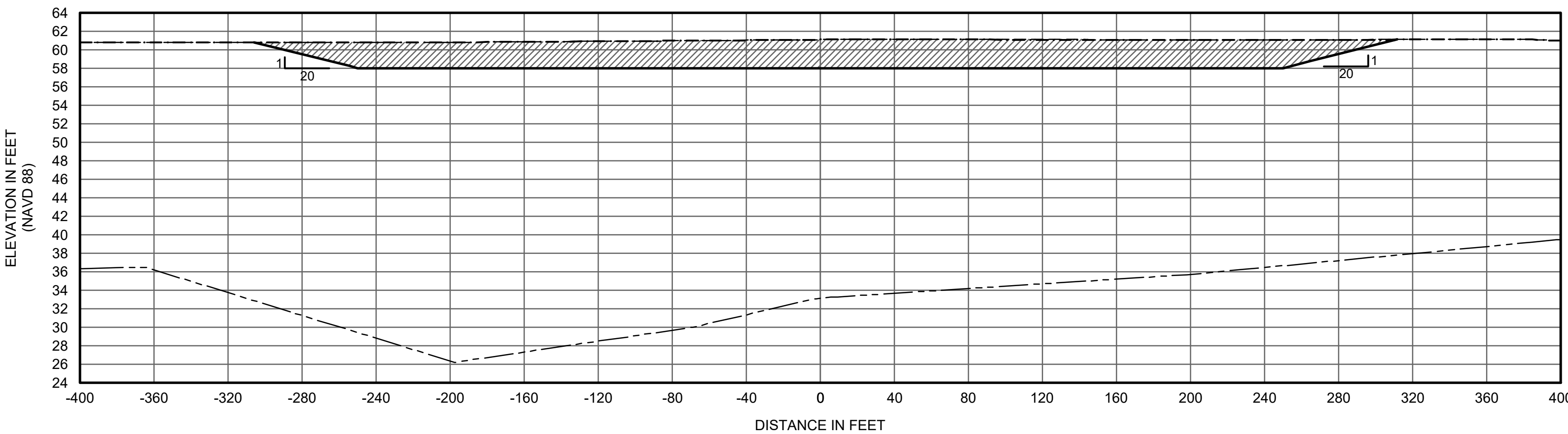
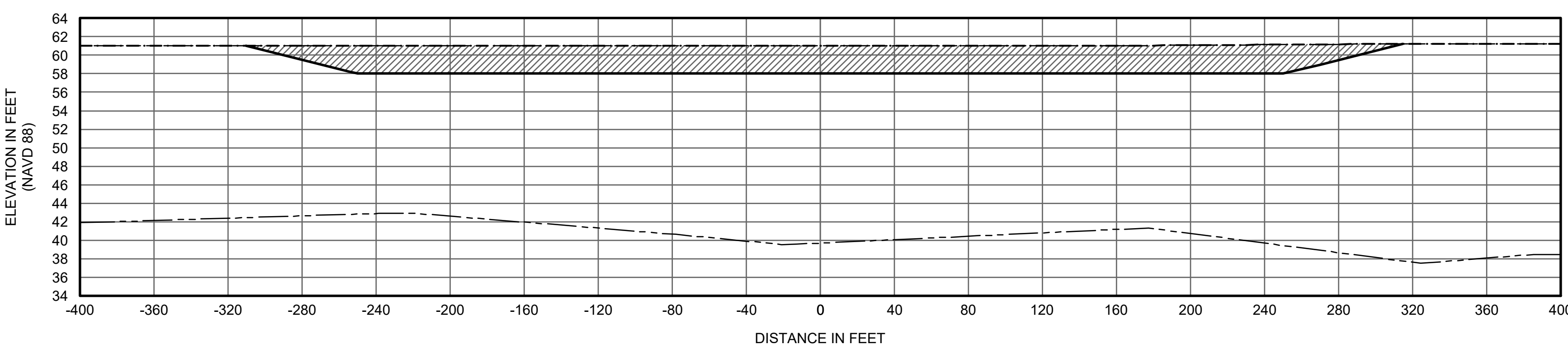
SECTION 20+00



SECTION 22+00



LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 18
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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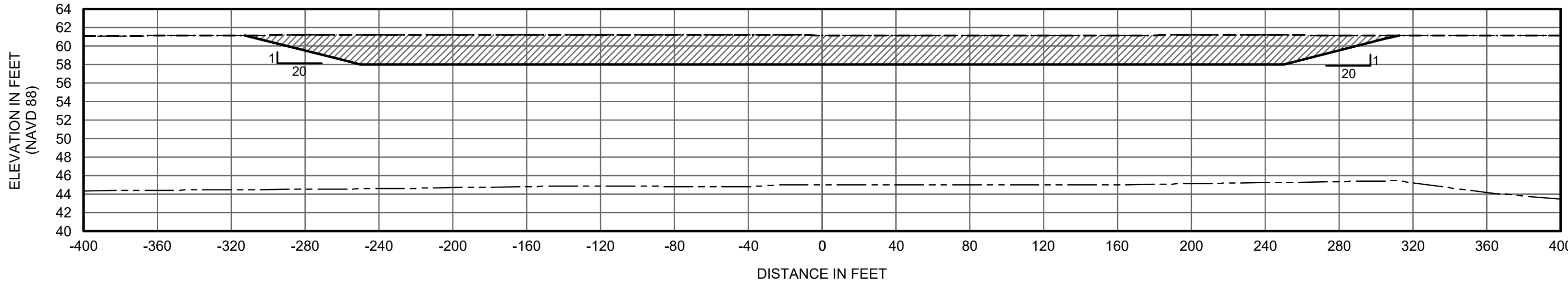
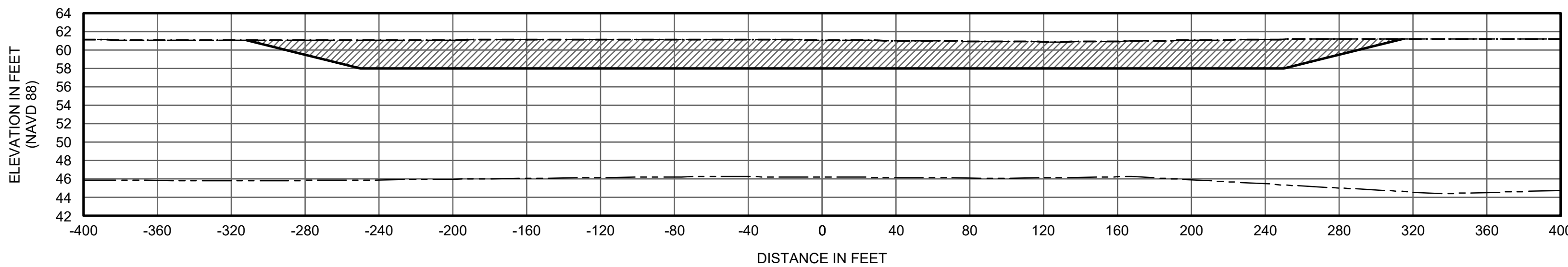
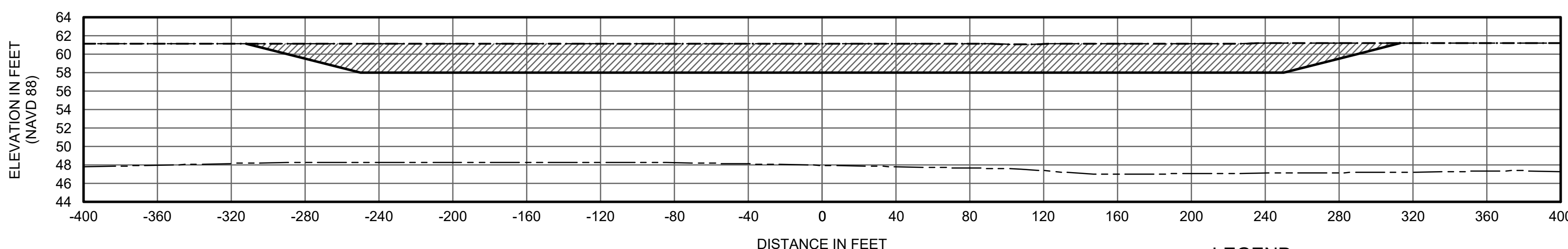
SECTION 24+00



SECTION 26+00



SECTION 28+00



LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 19
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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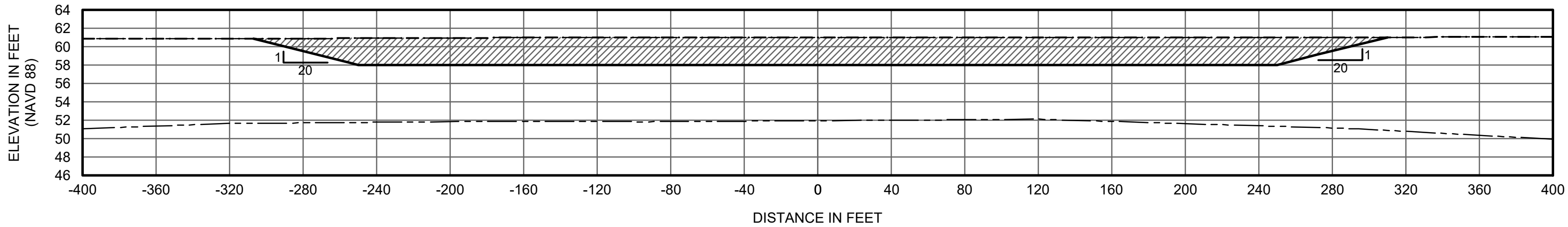
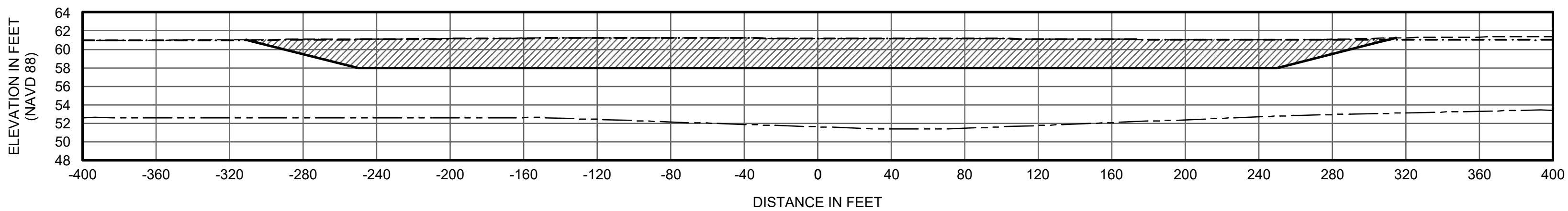
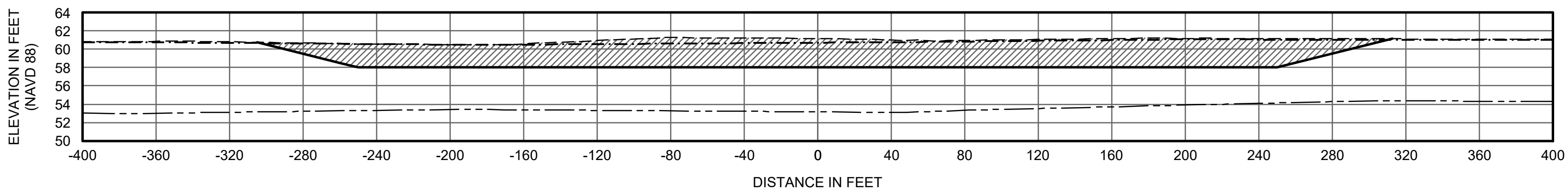
SECTION 30+00



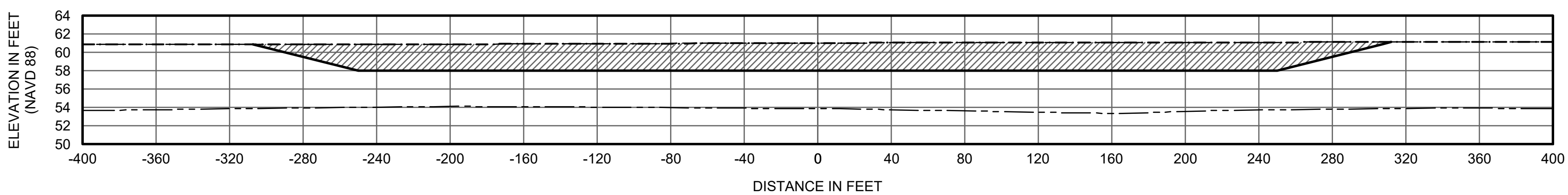
SECTION 32+00



SECTION 34+00



SECTION 36+00



LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 20
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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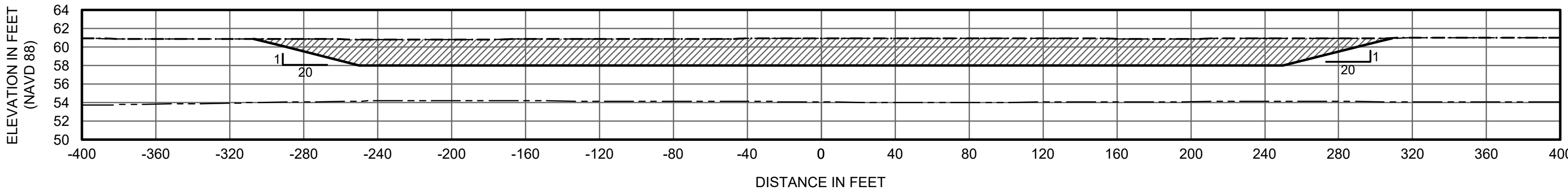
SECTION 38+00



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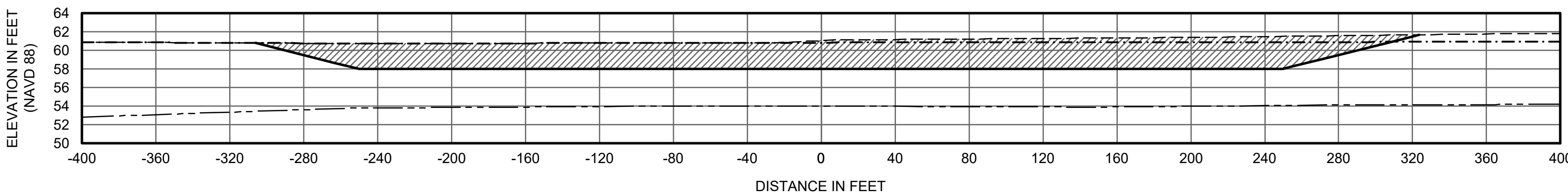

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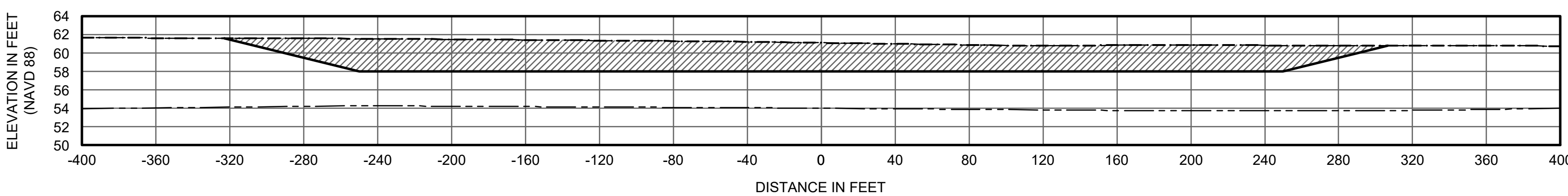

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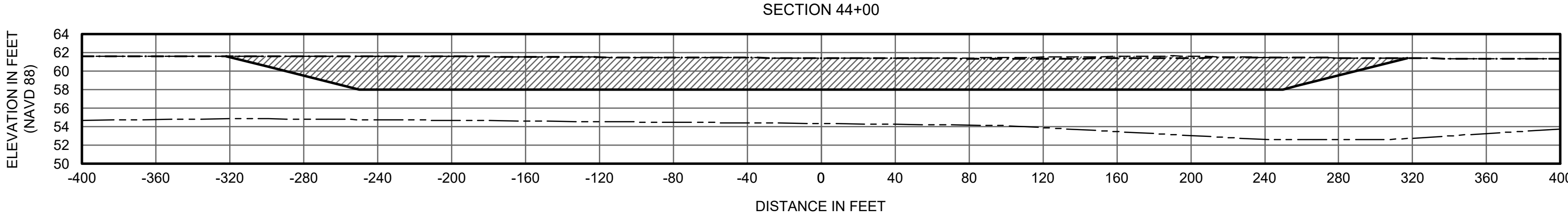

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 21
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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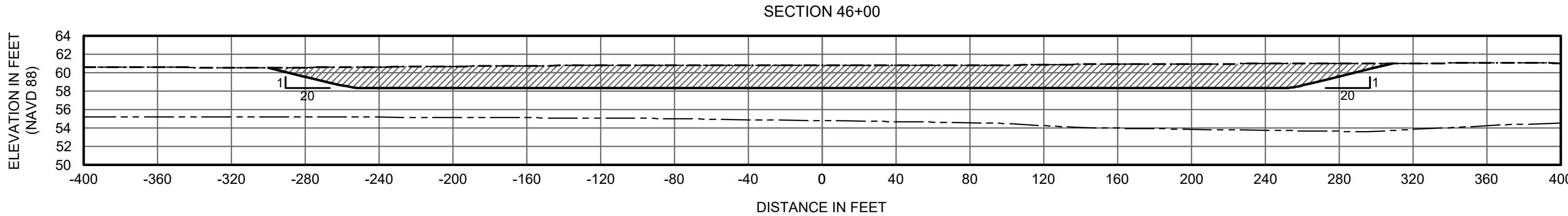

LEGEND

— — — — —	EXISTING GRADE
———	DREDGE TEMPLATE
—·—·—·—	TOP OF MUCK
— - - — - - —	BOTTOM OF MUCK
(hatched)	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 2

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 22
NEWTON PARK DREDGING AREA - OPTION 2
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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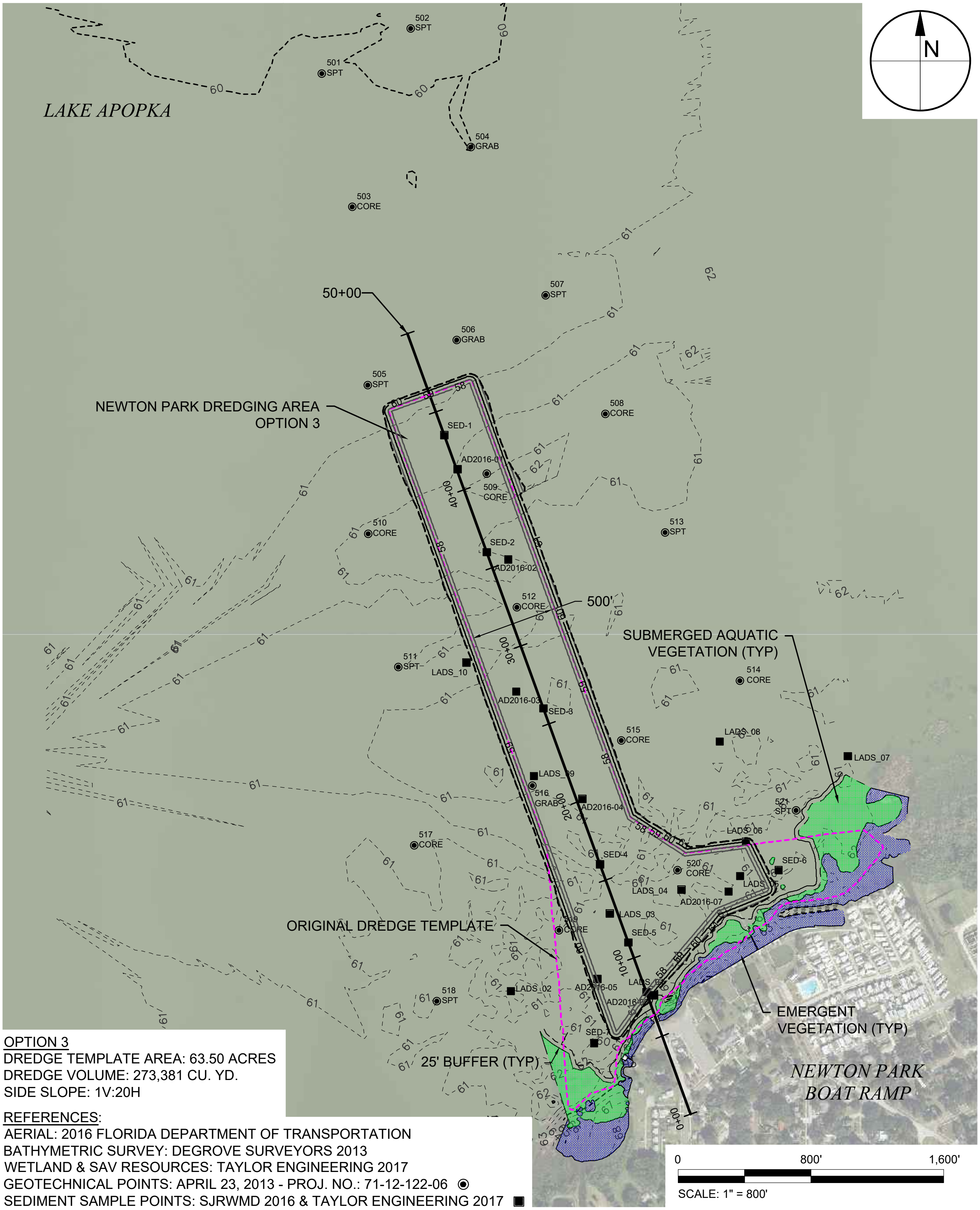

OPTION 3
DREDGE TEMPLATE AREA: 63.50 ACRES
DREDGE VOLUME: 273,381 CU. YD.
SIDE SLOPE: 1V:20H

REFERENCES:
AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
BATHYMETRIC SURVEY: DEGROVE SURVEYORS 2013
WETLAND & SAV RESOURCES: TAYLOR ENGINEERING 2017
GEOTECHNICAL POINTS: APRIL 23, 2013 - PROJ. NO.: 71-12-122-06 ◉
SEDIMENT SAMPLE POINTS: SJRWMD 2016 & TAYLOR ENGINEERING 2017 ■

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CERTIFICATE OF AUTHORIZATION # 4815

FIGURE 23
NEWTON PARK DREDGING AREA - OPTION 3
PLAN VIEW
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	23 of 32	DEC 2017

SEAL

LORI S. BROWNELL P.E.# 60025 DATE

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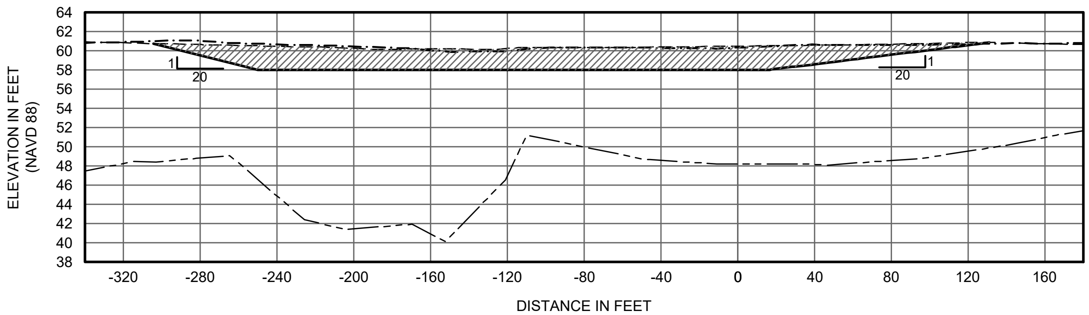
SECTION 8+00



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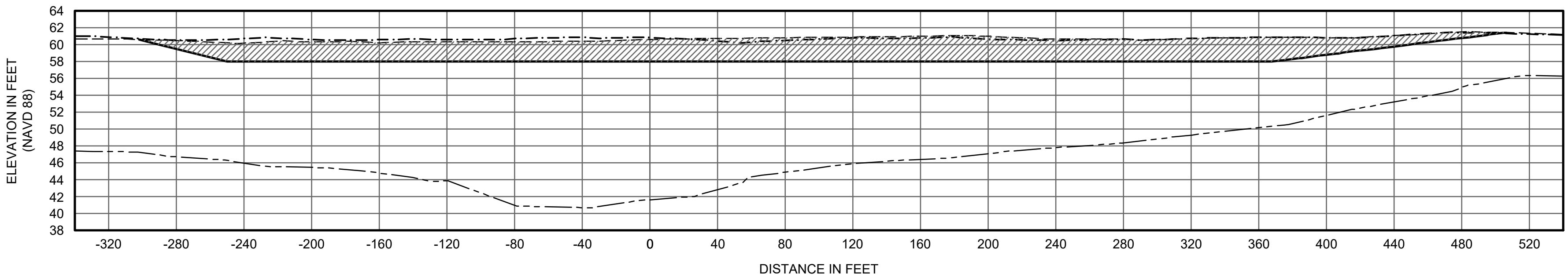

LEGEND

EXISTING GRADE

DREDGE TEMPLATE

TOP OF MUCK

BOTTOM OF MUCK

MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 24
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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DRAWN BY RLJ
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DATE DEC 2017

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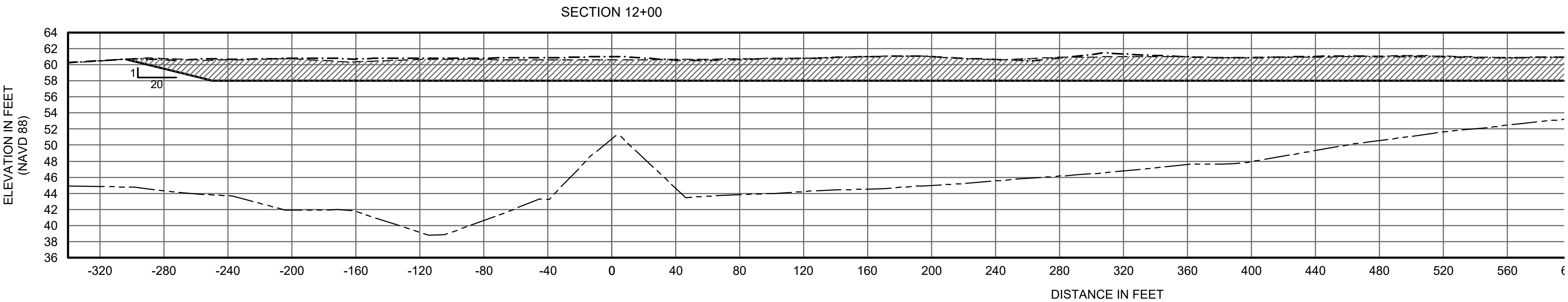

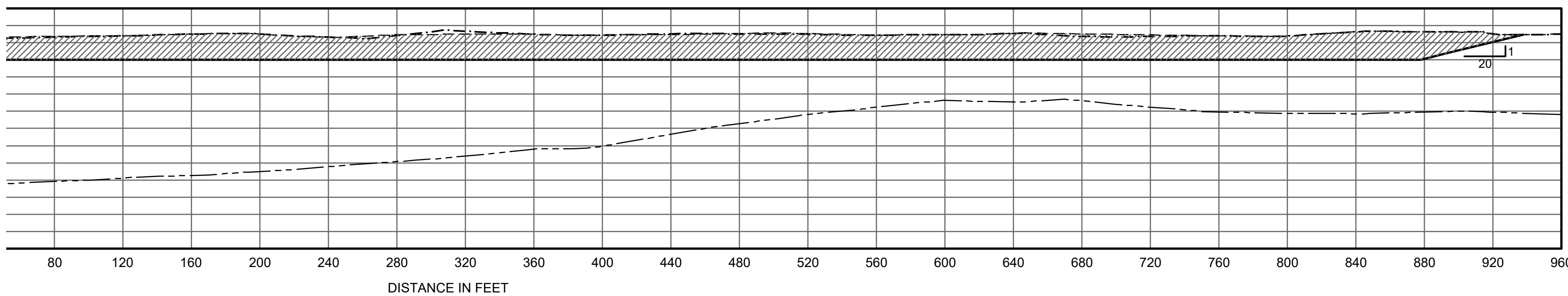

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 25
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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DRAWN BY	RLJ
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DATE	DEC 2017

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LORI S. BROWNELL P.E.# 60025 DATE

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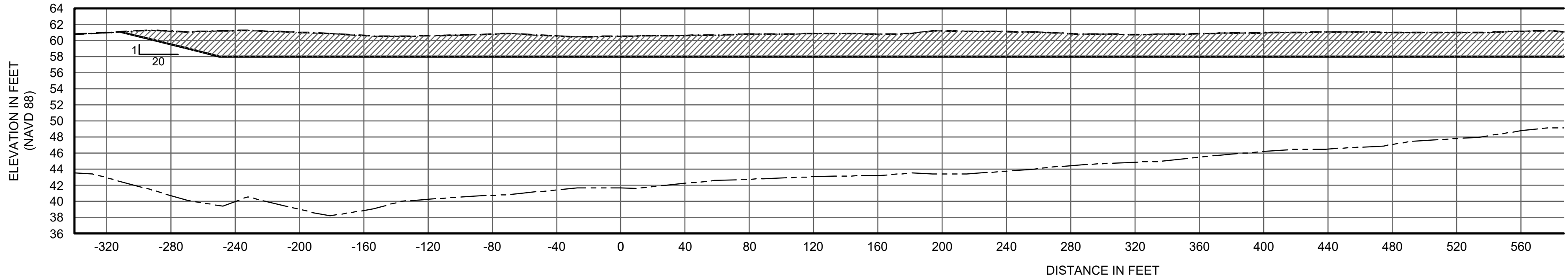
SECTION 14+00



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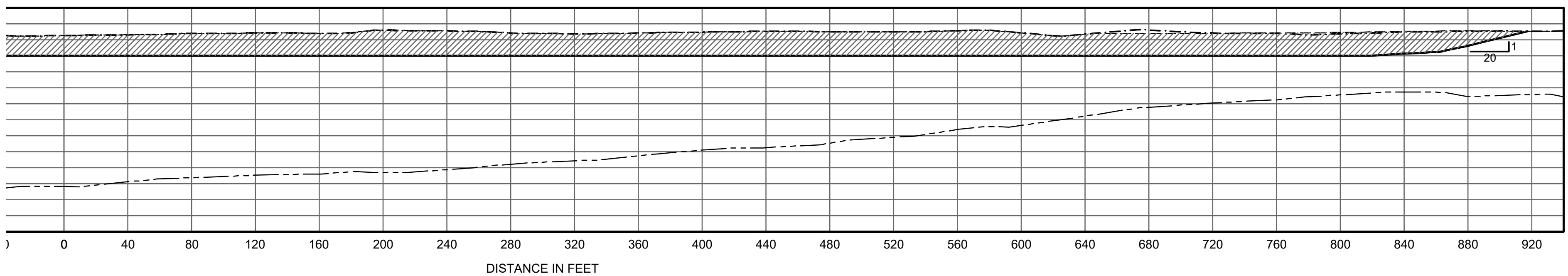

LEGEND

EXISTING GRADE

DREDGE TEMPLATE

TOP OF MUCK

BOTTOM OF MUCK

MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'

V-SCALE: 1" = 25'

0 100'

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FIGURE 26

NEWTON PARK DREDGING AREA - OPTION 3

CROSS-SECTIONS

LAKE APOPKA NEWTON PARK ACCESS CHANNEL

ORANGE COUNTY, FLORIDA

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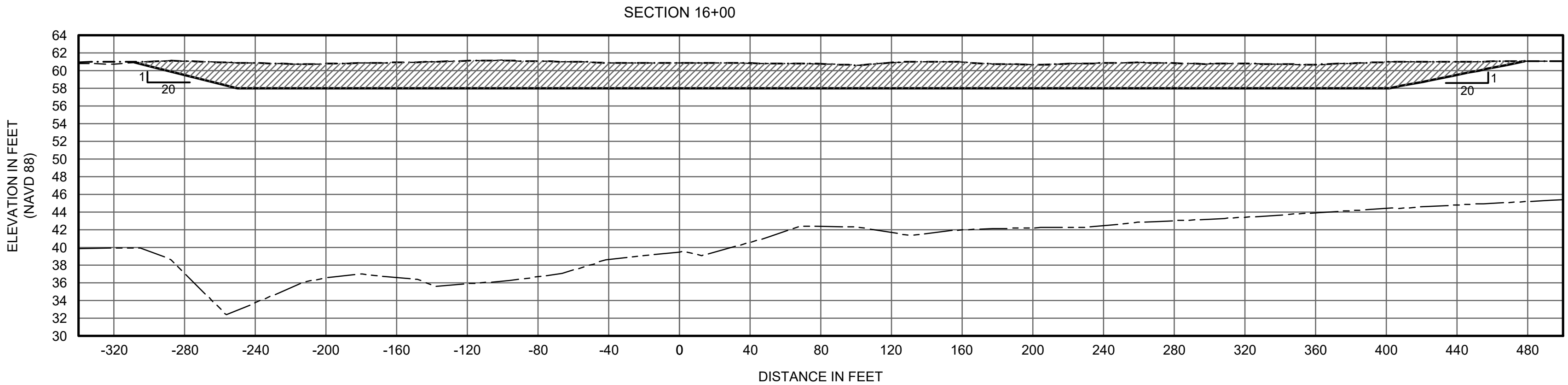
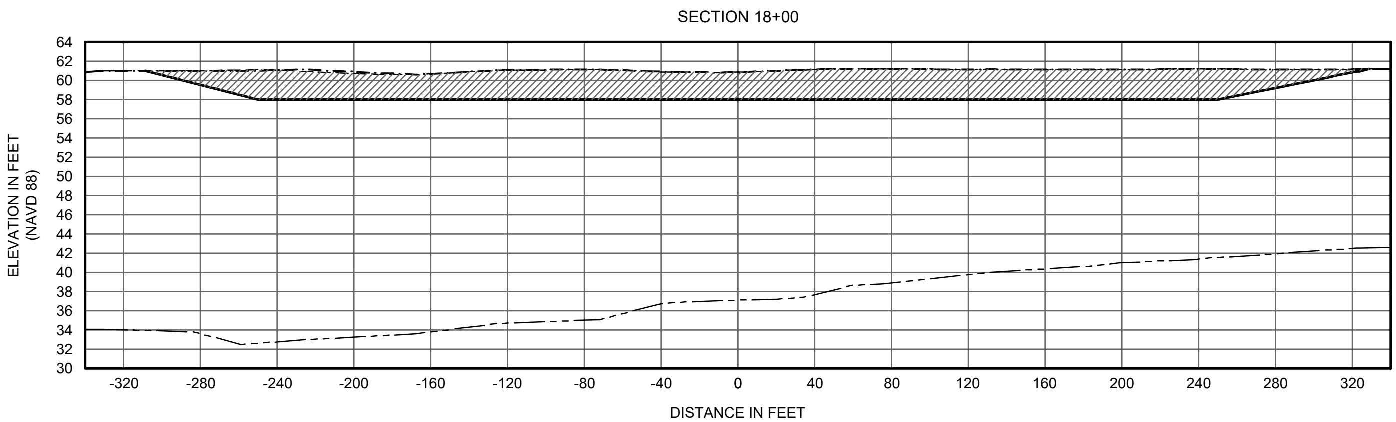
LORI S. BROWNELL P.E.# 60025 DATE





LEGEND

— — — — —	EXISTING GRADE
———	DREDGE TEMPLATE
—·—·—·—	TOP OF MUCK
—·—·—	BOTTOM OF MUCK
//////	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 27
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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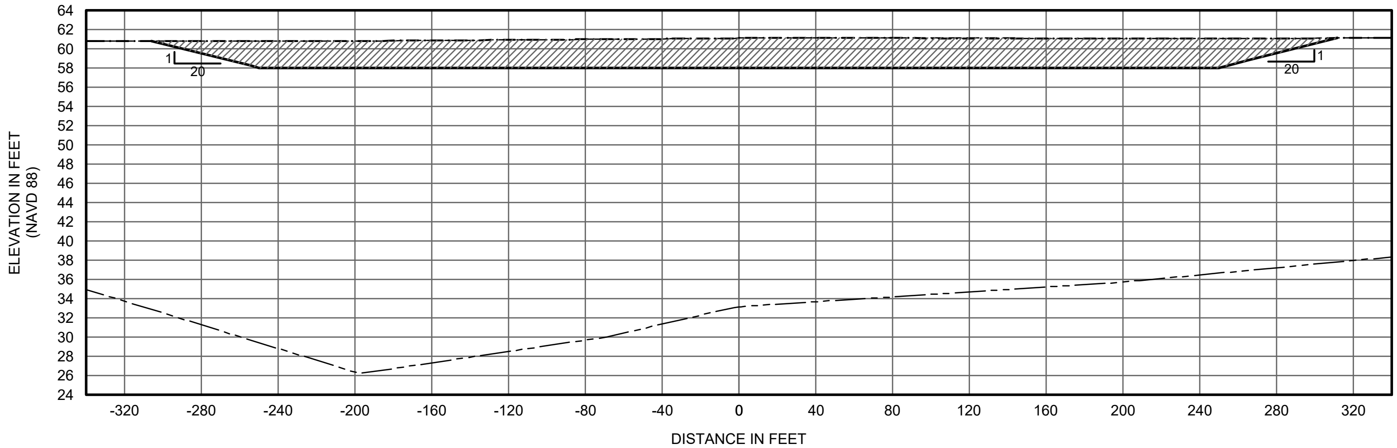
LORI S. BROWNELL P.E.# 60025 DATE

SECTION 20+00



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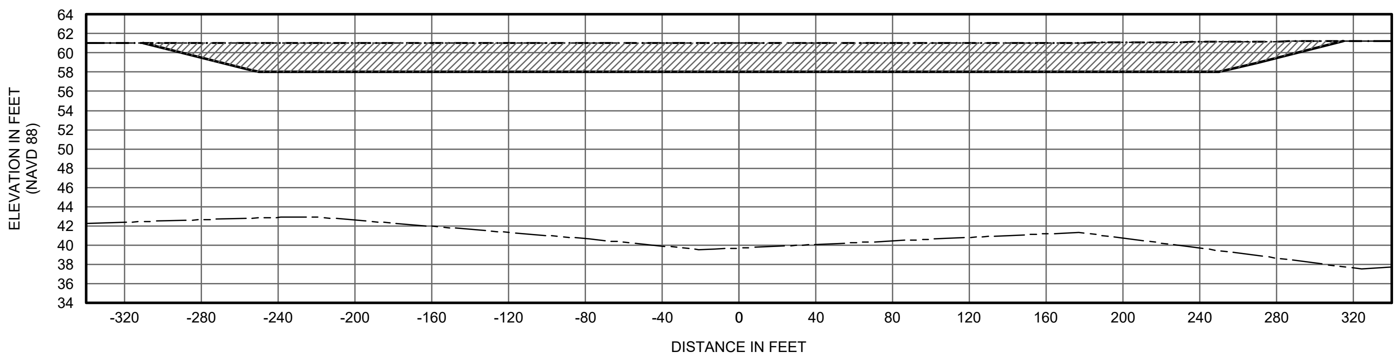

LEGEND

- EXISTING GRADE
- DREDGE TEMPLATE
- TOP OF MUCK
- BOTTOM OF MUCK
- MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 28
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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LORI S. BROWNELL P.E.# 60025 DATE

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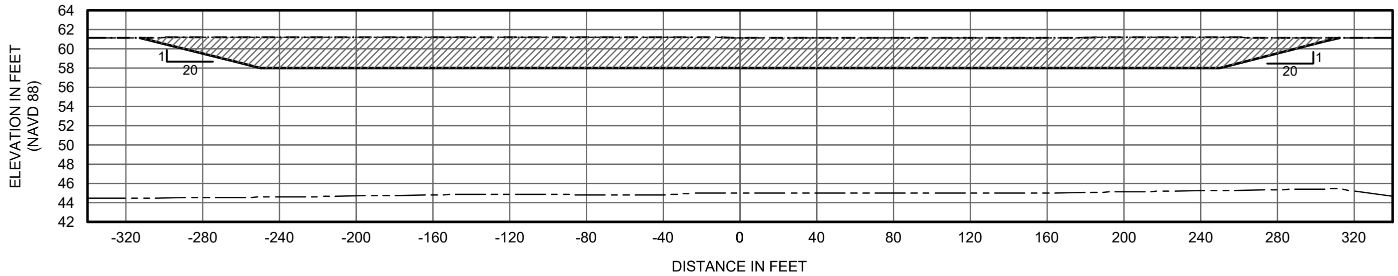

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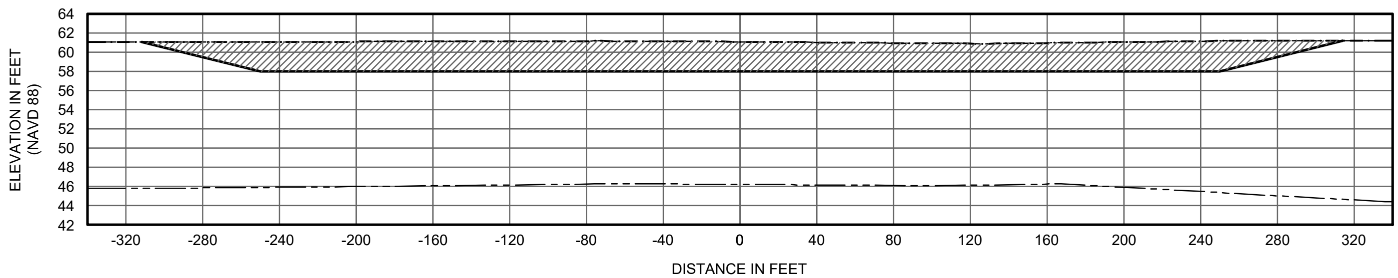

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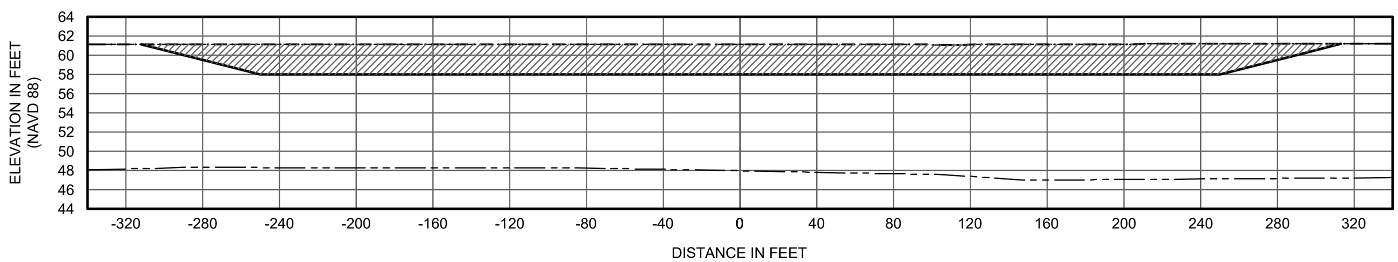

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 29
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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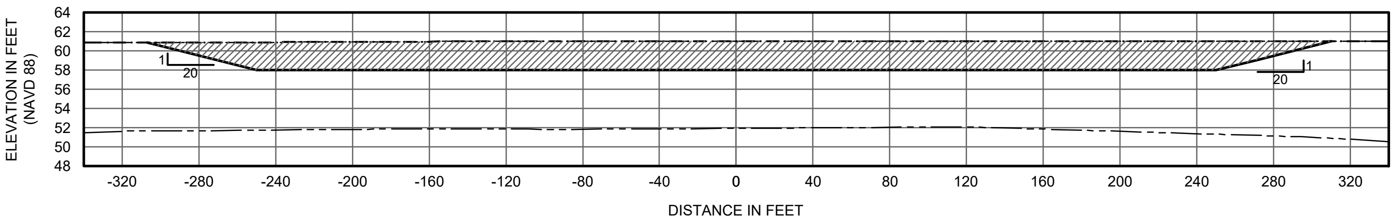

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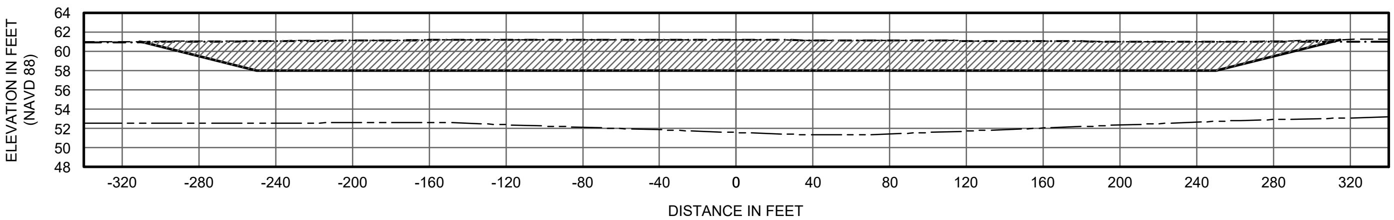

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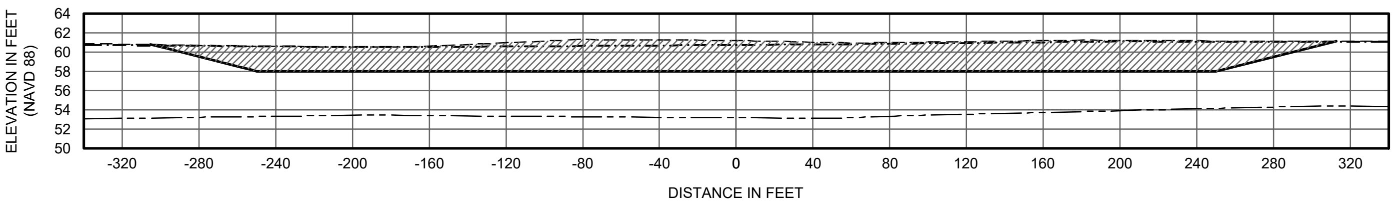

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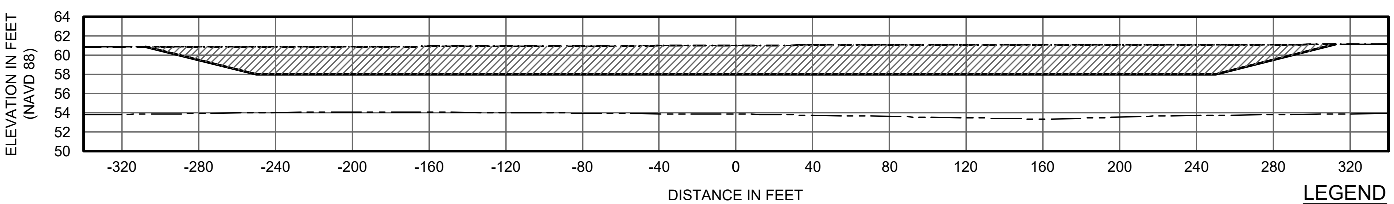

LEGEND

EXISTING GRADE
DREDGE TEMPLATE
TOP OF MUCK
BOTTOM OF MUCK
MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 30
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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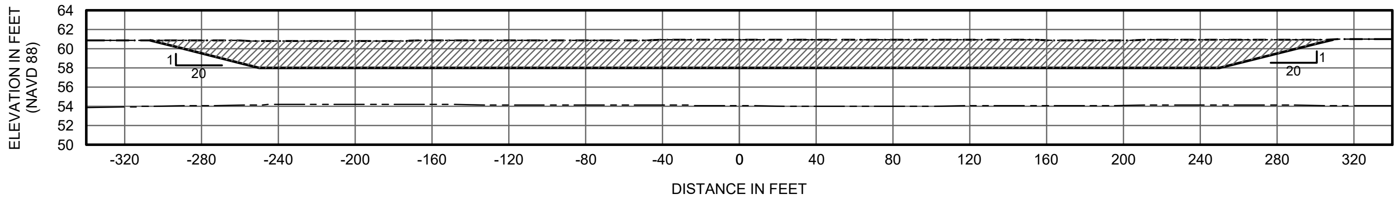
SECTION 38+00



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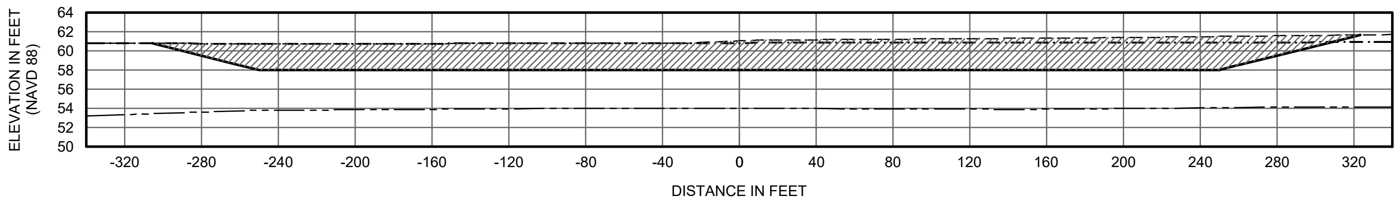

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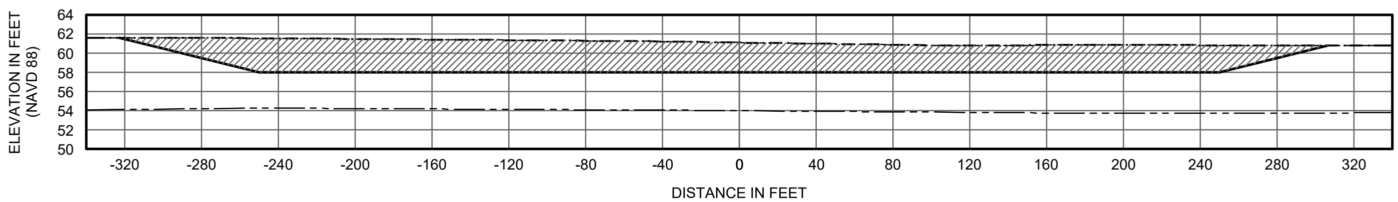

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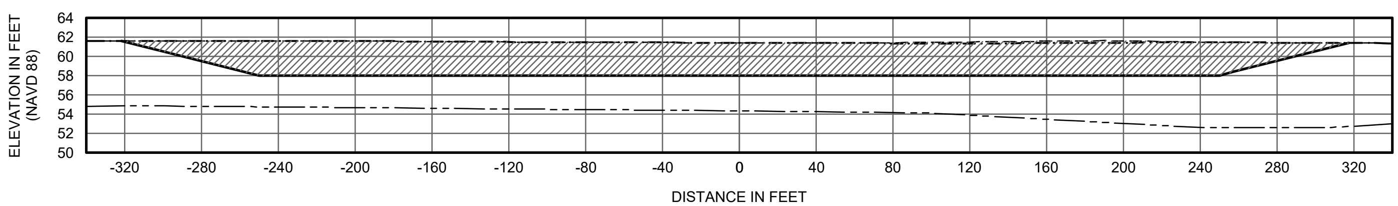

LEGEND

– – – – – –	EXISTING GRADE
———	DREDGE TEMPLATE
–·–·–·–	TOP OF MUCK
– · – · –	BOTTOM OF MUCK
//////	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 31
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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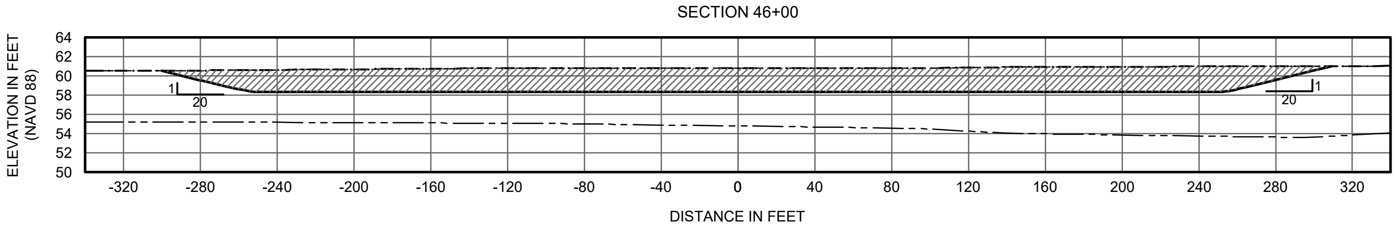

LEGEND

— — — — —	EXISTING GRADE
———	DREDGE TEMPLATE
—·—·—·—	TOP OF MUCK
— - - — - - —	BOTTOM OF MUCK
(hatched)	MATERIAL TO BE REMOVED

CROSS-SECTION NEWTON PARK DREDGING AREA - OPTION 3

SCALE: 1" = 100'
V-SCALE: 1" = 25'

0 100'

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FIGURE 32
NEWTON PARK DREDGING AREA - OPTION 3
CROSS-SECTIONS
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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ATTACHMENT B

CSI Geo, Inc. Geotechnical Exploration and Evaluation Report

Geotechnical · CMT · CEI

Geotechnical Exploration and Evaluation Report

Dredging Preliminary Design Newton Park, Lake Apopka at Winter Garden, Florida

CSI Geo Project No.: 71-12-122-06
Contract No.: 26908, Work Order No.: 4

Prepared for:

St. Johns River Water Management District

April 23, 2013

CSIGeo
Geotechnical • CMT • CEI

April 23, 2013

Mr. Robert Naleway, P.E.
St. Johns River Water Management District
25633 CR 448A
Mount Dora, FL 32757

RE: Dredging Preliminary Design
Newton Park, Lake Apopka at
Winter Garden, Florida

Subject: Geotechnical Exploration and Evaluation Report
CSI Geo Project No.: 71-12-122-06
Contract No.: 26908, Work Order No.: 04

Dear Mr. Naleway:

CSI Geo, Inc. has performed the authorized geotechnical exploration and laboratory testing for the Lake Apopka dredging preliminary design in Winter Garden, Florida. This report briefly presents our understanding of the site and subsurface conditions, along with our findings.

We have enjoyed working with you on this project and look forward to continued association with you on future projects. If you have any questions concerning this report, please contact our office.

Sincerely,

CSI Geo, Inc.

Jason Valeria, P.E.
Geotechnical Engineer

Bruce Khosrozadeh, P.E.
Senior Geotechnical and
Materials Engineer

BRUCE KHOSROZADEH
LICENSE
No. 45273
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

1.0 PROJECT INFORMATION

1.1 General Information

The St. Johns River Water Management District (SJRWMD), in coordination with the Florida Fish and Wildlife Conservation Commission (FWC) developed a conceptual dredging design for the area near the Winter Garden boat ramp located on Lake Apopka. The dredging design required an exploration of the native soils in order to assess the feasibility of four design alternatives:

- Dredging only
- Dredging plus a brush barrier
- Dredging plus a geotextile barrier
- Dredging plus a sheet pile barrier

The dredging only option would consist of dredging a small area along the shore of Lake Apopka in order to provide access from the shallow waters at the Winter Garden boat ramp to the deeper waters of the lake. The additional construction of a brush or geotextile barrier to the dredging option would attempt to retard the infiltration of sediments into the area created by dredging. The construction of a sheet pile barrier in addition to the dredging option would also limit the infiltration of sediment. The objective of this phase was to explore the subsurface conditions around the area of the proposed dredging site to assist in the design of the dredging plan and the selection of a design alternative.

Our geotechnical data collection and analysis was performed in accordance with our scope of work as follows:

Sediment Classification of Dredging Area

- A total of 10 sediment core samples were collected that provide the approximate depth and thickness of the muck layer and the top of competent lake bottom within the proposed dredging area. Core samples were evenly spaced throughout the proposed dredging area.

- A total of 3 sediment grab samples were collected for use in column settling tests following USACE EM 1110-2-5027. Grab samples were taken from the muck layer sediments at different locations within the proposed dredging area.
- A map with an aerial photo background showing the actual field location of each sediment core and grab sample was created, these locations were determined using GPS equipment. All maps were plotted with reference to the North American Datum of 1983 (NAD 83) Florida East state plane zone horizontal datum.
- All core and grab sample data were classified in general accordance with ASTM D-2487 and ASTM D-2488. A generalized core sample profile was created which shows core data at the proper elevations.
- Elevation data was correlated to the core sample profile in coordination with the project surveyor.
- Representative samples of the muck sediment were selected to perform laboratory analyses.

Preliminary Geotechnical Investigation for Sediment Barrier Area

- Preliminary geotechnical data was collected along the Sediment Barrier Area. The Sediment Barrier Area consists of two centerlines, each starting from either side of the proposed dredge area near shore and extending out into the lake to the proposed dredge limits.
- A total of eight standard penetration test (SPT) borings were performed to provide preliminary subsurface data within the approximate area of the project intended for use as a sediment barrier.
- SPT borings were performed to provide preliminary information on the soil beneath the competent lakebed. The SPT borings were aligned along the approximate area of the project intended for use as a sediment barrier.
- Undisturbed samples were collected during drilling of borings when soil conditions permitted retrieval. Undisturbed samples were used for shear strength and consolidation testing.
- A map with an aerial photo background showing the location of each SPT boring was created using GPS equipment. All maps were plotted with reference to the NAD 1983 Florida East state plane zone horizontal datum.

- All boring data was classified in general accordance with ASTM D-2487 and ASTM D-2488. A generalized subsurface profile was created which shows boring data at the proper elevations.
- Elevation data was correlated to the generalized subsurface profile in coordination with the project surveyor.Representative samples of the sediment and soils were selected to perform laboratory analyses.

Project information was provided to CSI Geo, Inc. (CSI Geo) by Mr. Robert Naleway, P.E., of the SJRWMD and Mr. Joseph Wagner, P.E., of Taylor Engineering, Inc. (Taylor).

1.2 Site Location and Existing Site Description

The proposed dredging site is located near the Winter Garden boat ramp off of North Lakeview Avenue. A Site Location Map is included in ***Appendix 1*** to help visualize the geographical location of the project site. Generally, the site conditions consist of competent lake bottom soils composed of sands overlain by peat, which is overlain by a suspended layer of fine-grain, organic-rich sediment referred to as muck.

1.3 Project Features and Proposed Construction

The proposed features of this project include a dredged area to allow access to deeper waters from the shallower waters located near the Winter Garden boat ramp. Additionally, design alternatives featuring sediment barrier options include either a:

- Brush barrier
- Geotextile barrier
- Sheet pile barrier

1.4 NRCS/USDA Soil Survey

Review of the Soil Survey Map for Orange County, Florida indicates that the soils within the shoreline of the project area primarily consist of the *Millhopper-Urban land complex, Wabasso fine sand, Tavares-Urban land complex, Pomello-Urban land complex,* and *Arents* soil series (soil numbers 24, 51, 48, 35, and 1 respectively).

Millhopper-Urban Land Complex (24) is a moderately well drained soil in coastal plains on marine terraces. Slopes range from 0 to 5 percent with convex down-slope shape and linear across-slope shape. Under natural conditions, this soil has a water table depth of about 42 to 60 inches. Minor components include Seffner and Tavares series.

Wabasso Fine Sand (51) is a poorly drained soil in coastal plains on marine terraces. Slopes range from 0 to 2 percent with convex down-slope shape and linear across-slope shape. Under natural conditions, this soil has a water table depth of about 6 to 18 inches. Minor components include Immokalee and Smyrna series.

Tavares-Urban land complex (48) is a moderately well drained soil in coastal plains on marine terraces. Slopes range from 0 to 5 percent with convex down-slope shape and linear across slope shape. Under natural conditions, this soil has a water table depth of about 42 to 72 inches. Minor components include Candler, Apopka, Pomello, and Millhopper series.

Pomello-Urban land complex (35) is a moderately well drained soil in coastal plains on marine terraces. Slopes range from 0 to 5 percent with convex down-slope shape and linear across slope shape. Under natural conditions, this soil has a water table depth of about 24 to 42 inches. Minor components include Archbold, Smyrna, and Pompano series.

Arents (1) is a somewhat poorly drained soil in coastal plains on marine terraces. Slopes range from 0 to 2 percent with convex down-slope shape and linear across-slope shape. Under natural conditions, this soil has a water table depth of about 24 to 36 inches.

2.0 GEOTECHNICAL EXPLORATION

2.1 Field Exploration

Dredging Area – The proposed dredging area was explored by means of ten core samples (C-1 through C-10) and three grab samples (G-1 through G-3). The core sampler was pushed through the muck layer until resistance was encountered. The core samples were spaced roughly 800 to 1,800 feet apart. Core sample locations were determined by Taylor and located in the field by CSI Geo. The purpose of obtaining the three grab samples was to perform column settling tests to characterize and measure the settling characteristics of the suspended fine-grained muck layer.

Sediment Barrier Area – The proposed sediment barrier area was explored by means of eight Standard Penetration Test (SPT) borings (B-1 through B-8) drilled to a depth between 8 and 21 feet below the existing muck line. The interface between the muck line and competent material was established by lowering the sampling spoon until resistance was first perceived, the SPT was then initiated. Even numbered borings were spaced approximately 1,600 to 1,800 feet apart along the northeastern edge of the sediment barrier area. Odd numbered borings were spaced approximately 1,700 to 2,000 feet apart along the southeastern edge of the barrier area. Boring locations were determined by Taylor and located in the field by CSI Geo.

The Report of SPT Borings and Report of Core Sampling sheets presented in ***Appendices 3*** & ***4***, respectively, graphically present the soil description for each soil type encountered at the boring and sampling locations. The stratification lines and depth designations on the boring records represent approximate boundaries between soil types. In some instances, the transition between soil types may be gradual. Photographs of field activities are presented in ***Appendix 6***. A brief description of the exploratory drilling and sampling techniques used is provided in the Field and Laboratory Test Procedures in ***Appendix 8***.

2.2 Laboratory Testing

Quantitative laboratory testing was performed on selected samples of the soils encountered in the field exploration in order to better characterize the soils encountered. Laboratory tests were performed to determine the moisture content, solids content, fines content, grain size distribution, organic content, specific gravity, and plasticity (Atterberg limits) of the soils encountered.

Additionally, the settling characteristics of the suspended fine-grained muck layers were determined from the three grab samples taken. Photographs of laboratory activities are presented in ***Appendix 6***. The results of these tests are presented in Laboratory Data in ***Appendix 5***. A key to the classification of soil samples is provided in ***Appendix 7***. The laboratory testing procedures used are briefly described in the Field and Laboratory Test Procedures sheets in the ***Appendix 8***.

3.0 <u>SUBSURFACE CONDITIONS</u>

3.1 <u>General</u>

Illustrations of the subsurface conditions encountered at the site are shown on the Report of SPT Borings and Report of Core Sampling sheets presented in ***Appendices 3*** and ***4***, respectively. The Report of SPT borings and Core Sampling sheets, along with the soil conditions outlined below highlight the major subsurface stratifications. The Report of SPT Borings and Core Sampling sheets in the Appendices should be consulted for detailed descriptions of the subsurface conditions encountered at each test location. When reviewing the Report of SPT Borings and Core Sampling sheets and the subsurface conditions, it should be understood that soil conditions might vary between explored locations. The description of soils encountered at each of the project components are discussed below.

3.2 <u>Dredging Area</u>

Ten core samples (C-1 through C-10) were collected throughout the proposed dredging area. The samples collected were used to delineate the thickness of the layer of fine-grain, organic-rich sediment referred to as muck. The muck was found to consist of mostly organic material with organic contents ranging from 8.0% to 78.0%. The solids content and specific gravity of the material range from 2.0% to 67.0% and 1.6 to 2.7, respectively. Typically the upper layer of the muck was a suspended, unconsolidated material with a solids content ranging from about 2.0% to 6.0%. A detailed summary of index testing on the muck layer is found in the Summary of Laboratory Test Results for Core Samples in ***Appendix 5.*** The thickness of the muck layer varied with the distance of the sample location from the shoreline. Further away from the shoreline, core samples C-1 through C-5 had muck thicknesses between roughly 5.5 and 10 feet. Closer to the shoreline, core samples C-6 through C-8 had a muck thickness between roughly 24.5 and 32 feet (these were the thickest layers of muck recorded). The two core samples, C-9 and C-10, collected closest to the shoreline, had muck thicknesses of roughly 18 and 14.5 feet, respectively.

The settling characteristics of the suspended fine-grained muck layers were determined from the three grab samples taken (G-1 through G-3) following column settling test procedures in USACE EM 1110-2-5027. The results of these tests are presented in Laboratory Data in ***Appendix 5***.

3.3 <u>Sediment Barrier Area</u>

Eight SPT borings (B-1 through B-8) were performed along the approximate alignments of the proposed sediment barrier areas. The subsurface conditions encountered at borings B-1 and B-2 consisted of a top layer of very soft muck sediment ranging in thickness from 1.5 to 2 feet. Below this, a loose to medium dense layer of slightly clayey fine sand or slightly silty fine sand (SP-SC or SP-SM) was encountered to a depth ranging from 6 to 7 feet. A thin layer of firm clayey sands (SC) was encountered at boring B-1 between 6 and 8 feet of depth. A layer of medium dense fine sand (SP) extended below these layers to a depth of about 14 feet. A layer of firm to stiff clayey fine sand (SC) was encountered below these layers until the termination of the borings.

The subsurface conditions encountered at borings B-3 and B-4 consisted of an initial 3 to 5 feet thick layer of very soft muck sediment. This was underlain by a layer of soft organic silt (OH) to a depth of about 5 to 7 feet followed by hard sandy silt (MH) with many limestone fragments this until the termination of the borings.

The subsurface conditions encountered at borings B-5 and B-6 consisted of a top layer of very soft muck ranging from 10 to 12 feet thick. Below this, a layer of soft to stiff peat (PT) was encountered to a depth of about 12 to 14 feet. Below the peat layer in boring B-5, a layer of stiff to very stiff sandy silt (MH) was encountered to a depth of 24 feet. Below the peat layer in boring B-6, a layer of very soft to stiff organic silt (OH) was encountered to a depth of 18 feet underlain by a medium dense layer of slightly clayey fine sand (SP-SC) to a depth of 22 feet. Both borings B-5 and B-6 were terminated in very stiff to hard sandy silt (MH).

The subsurface conditions encountered at borings B-7 and B-8 consisted of an initial 13 to 19 feet layer of very soft muck sediment. Below this until the boring termination depth of about 35 to 37, feet the subsurface conditions consisted of very loose to dense intermixed layers of fine sand and slightly clayey fine sand (SP and SP-SC), clayey fine sand (SC), soft to stiff organic silt (OH), and stiff clay (CH).

3.4 <u>Water Conditions</u>

The lake stage at the time of drilling and sampling operations was found to be between 63.7 and 63.8 feet (NAVD 88). Little variation in lake stage was noted during drilling and sampling operations. However, fluctuations of the lake stage should be anticipated as a result of seasonal climatic variations, surface water runoff patterns, and other related factors. During seasonal high precipitation periods, lake stage can be expected to rise above the levels recorded during this exploration.

Therefore, design drawings and specifications should account for the possibility of lake stage variations, and construction planning should be based on the assumption that such variations will occur.

4.0 ENGINEERING EVALUATION & RECOMMENDATIONS

4.1 Basis of Evaluation & Recommendations

The following recommendations are based on the previously presented project information and the data obtained in this exploration. The discovery of site and/or subsurface conditions during construction that deviate from the data obtained in this exploration should be reported to us for our review.

4.2 Dredging Side Slope Evaluation

As previously discussed, the upper layer of muck sediment was a suspended, unconsolidated material with a solids content ranging from about 2.0% to 6.0%. This muck sediment layer exhibits a very low shear strength and is not expected to be capable of maintaining a slope due to its fluid behavior. However, it is our understanding that recommended construction methods will be to dredge from beneath the upper sediment, or undercut, into material with higher solids content. If such methods are used, we recommend a dredging side slope of no steeper than 20H:1V.

4.3 Sheet Pile Design Parameters

We understand that sheet piles are being considered as a sediment barrier design alternative for the project. The muck sediment layer throughout the project site is assumed to contribute no lateral resistance and is expected to exert an equivalent fluid pressure on the cantilevered portion of the wall. For purposes of sheet pile barrier design, we recommend that only soils beneath the muck sediment layer be considered. Soil parameters and assumptions to be used in the analysis of the sheet piles barriers should include the following presented in **Table 1**.

Soil Type	Peat/Organic Silt	Sand	Plastic Layers
Saturated Unit Weight γ (pcf)	80	110	100
Effective Unit Weight for Input Purposes γ' (pcf)	18	48	38
Estimated Friction Angle ϕ (degrees)	-	32	-
Cohesion C (psf)	100	-	1300
Friction Angle Between Soil and Pile δ (degrees)	-	16	-
At-Rest Earth Pressure Coefficient K_o	1.0	0.47	1.0
Active Earth Pressure Coefficient K_a	1.0	0.31	1.0
Passive Earth Pressure Coefficient K_p	1.0	3.25	1.0

Table 1: Sheet Pile Design Parameters

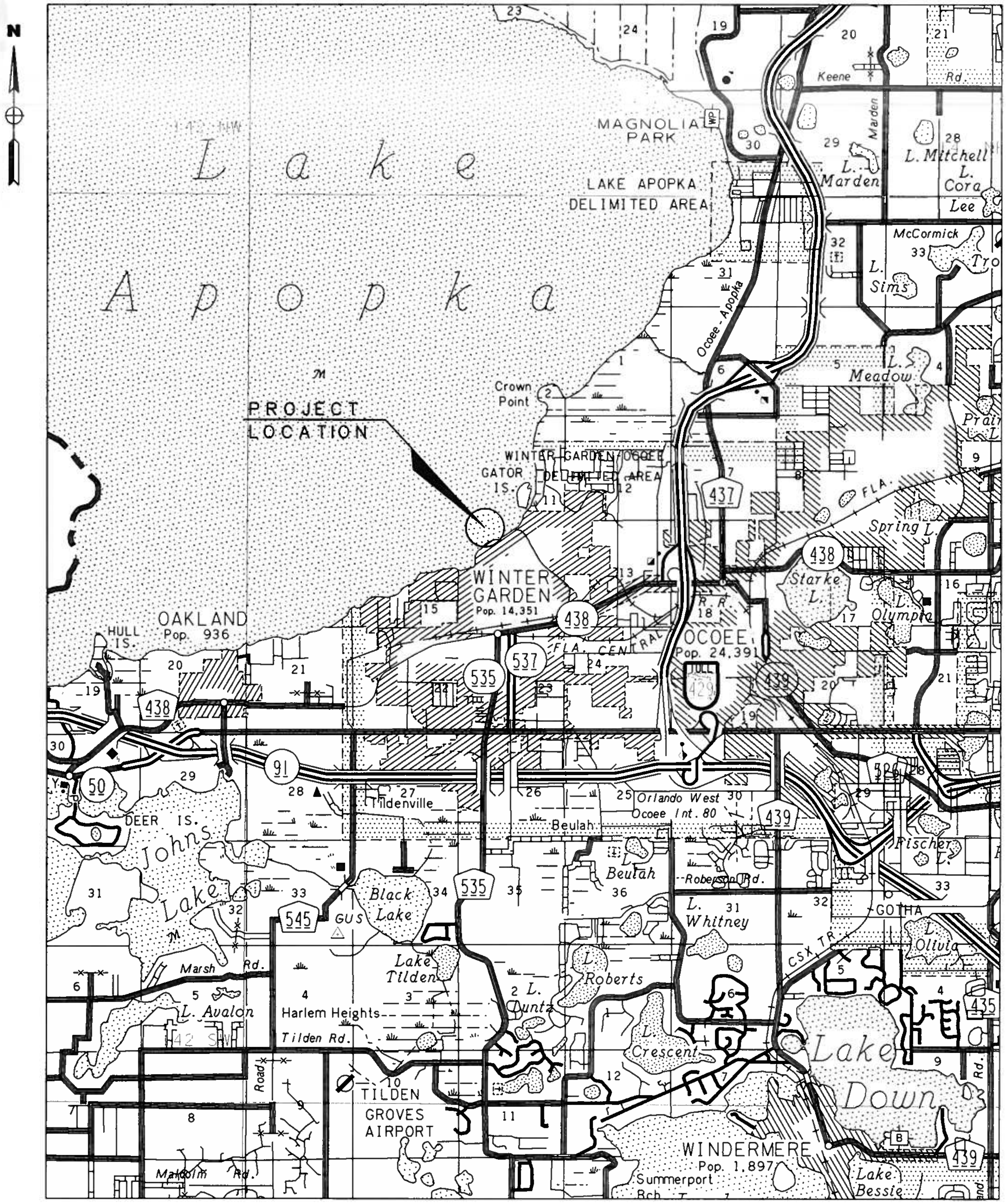
4.4 Settlement Evaluation

Total estimated settlement of the geotextile sediment barrier was determined based on elastic and consolidation settlements. Elastic or immediate settlement was calculated using Schmertmann's method, which calculates the deformation of soils upon loading based on the theory of elasticity. The analyses excluded settlement of the unconsolidated muck sediment layer presently found throughout the site as it would be displaced due to any bearing pressure exerted on it. Therefore, our analyses assume any barrier system would bear on the lake bottom material found below the muck sediment. Based on the analyses, it is estimated that total settlement will vary from 2 to 60 inches, depending on the location and configuration of the sediment barrier. Approximately 1 inch of this settlement is estimated as elastic settlement, which should take place during construction, while the remainder would be primary consolidation of the peat, organic silt, sandy silt, and clay layers.

It is cautioned that the settlement estimates noted herein are estimates only and that the actual rate of settlement should be monitored during construction and during the service life of the structure. Periodic inspections will help determine the actual settlement and remedial actions needed to maintain the structure in service.

APPENDIX 1

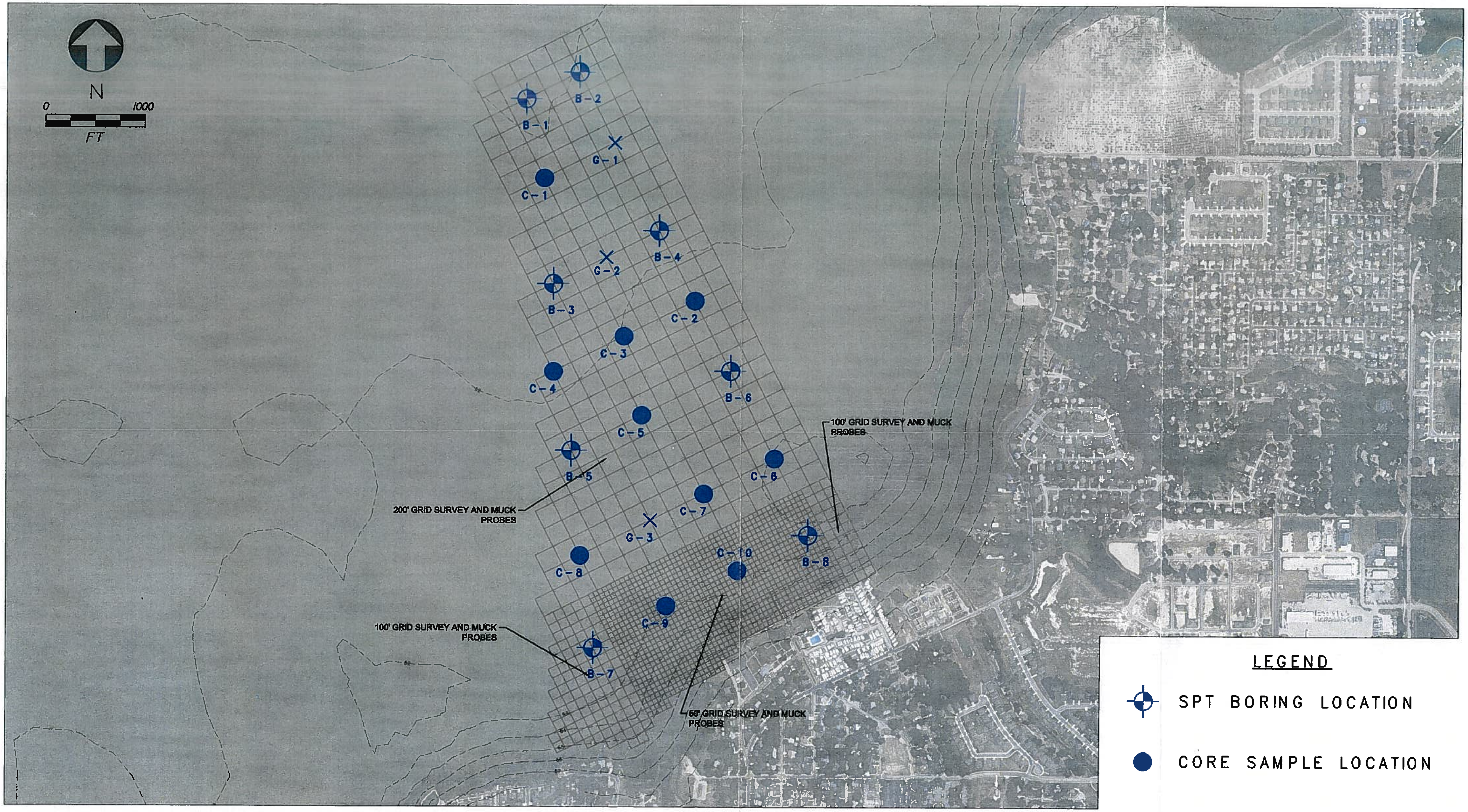
Site Location Map



CSIGeo GEOTECHNICAL · CMT · CEI 2394 ST. JOHNS BLUFF ROAD, S. SUITE 200 JACKSONVILLE, FLORIDA 32246	GEOTECHNICAL ENGINEERING CONSTRUCTION MATERIAL TESTING CONSTRUCTION ENGINEERING INSPECTION	SITE LOCATION MAP DREDGING PRELIMINARY DESIGN LAKE APOPKA WINTER GARDEN, FLORIDA

APPENDIX 2

Field Exploration Plan



LEGEND

SPT BORING LOCATION

CORE SAMPLE LOCATION

GRAB SAMPLE LOCATION

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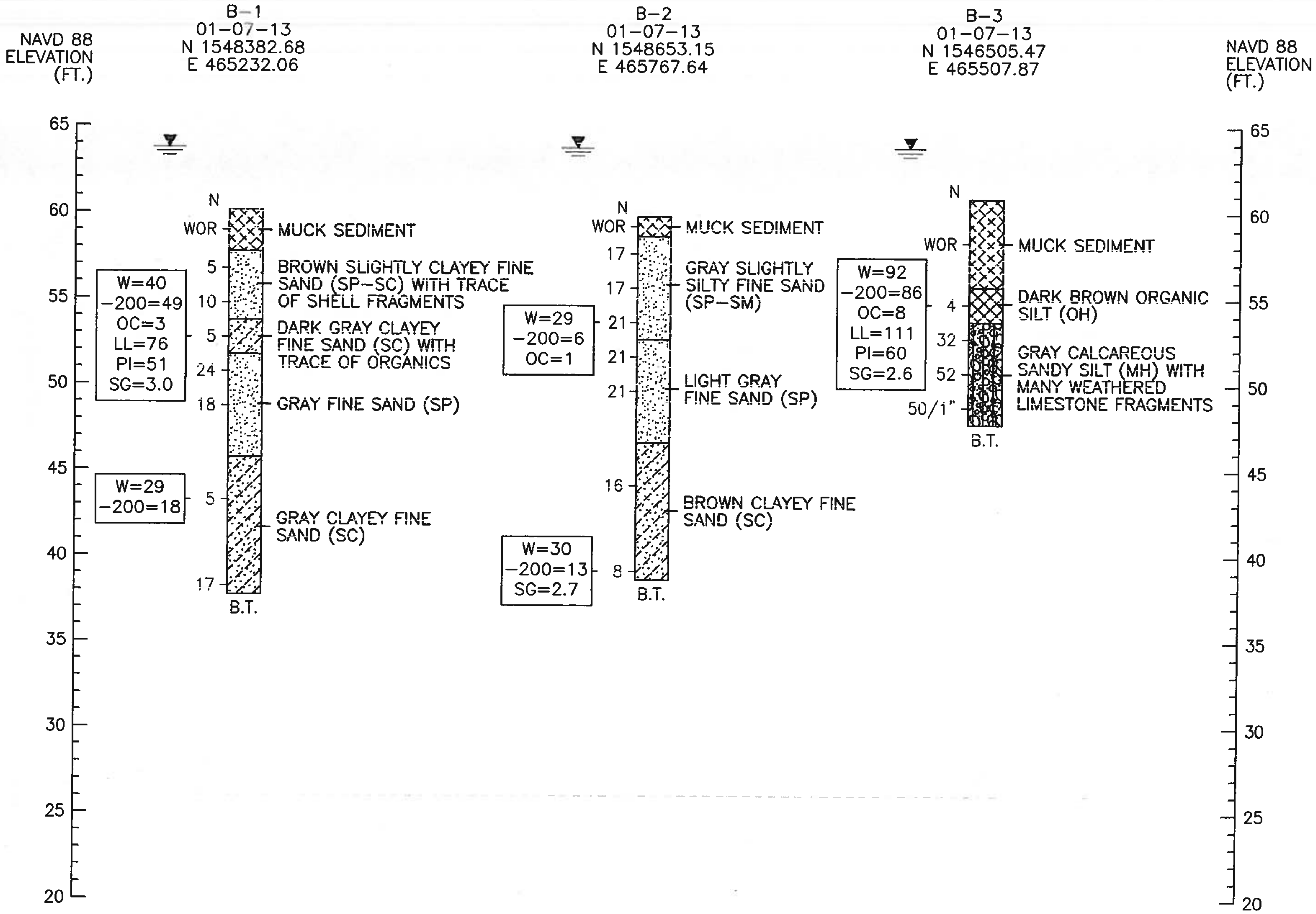
CONSTRUCTION ENGINEERING INSPECTION

FIELD EXPLORATION PLAN

DREDGING PRELIMINARY DESIGN
LAKE APOPKA
WINTER GARDEN, FLORIDA

APPENDIX 3

Report of SPT Borings



LEGEND

FINE SAND (SP);
SLIGHTLY SILTY FINE SAND (SP-SM);
SLIGHTLY CLAYEY FINE SAND (SP-SC)

SANDY SILT (ML/MH)

SANDY CLAY (CL/CH)

ORGANIC SAND/ PEAT (PT);
ORGANIC SILT (OL/OH)

MUCK SEDIMENT
(FROM SURVEY DATA)

CLAYEY FINE SAND (SC)

LIMESTONE FRAGMENTS

(SP)	UNIFIED SOIL CLASSIFICATION SYSTEM
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FT UNLESS OTHERWISE NOTED, NUMBERS TO THE LEFT OF BORING INDICATE N-VALUES.
W -200 OC LL PI SG	NATURAL MOISTURE CONTENT (%) FINES PASSING NO. 200 SIEVE (%) ORGANIC CONTENT (%) LIQUID LIMIT PLASTICITY INDEX SPECIFIC GRAVITY
▼	WATER LEVEL AT TIME OF DRILLING
B.T.	STANDARD PENETRATION TEST BORING TERMINATION NAVD 88 ELEVATION
UD	UNDISTURBED SAMPLE
WOR	WEIGHT OF ROD

GRANULAR MATERIALS

RELATIVE DENSITY	SPT (BLOWS/FT)
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50

SILTS AND CLAYS

CONSISTENCY	SPT (BLOWS/FT)
VERY SOFT	0-2
SOFT	3-4
FIRM	5-8
STIFF	9-15
VERY STIFF	16-30
HARD	31-50
VERY HARD	OVER 50

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1.44 INCHES
SPOON OUTSIDE DIA.	2.0 INCHES
ASTM STANDARD DROP HAMMER, MANUAL.	
AVG. HAMMER DROP	30.0 INCHES
HAMMER WEIGHT	140.0 LBS

NOTES:

1) DRILL AND PENETRATION TESTING WAS PERFORMED IN ACCORDANCE WITH ASTM D-1586.

2) LAYER BOUNDARIES ARE APPROXIMATE AND MAY VARY BETWEEN OR AWAY FROM BORING LOCATIONS.

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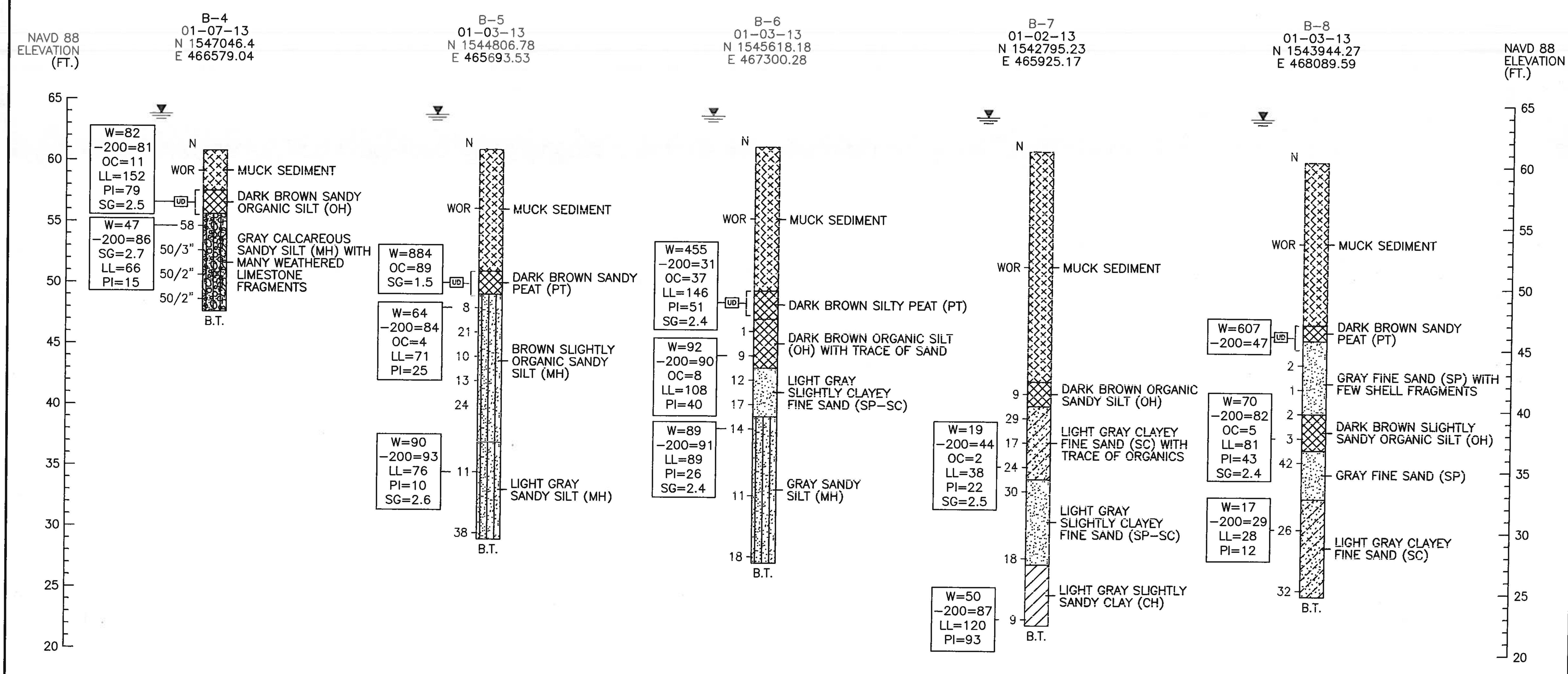
REPORT OF SPT BORINGS

DREDGING PRELIMINARY DESIGN
LAKE APOPKA
WINTER GARDEN, FLORIDA



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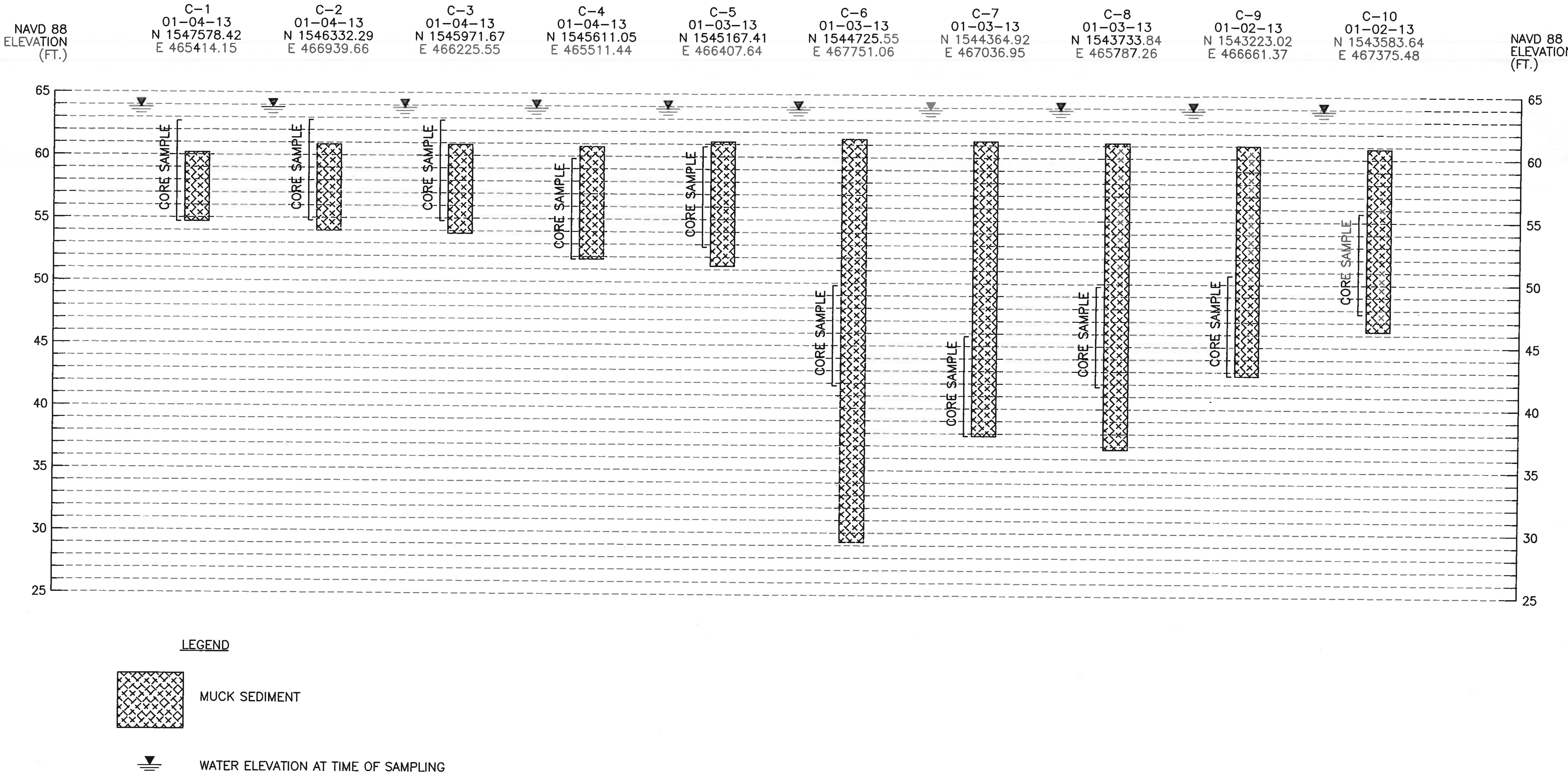
REPORT OF SPT BORINGS
DREDGING PRELIMINARY DESIGN
LAKE APOPKA
WINTER GARDEN, FLORIDA

APPENDIX 4

Report of Core Sampling



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REPORT OF CORE SAMPLING
DREDGING PRELIMINARY DESIGN
LAKE APOPKA
WINTER GARDEN, FLORIDA

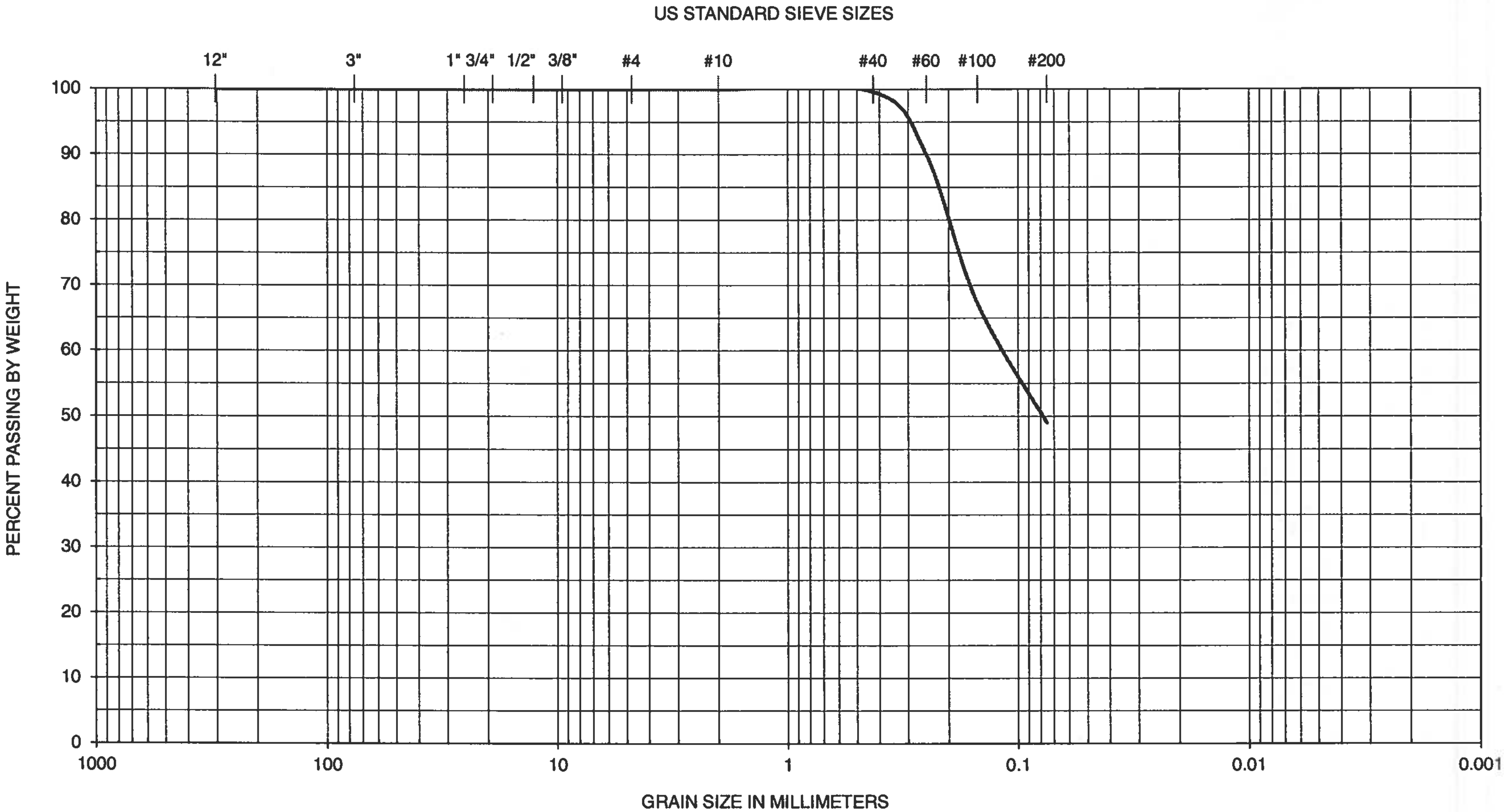
APPENDIX 5

Laboratory Data

SUMMARY OF LABORATORY TEST RESULTS FOR SPT BORINGS

Dredging Preliminary Design
Lake Apopka
Winter Garden, Florida

Boring No.	Sample No.	Approximate Depth from Start of Boring (ft)			Natural Moisture Content (%)	Organic Content (%)	Specific Gravity (G_s)	Percent Passing Sieve Size (%)						Atterberg Limits		Soil Classification Symbol
								#4	#10	#40	#60	#100	#200	LL	PI	
B-1	3	4.0	-	6.0	40	3	3.0	100	100	100	90	67	49	76	51	SC
B-1	6	13.0	-	15.0	29			100	100	100	95	65	18			SC
B-2	3	4.0	-	6.0	29	1		100	100	98	80	38	6			SP-SM
B-2	7	18.0	-	20.0	30		2.7	100	100	100	79	34	13			SC
B-3	1	0.0	-	2.0	92	8	2.6	99	98	97	95	92	86	111	60	OH
B-4	1	0.0	-	2.0	47		2.7	100	98	94	92	89	86	66	15	MH
B-4	UD	3.5	-	5.5	82	11	2.5						81	152	79	OH
B-5	1	0.0	-	2.0	64	4		100	98	94	93	91	84	71	25	MH
B-5	6	13.0	-	15.0	90		2.6	100	98	96	95	94	93	76	10	MH
B-5	UD	10.0	-	12.0	884	89	1.5									PT
B-6	2	2.0	-	4.0	92	8		100	100	99	98	94	90	108	40	OH
B-6	5	8.0	-	10.0	89		2.6	100	99	96	96	94	91	89	26	MH
B-6	UD	11.5	-	13.5	455	37	2.4						31	140	51	PT
B-7	4	6.0	-	8.0	19	2	2.5	100	100	100	98	85	44	38	22	SC
B-7	7	18.0	-	20.0	50			100	100	99	95	92	87	120	93	CH
B-8	4	6.0	-	8.0	70	5	2.4	100	100	100	99	96	82	81	43	OH
B-8	6	13.0	-	15.0	17			100	100	100	100	89	29	28	12	SC
B-8	UD	13.0	-	15.0	607	47							3	634	344	PT



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-1	3	4.0 - 6.0	40.0	76	25	51	SC

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

CSI Geo
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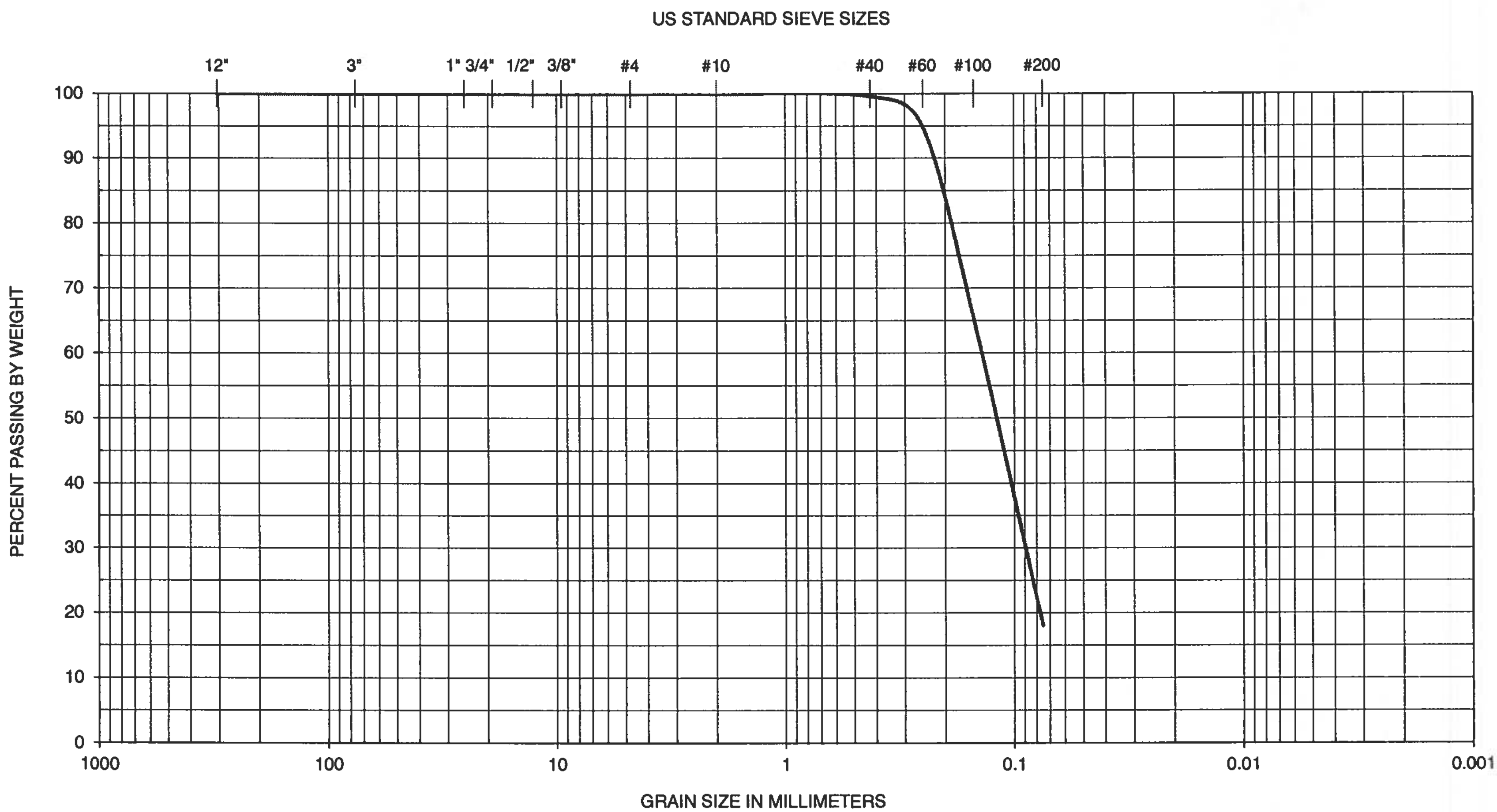

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-1	6	13.0 - 15.0	29.0	-	-	-	SC

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

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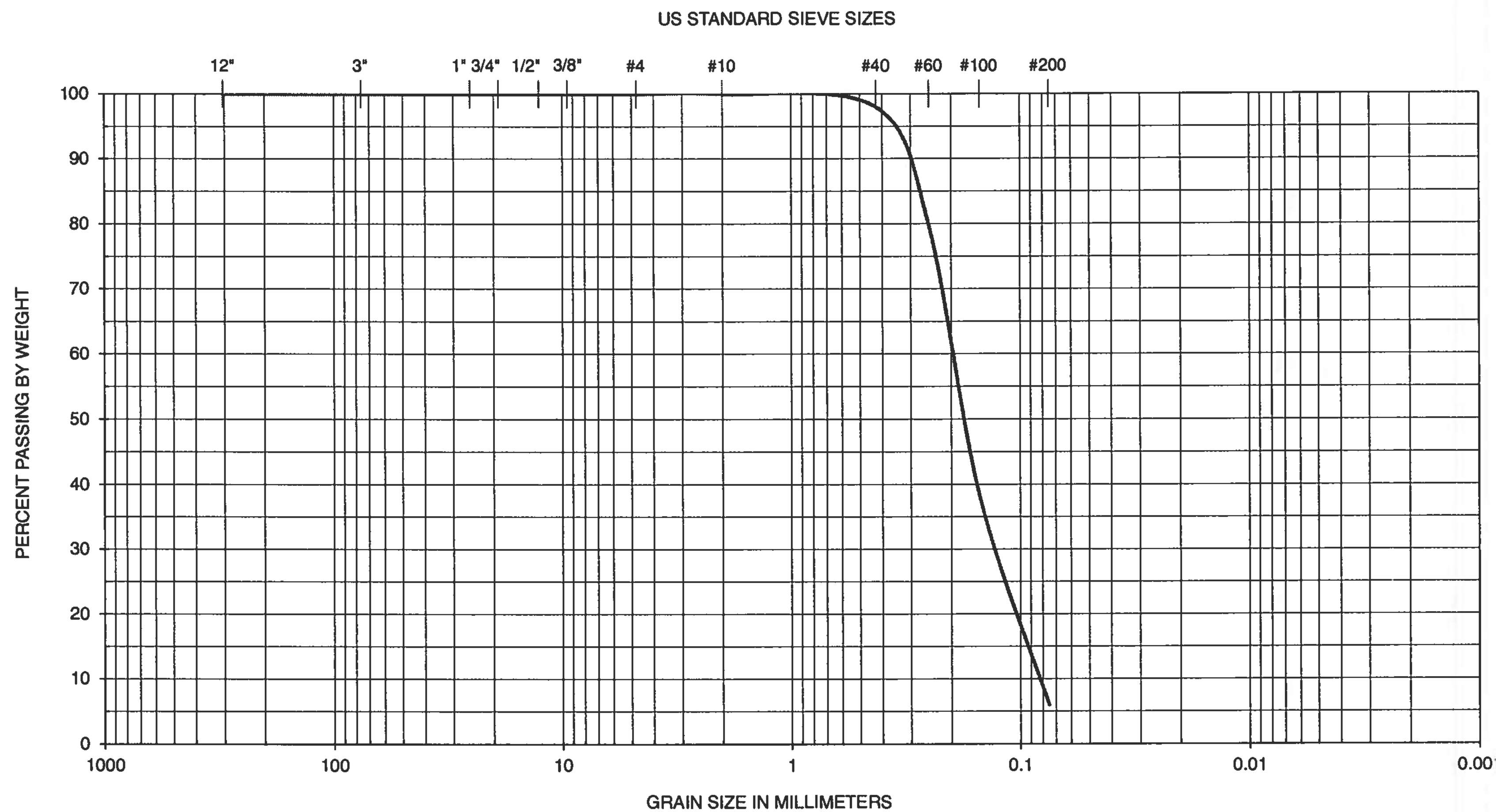

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-2	3	4.0 - 6.0	29.0	-	-	-	SP-SM

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

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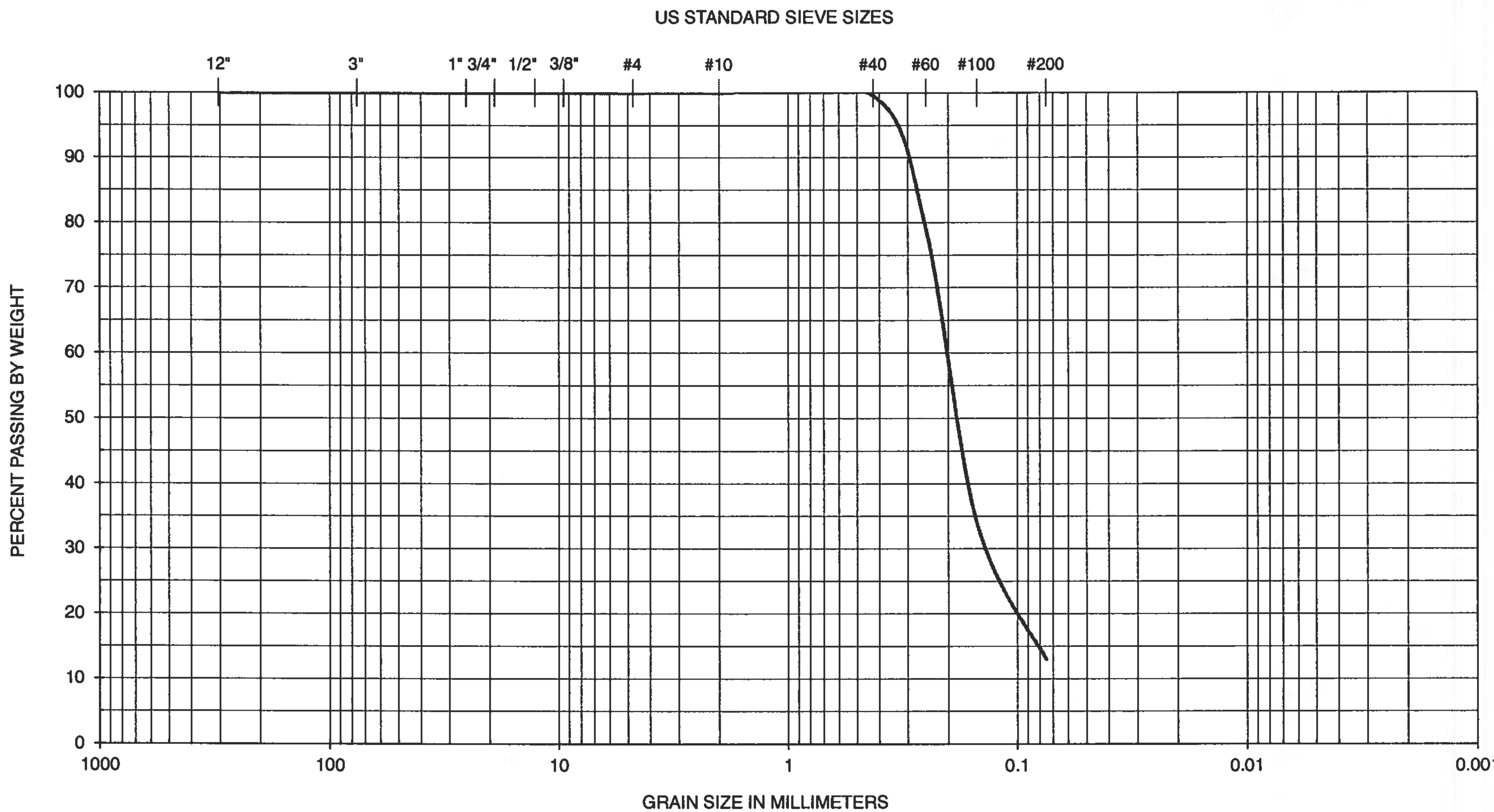

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-2	7	18.0 - 20.0	30.0	-	-	-	SC

GRAIN SIZE DISTRIBUTION

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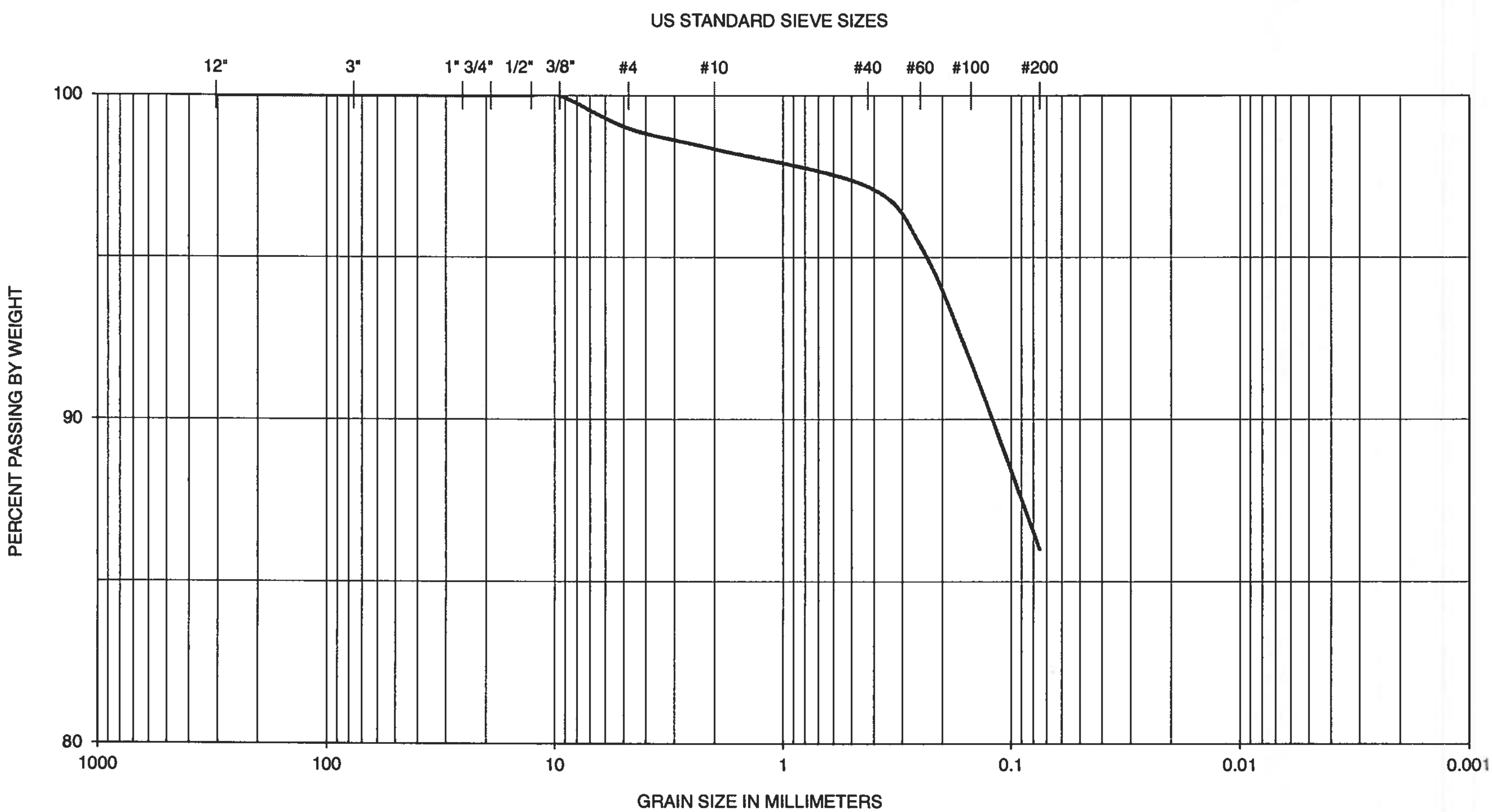

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-3	1	0.0 - 2.0	92.0	111	51	60	OH

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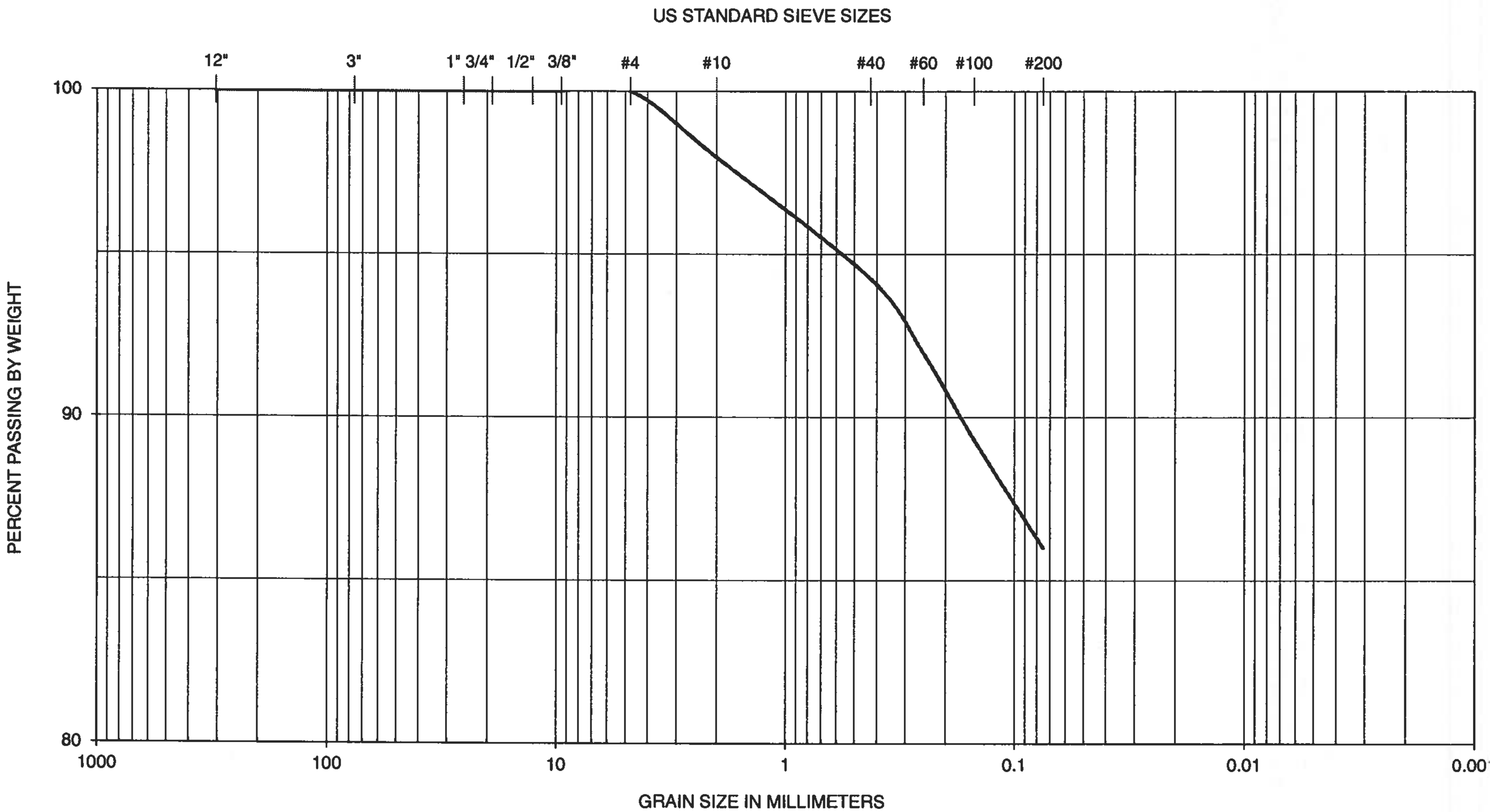

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-4	1	0.0 - 2.0	47.0	66	51	15	MH

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

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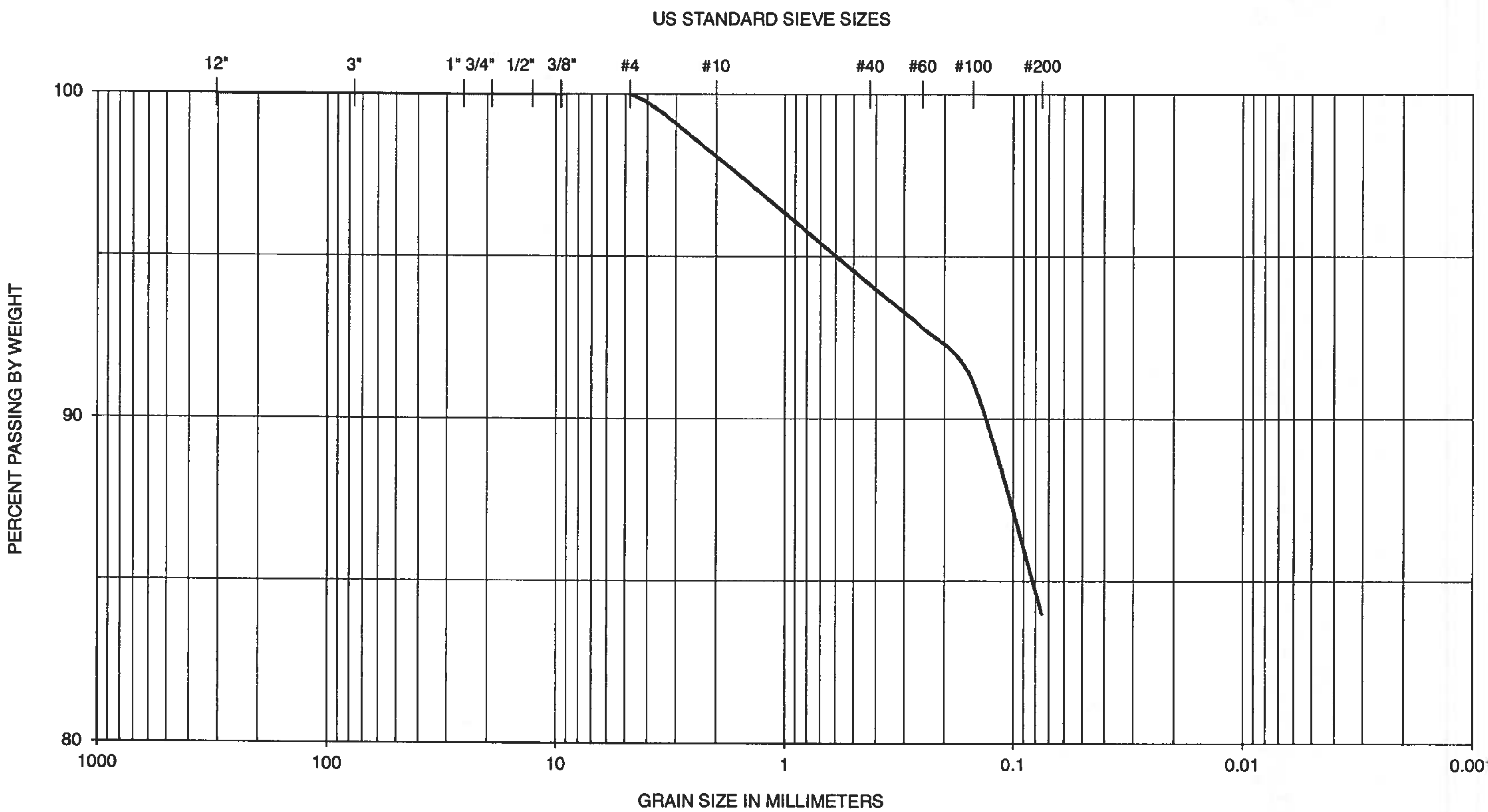

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-5	1	0.0 - 2.0	64.0	71	46	25	MH

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

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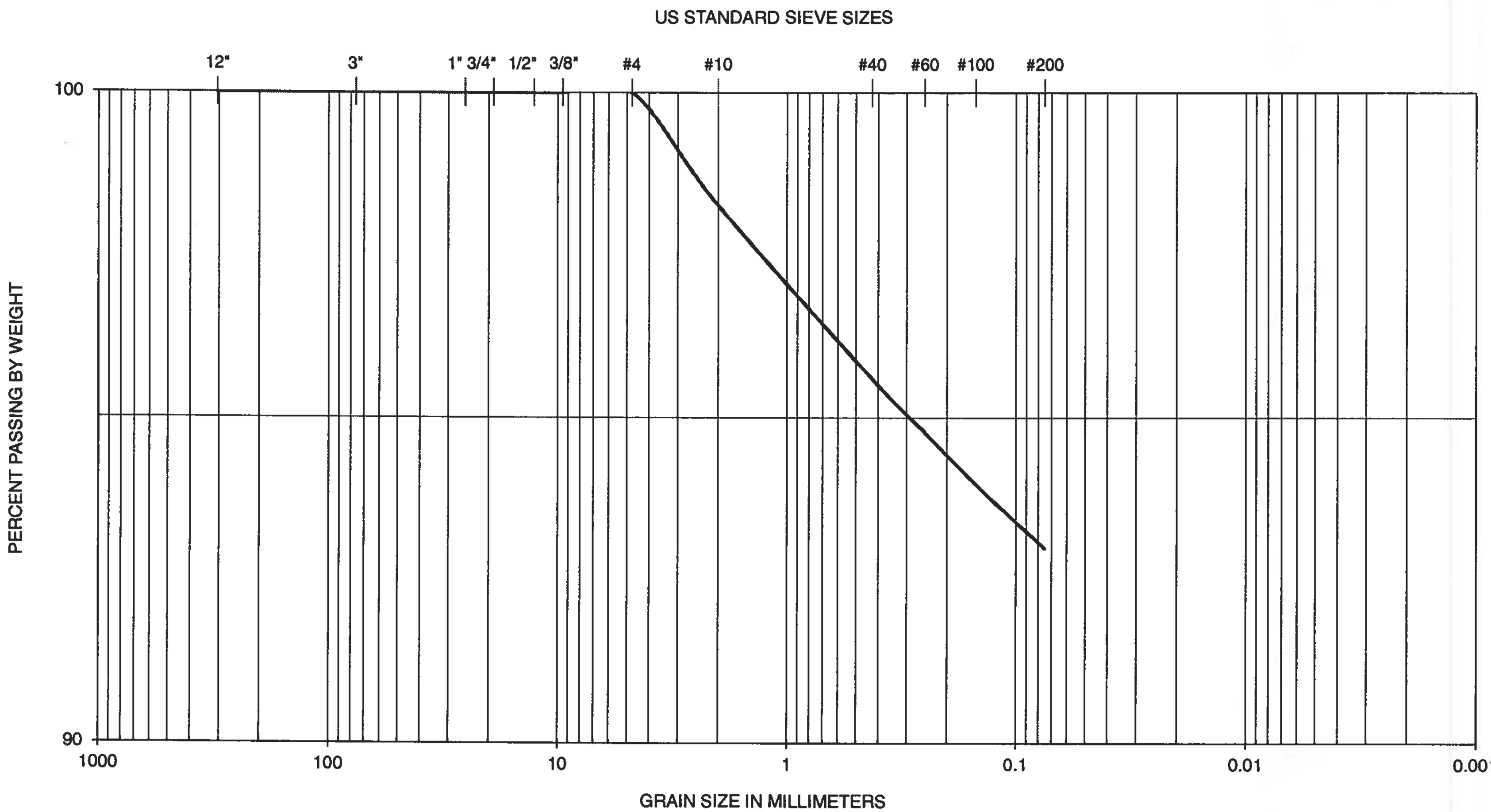

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-5	6	13.0 - 15.0	90.0	76	66	10	MH

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

CSI Geo
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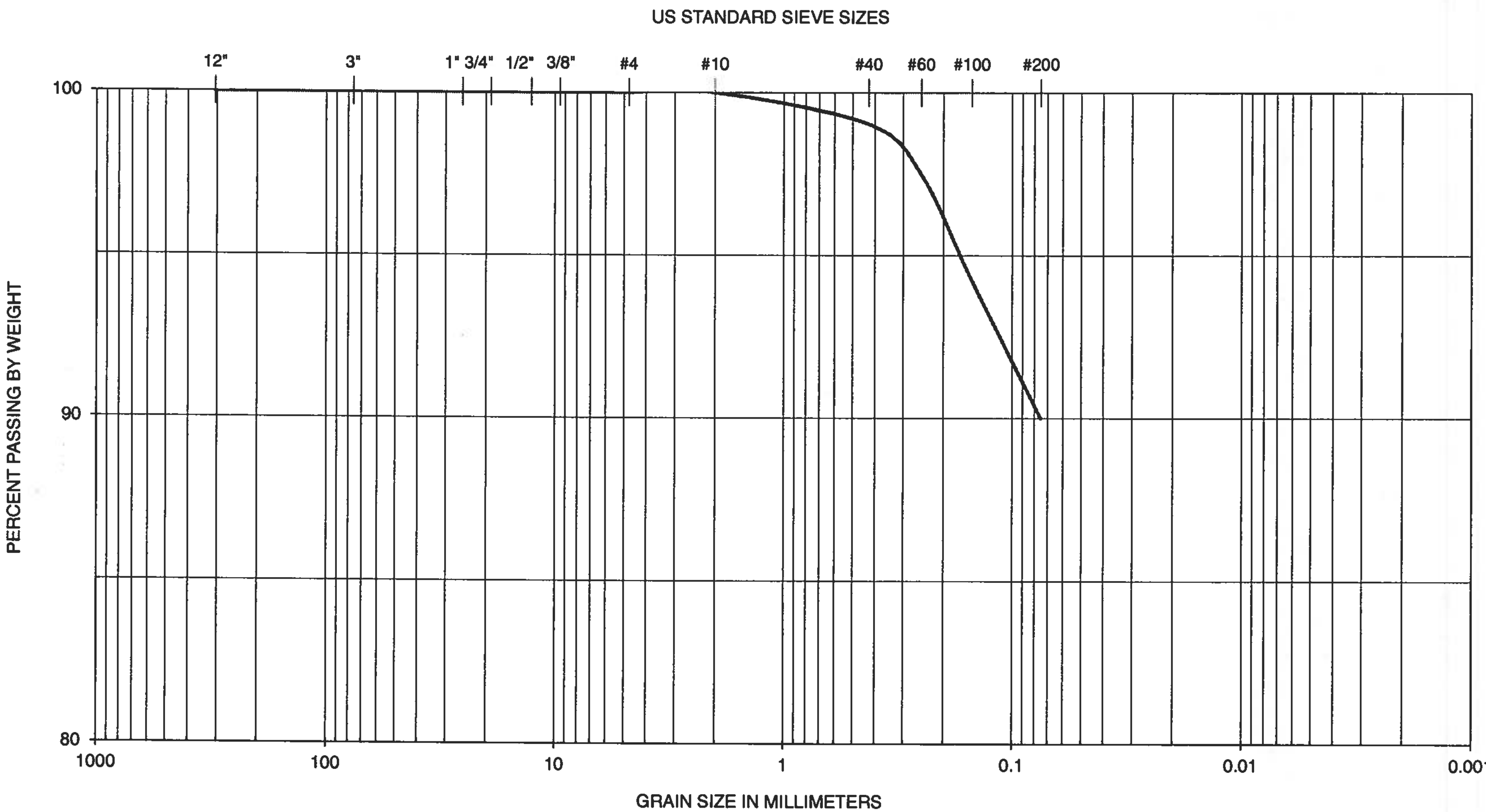

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-6	2	2.0 - 4.0	92.0	108	68	40	OH

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

CSI Geo
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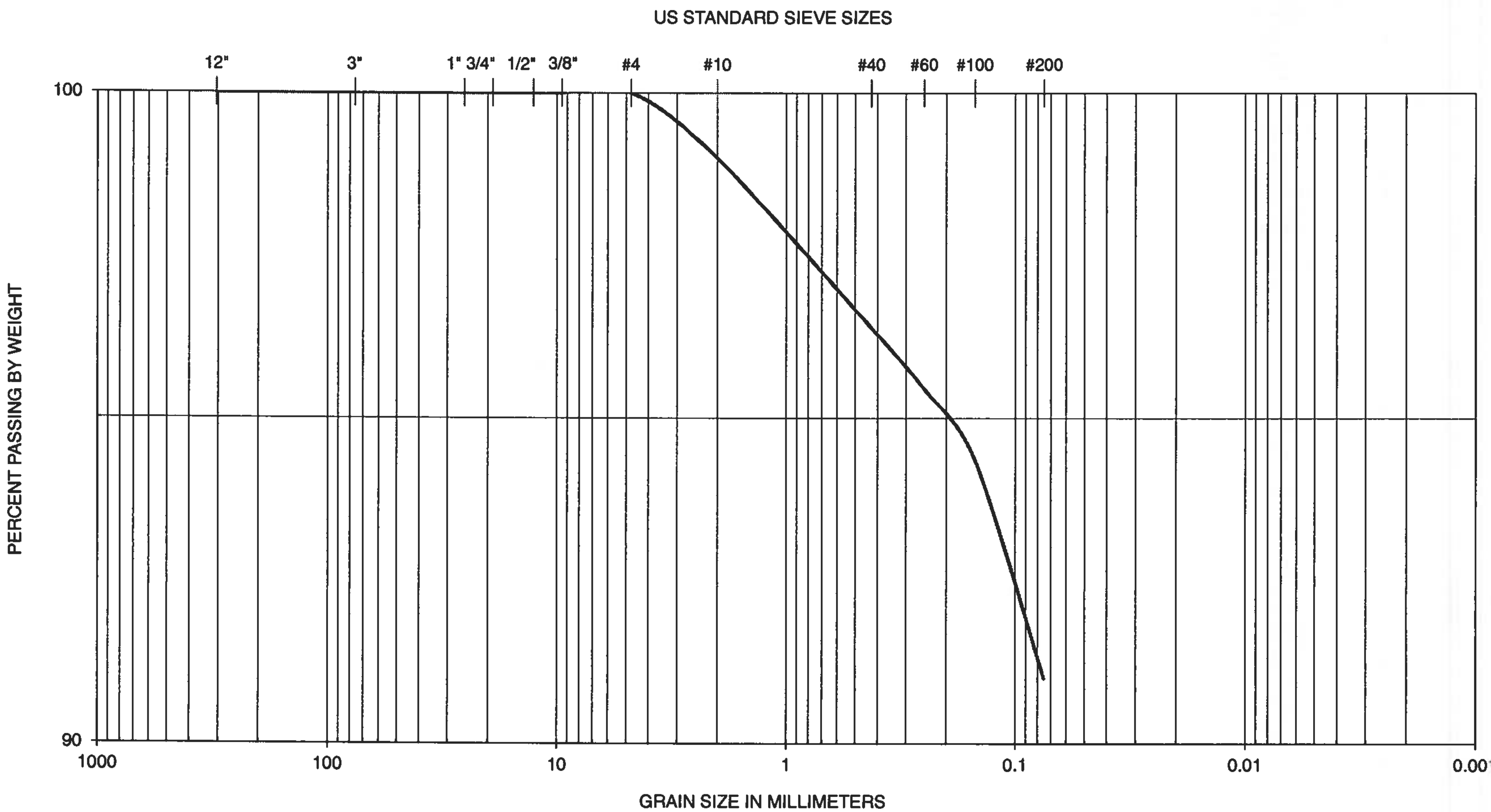


BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-6	5	8.0 - 10.0	89.0	89	63	26	MH

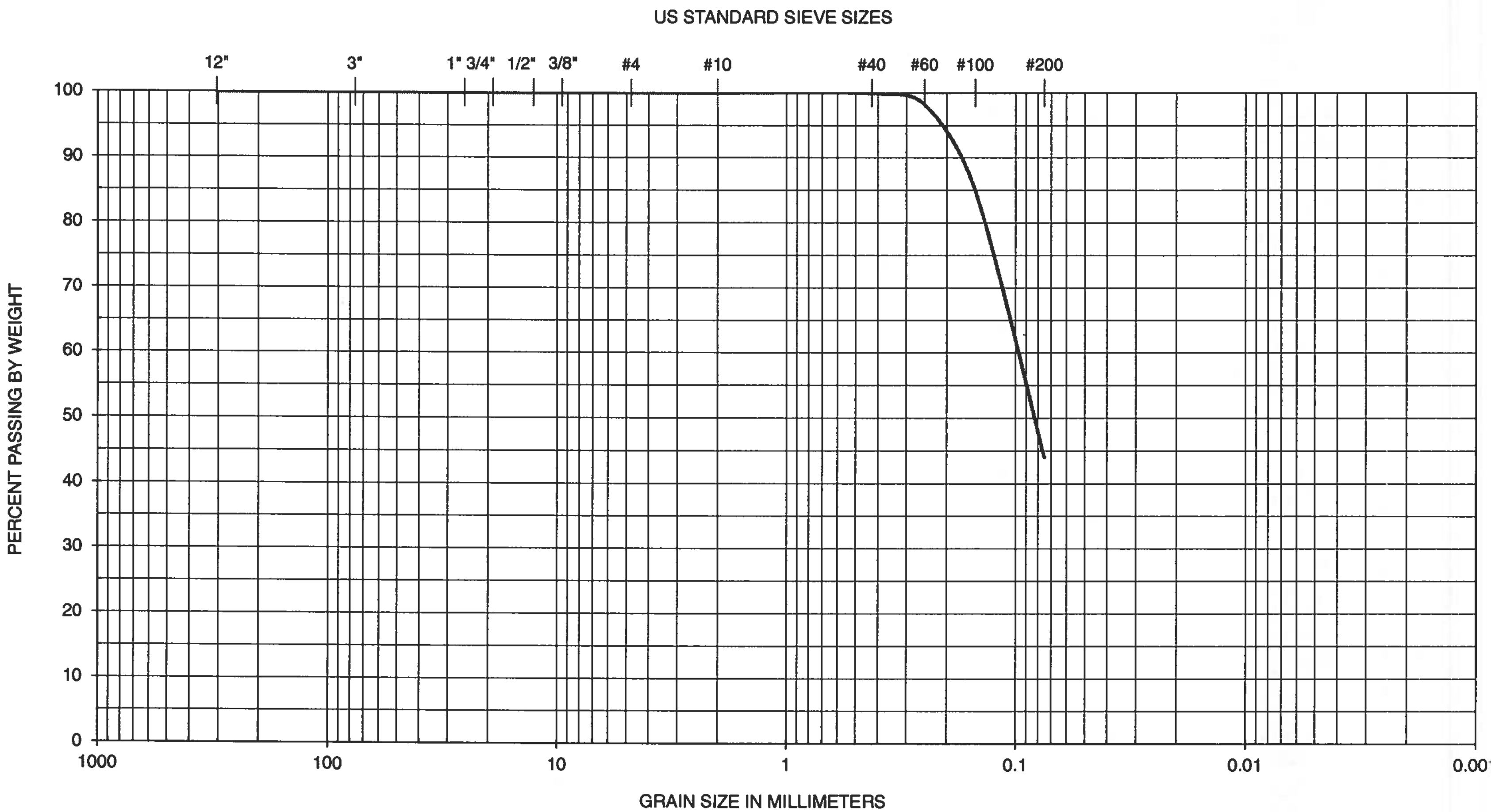
GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

CSI Geo
Geotechnical · CMT · CEI



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-7	4	6.0 - 8.0	19.0	38	16	22	SC

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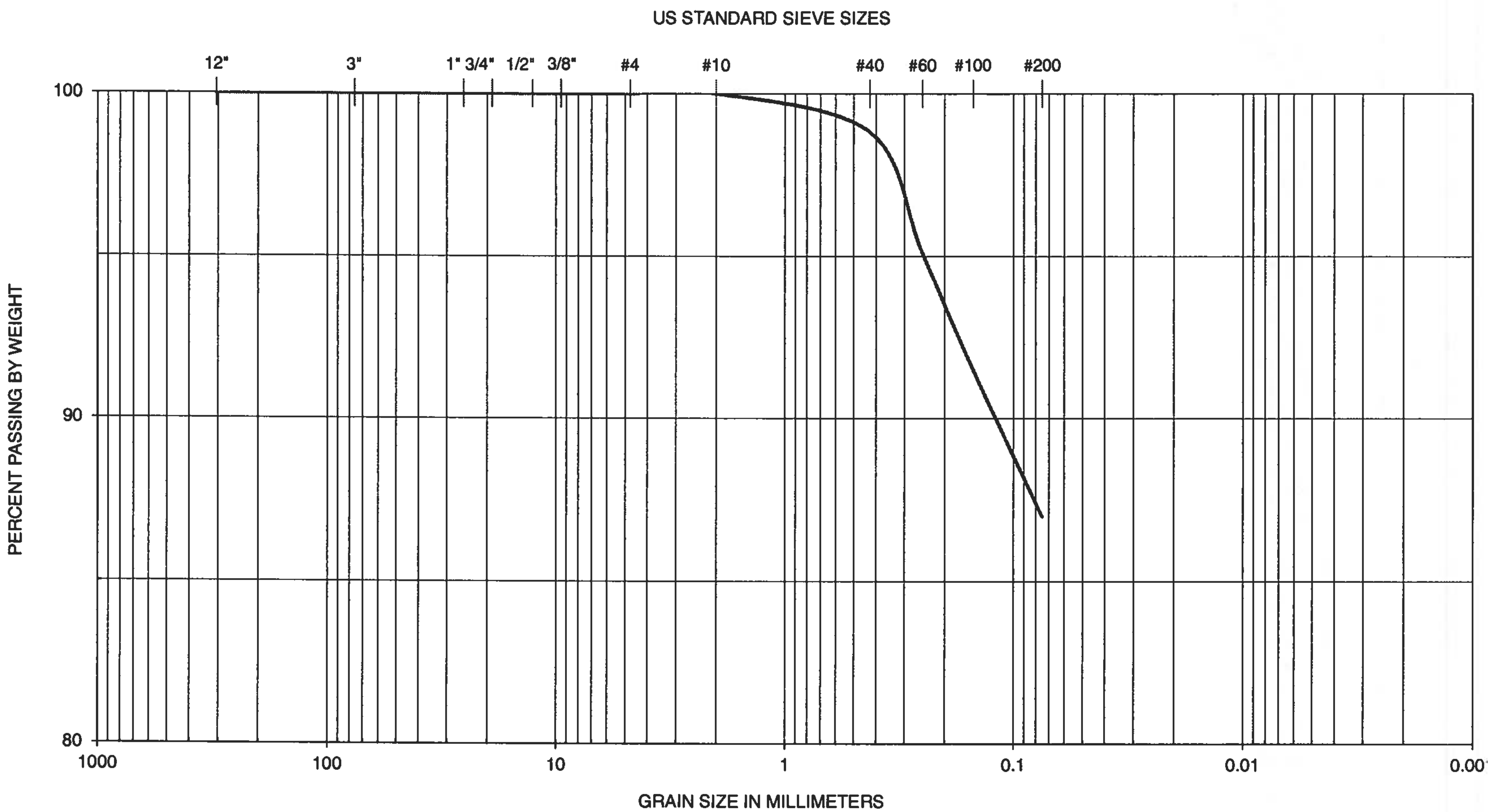

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-7	7	18.0 - 20.0	50.0	120	27	93	CH

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CSI Geo
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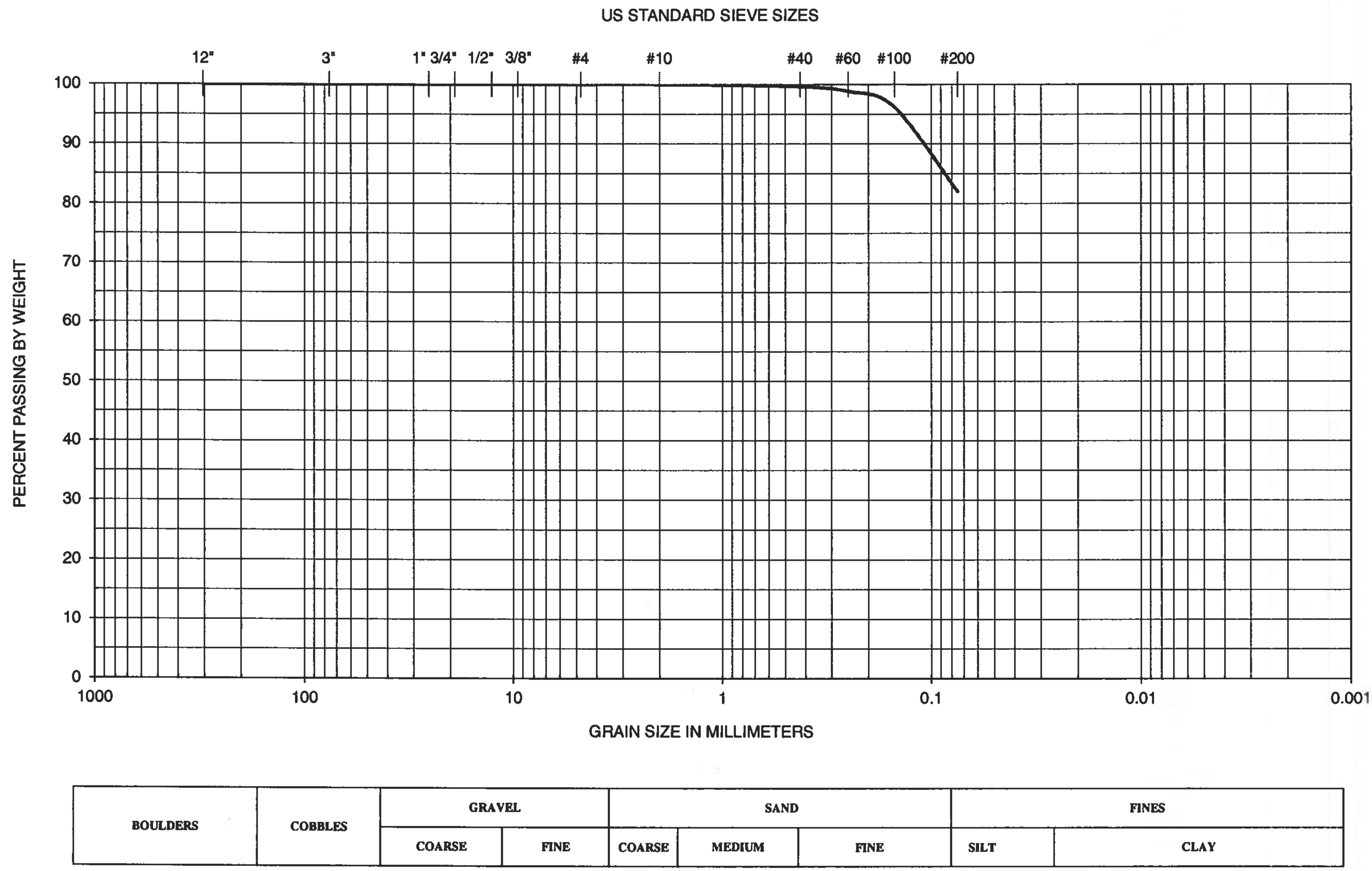

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-8	4	6.0 - 8.0	70.0	81	38	43	OH

GRAIN SIZE DISTRIBUTION

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CSI Geo
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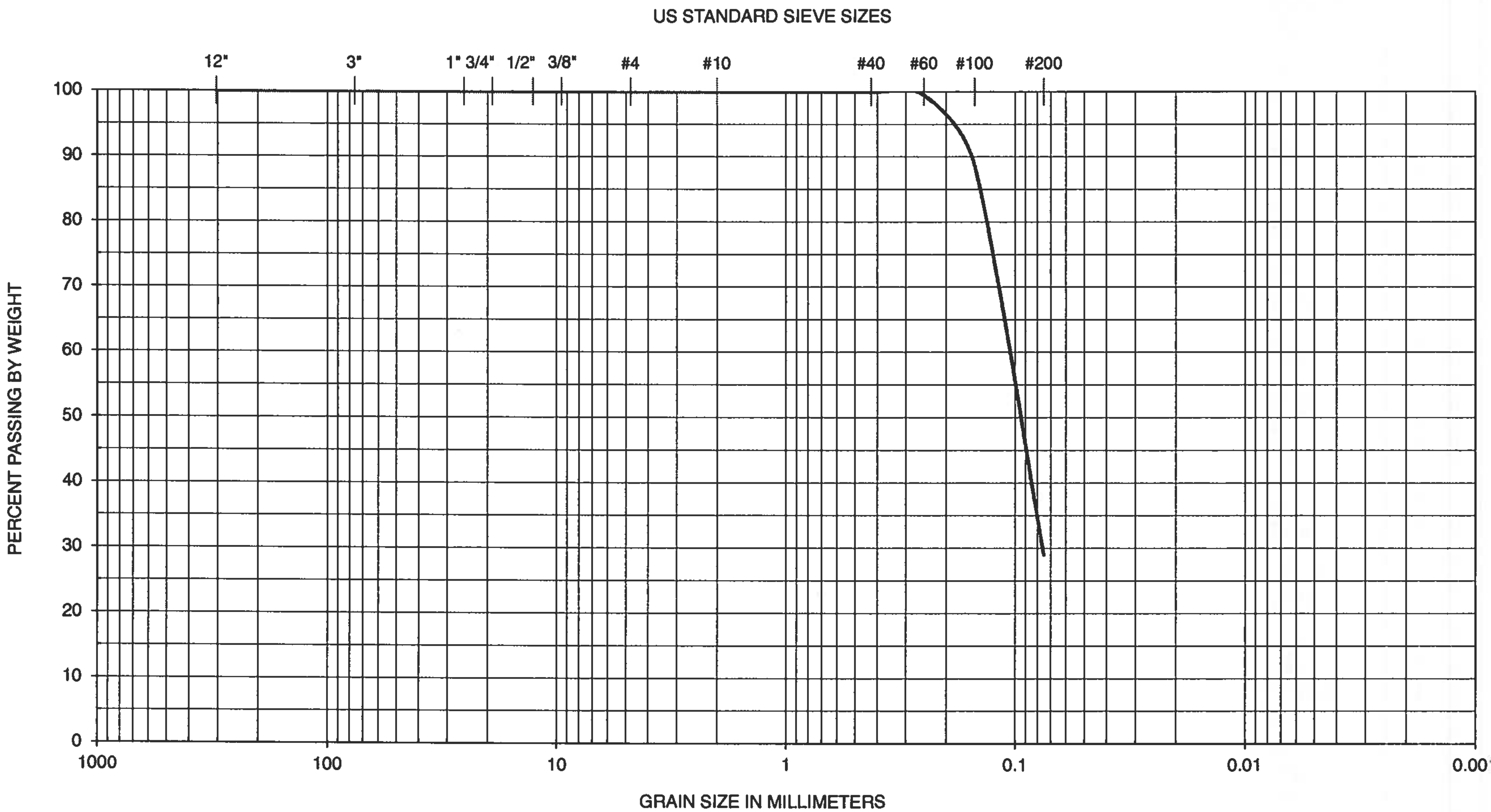

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	DEPTH (FT)	W (%)	LL	PL	PI	SOIL CLASSIFICATION
B-8	6	13.0 - 15.0	17.0	28	16	12	SC

GRAIN SIZE DISTRIBUTION

Project Name: Dredging Preliminary Design - Lake Apopka

CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

CSI Geo
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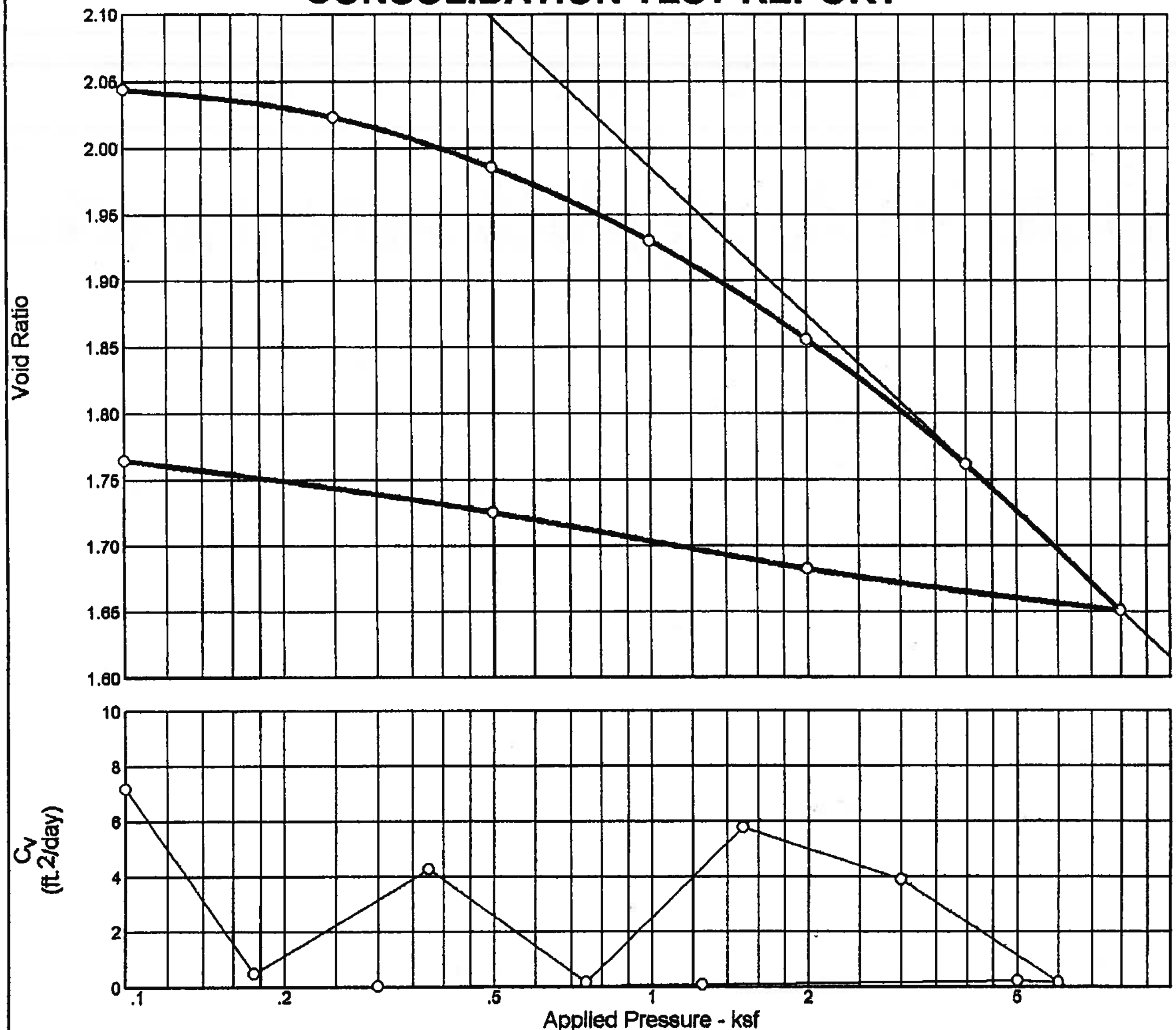
CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Dark brown organic SILT with sand	MH	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
152	79	2.517		51.6		81.6 %	78.8 %	100.3 %	100.0 %	2.047	1.764	1.21	0.37

	D2435 Method	C_r	Swell Press. (ksf)	Swell %
Preparation Process: Trimmed using cylindrical cutting ring				
Condition of Test: Natural moisture, inundated at 0.05 ksf	B	0.06		

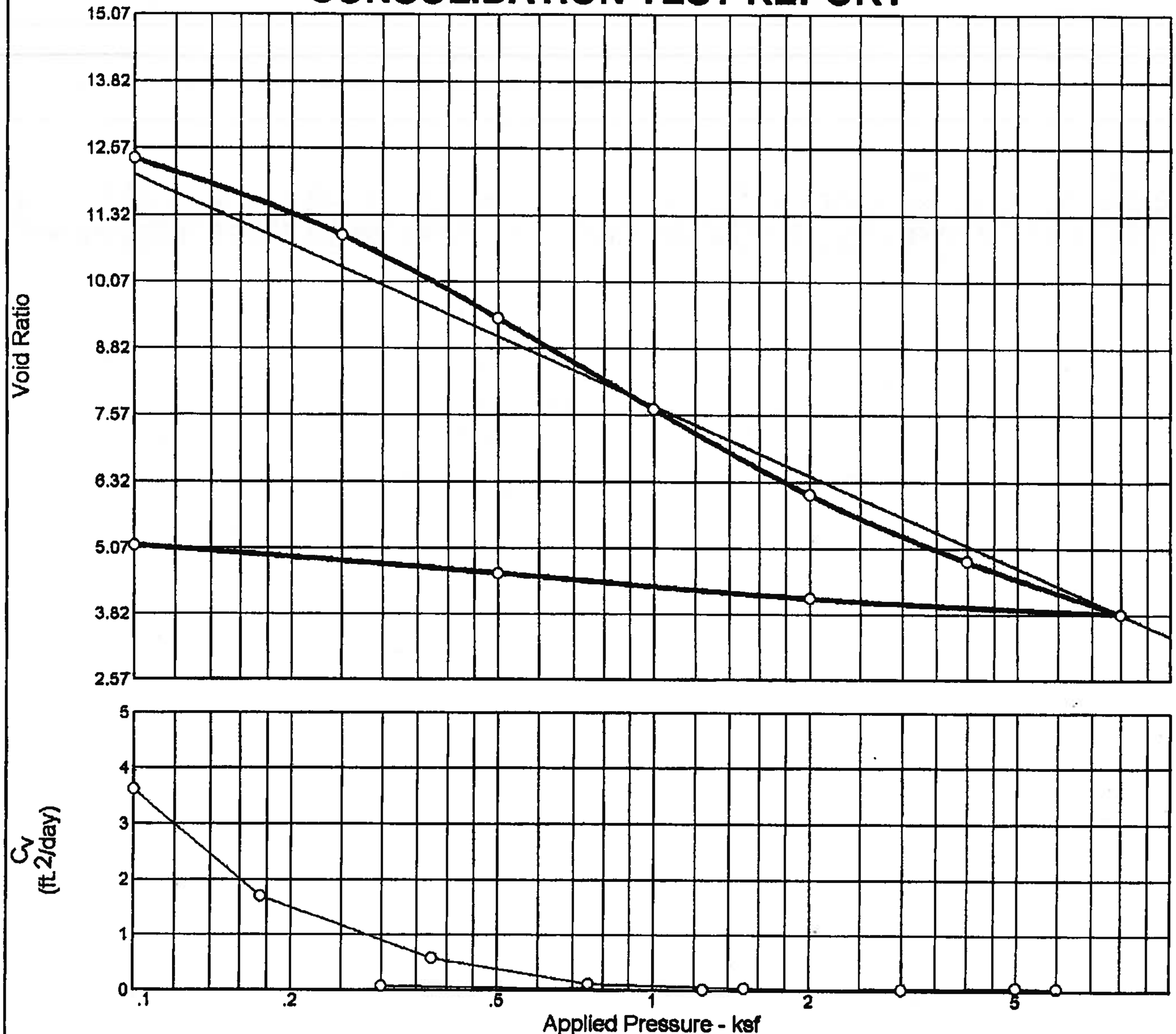
Project: Lake Apopka

Source: Boring B-4

Remarks:

Percent organic (loss on ignition): 11.1
Percent passing #200 sieve: 80.9

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Dark brown PEAT		

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		1.495		6.6		883.7	351.3	100.6 %	100.0 %	13.133	5.114	0.13	4.34

Preparation Process: Trimmed using cylindrical cutting ring

Condition of Test: Natural moisture, inundated at 0.05 ksf

D2435 Method	C_r	Swell Press. (ksf)	Swell %
B	0.68		

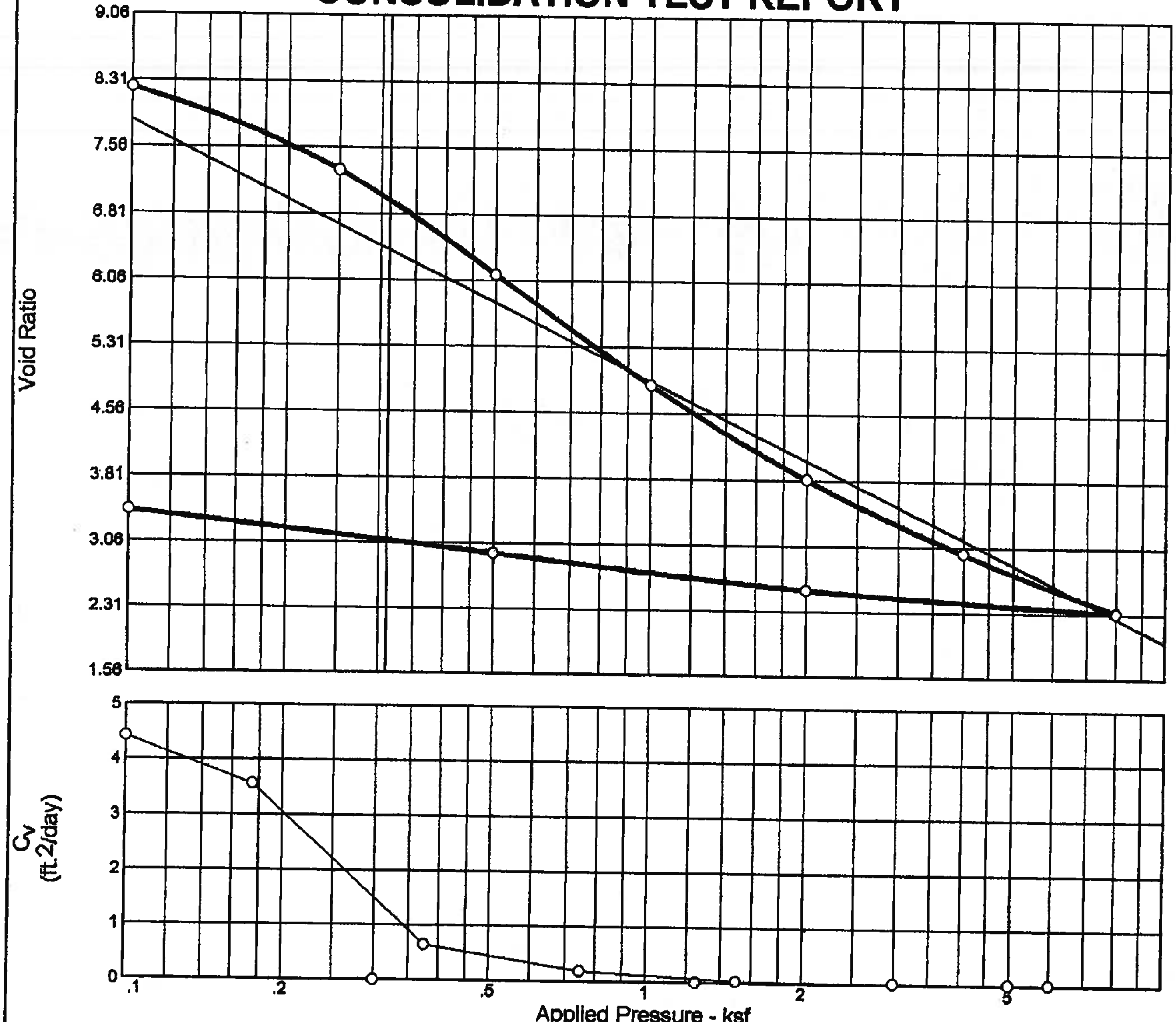
Project: Lake Apopka

Source: Boring B-5

Remarks:

Percent organic (loss on ignition): 88.8

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Dark brown PEAT with organic silt	OH	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf) Init.	Dry Dens. (pcf) Final	Moisture Init.	Moisture Final	Saturation Init.	Saturation Final	Void Ratio Init.	Void Ratio Final	P_c (ksf)	C_c
140	51	2.376		15.8		455.1	191.9	129.4 %	100.0 %	8.359	3.415	0.09	2.94

Preparation Process: Trimmed using cylindrical cutting ring

Condition of Test: Natural moisture, inundated at 0.05 ksf

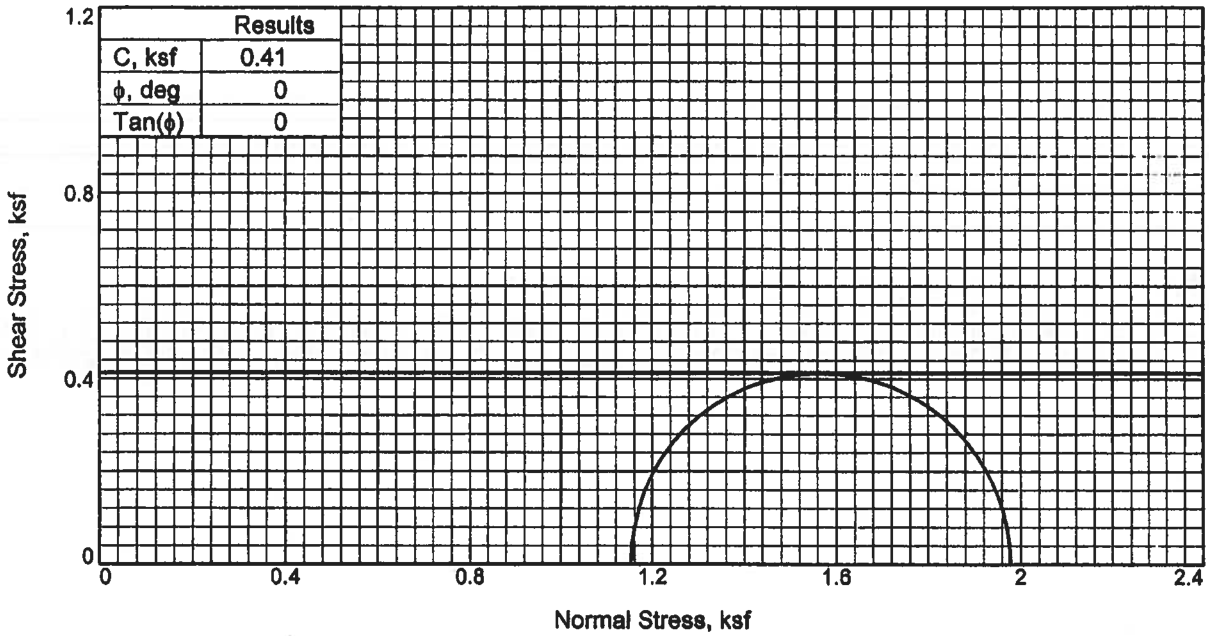
D2435 Method	C_r	Swell Press. (ksf)	Swell %
B	0.57		

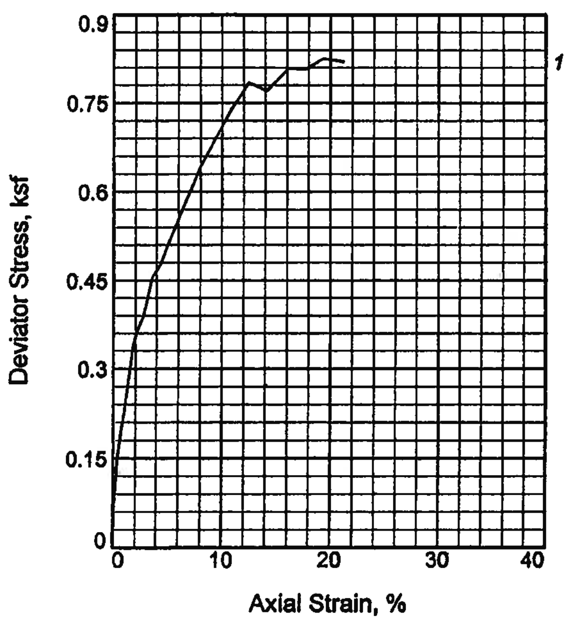
Project: Lake Apopka

Source: Boring B-6

Remarks:

Percent organic (loss on ignition): 37.0





Sample No.		1
Initial	Water Content, %	81.6
	Dry Density, pcf	51.6
	Saturation, %	100.3
	Void Ratio	2.0467
	Diameter, in.	2.71
	Height, in.	5.67
At Test	Water Content, %	81.6
	Dry Density, pcf	51.6
	Saturation, %	100.3
	Void Ratio	2.0467
	Diameter, in.	2.71
	Height, in.	5.67
Strain rate, in./min.		0.03
Back Pressure, psi		0.00
Cell Pressure, psi		8.00
Fail. Stress, ksf		0.83
Strain, %		19.4
Ult. Stress, ksf		
Strain, %		
σ_1 Failure, ksf		1.98
σ_3 Failure, ksf		1.15

Type of Test:
Unconsolidated Undrained

Sample Type: UD

Description: Dark brown organic SILT

LL= 152 **PL=** 73 **PI=** 79

Specific Gravity= 2.517

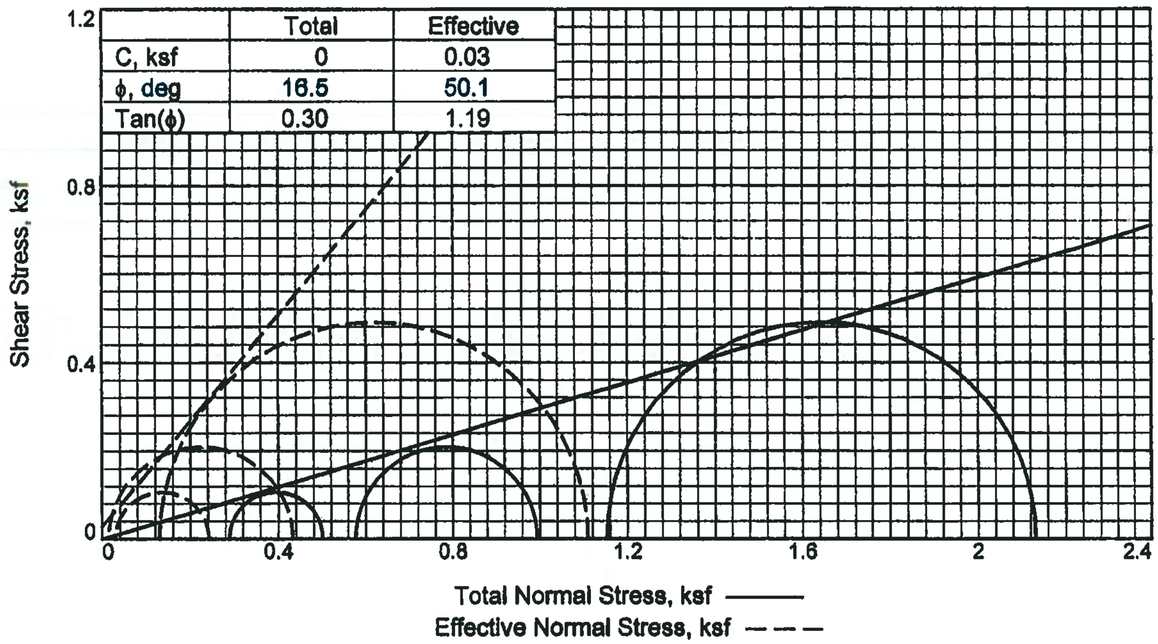
Remarks:

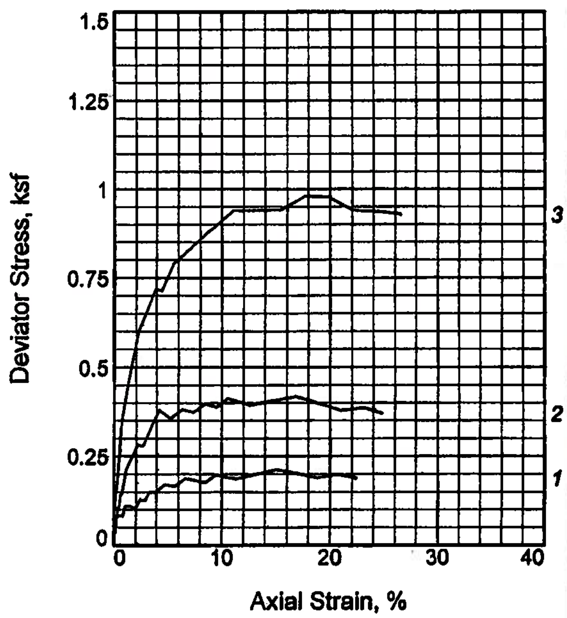
Figure ________

Project: Lake Apopka

Source of Sample: Boring B-4

TRIAXIAL SHEAR TEST REPORT





Sample No.		1	2	3
Initial	Water Content, %	1235.3	1093.3	1130.2
	Dry Density, pcf	4.4	4.9	4.7
	Saturation, %	90.9	90.5	90.1
	Void Ratio	20.3183	18.0662	18.7583
	Diameter, in.	2.86	2.84	2.87
	Height, in.	5.92	5.86	6.05
At Test	Water Content, %	967.3	590.9	436.8
	Dry Density, pcf	6.0	9.5	12.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	14.4617	8.8344	6.5306
	Diameter, in.	2.56	2.26	2.04
	Height, in.	5.34	4.78	4.56
Strain rate, in./min.		0.01	0.01	0.01
Eff. Cell Pressure, psi		2.00	4.00	8.00
Fail. Stress, ksf		0.21	0.42	0.98
Total Pore Pr., ksf		4.58	4.88	5.34
Strain, %		15.1	16.8	17.6
Ult. Stress, ksf				
Total Pore Pr., ksf				
Strain, %				
$\bar{\sigma}_1$ Failure, ksf		0.24	0.43	1.11
$\bar{\sigma}_3$ Failure, ksf		0.03	0.01	0.13

Type of Test:
CU with Pore Pressures

Sample Type: UD

Description: Dark brown PEAT

Specific Gravity= 1.495

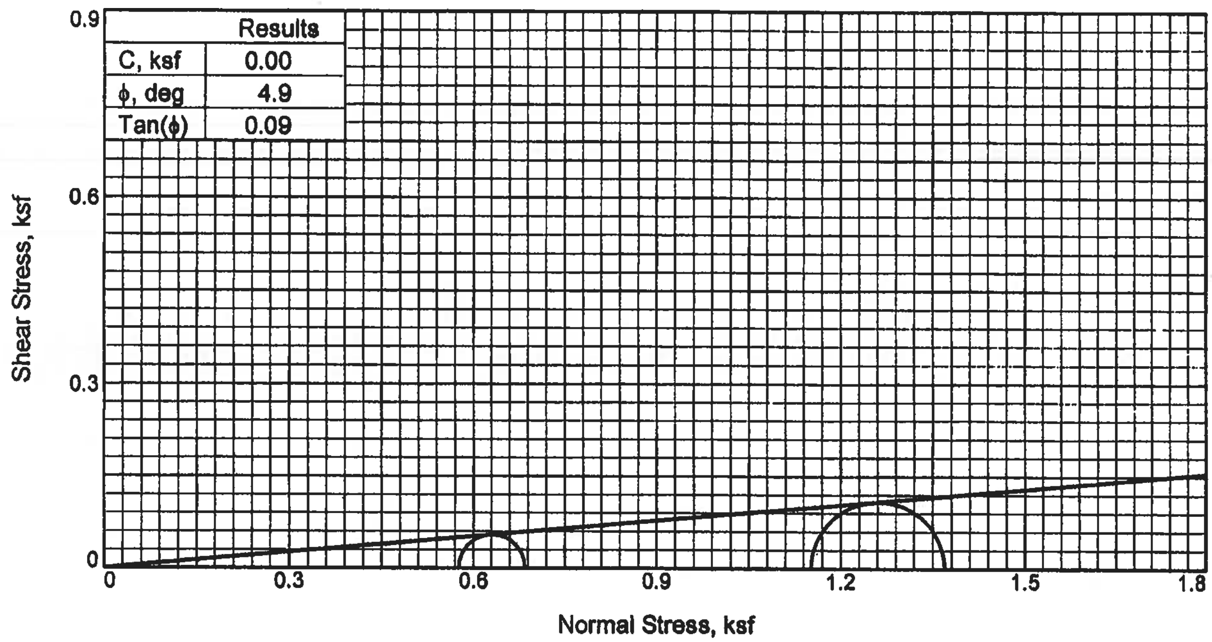
Remarks: Percent organic (loss on ignition): 88.8

Figure ________

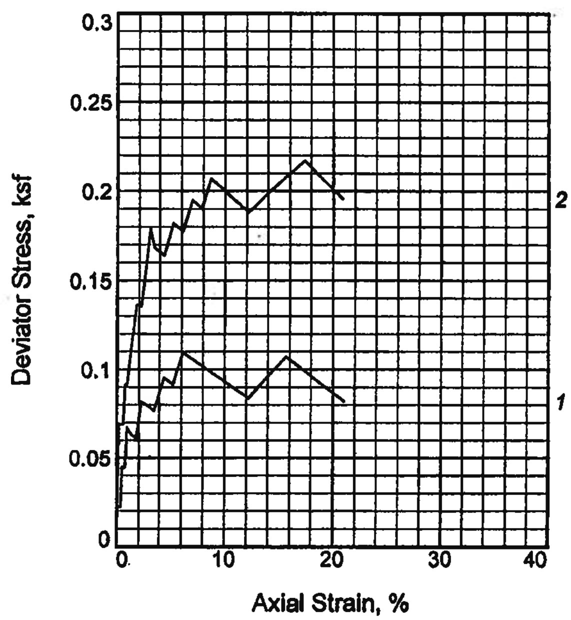
Project: Lake Apopka

Source of Sample: Boring B-5

TRIAXIAL SHEAR TEST REPORT



Results	
C, ksf	0.00
ϕ, deg	4.9
Tan(ϕ)	0.09



	Sample No.	1	2
Initial	Water Content, %	455.1	455.1
	Dry Density, pcf	15.7	15.8
	Saturation, %	128.2	129.4
	Void Ratio	8.4354	8.3589
	Diameter, in.	2.85	2.82
	Height, in.	5.77	5.78
At Test	Water Content, %	455.1	455.1
	Dry Density, pcf	15.7	15.8
	Saturation, %	128.2	129.4
	Void Ratio	8.4354	8.3589
	Diameter, in.	2.85	2.82
	Height, in.	5.77	5.78
	Strain rate, in./min.	0.03	0.03
	Back Pressure, psi	0.00	0.00
	Cell Pressure, psi	4.00	8.00
	Fail. Stress, ksf	0.11	0.22
	Strain, %	6.1	17.4
	Ult. Stress, ksf		
	Strain, %		
	σ_1 Failure, ksf	0.69	1.37
	σ_3 Failure, ksf	0.58	1.15

Type of Test:
Unconsolidated Undrained

Sample Type: UD

Description: Dark brown PEAT with organic silt

LL= 140 **PL=** 89 **PI=** 51

Specific Gravity= 2.376

Remarks:

Figure ________

Project: Lake Apopka

Source of Sample: Boring B-6

TRIAXIAL SHEAR TEST REPORT

SUMMARY OF LABORATORY TEST RESULTS FOR CORE SAMPLES

Dredging Preliminary Design
Lake Apopka
Winter Garden, Florida

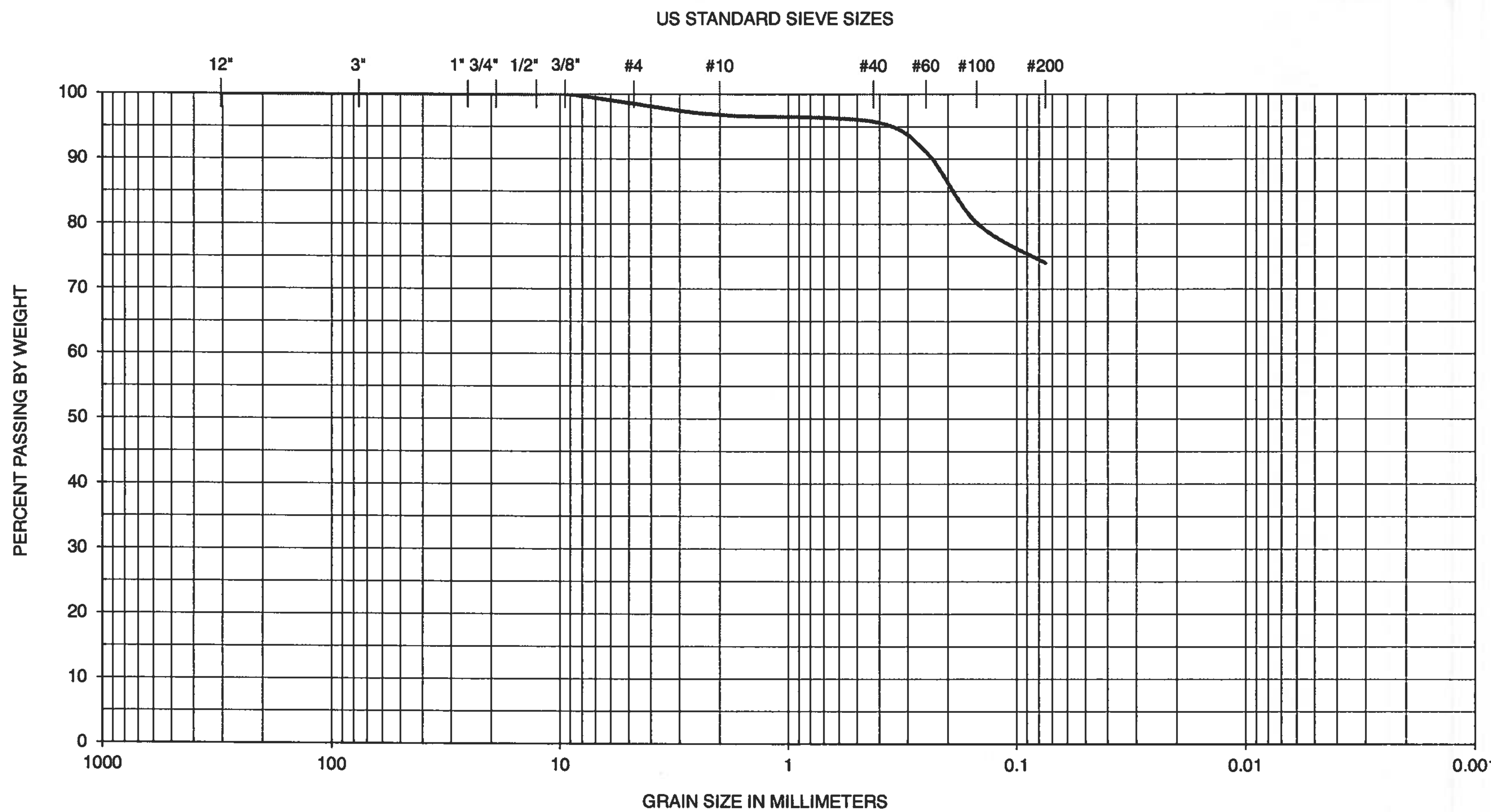
Core No.	Length from Bottom of Core (in)			Solids Content (%)	Organic Content (%)	Specific Gravity (G_s)	Percent Passing Sieve Size (%)						Atterberg Limits		Soil Classification Symbol
							#4	#10	#40	#60	#100	#200	LL	PI	
C-1	23	-	66	3		1.9						38			SM
C-1	11	-	23	26	34	2.4						64			OL
C-1	0	-	11	58		2.7	99	97	96	91	80	74	49	5	OL
C-2	36	-	73	3		2.1						58			OL
C-2	17	-	36	28	29	2.1						28			PT
C-2	0	-	17	55	10	2.7						83	102	35	OH
C-3	36	-	73	4		2.5						55			OL
C-3	12	-	36	29	17	2.4						63			PT
C-3	0	-	12	66		2.7	96	83	66	60	55	46	87	28	SM
C-4	34	-	96	4		2.4						62			OL
C-4	14	-	34	9		1.9						39			SM
C-4	0	-	14	54	9	2.5						83	104	18	OH
C-5	46	-	96	2		2.6						84			OL

SUMMARY OF LABORATORY TEST RESULTS FOR CORE SAMPLES

Dredging Preliminary Design
Lake Apopka
Winter Garden, Florida

Core No.	Length from Bottom of Core (in)	Solids Content (%)	Organic Content (%)	Specific Gravity (G_s)	Percent Passing Sieve Size (%)						Atterberg Limits		Soil Classification Symbol
					#4	#10	#40	#60	#100	#200	LL	PI	
C-5	36 - 46	7	69	1.7						27			PT
C-5	12 - 36	11	57	1.9						65			PT
C-5	0 - 12	48	8	2.5						85	99	25	OH
C-6	36 - 96	4		2.4						39			SM
C-6	14 - 36	7	69	1.6						17			SM
C-6	0 - 14	11	63	1.7						16			PT
C-8	48 - 96	4		1.8						29			SM
C-8	16 - 48	6		1.7						28			SM
C-8	0 - 16	9	78	1.8						45			PT
C-9	24 - 96	10	57	1.9						18			PT
C-9	0 - 24	67		2.6	100	98	96	93	59	3			SP
C-10	5 - 96	6	54	1.7						33			SM
C-10	0 - 5	35		2.1	96	85	73	69	43	17			SM

Note: Core sample C-7 was provided to ChemTreat, Inc.



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	LOCATION FROM BOTTOM OF CORE (IN)	S (%)	LL	PL	PI	SOIL CLASSIFICATION
C-1	N/A	0 - 11	26.0	49	44	5	OL

GRAIN SIZE DISTRIBUTION

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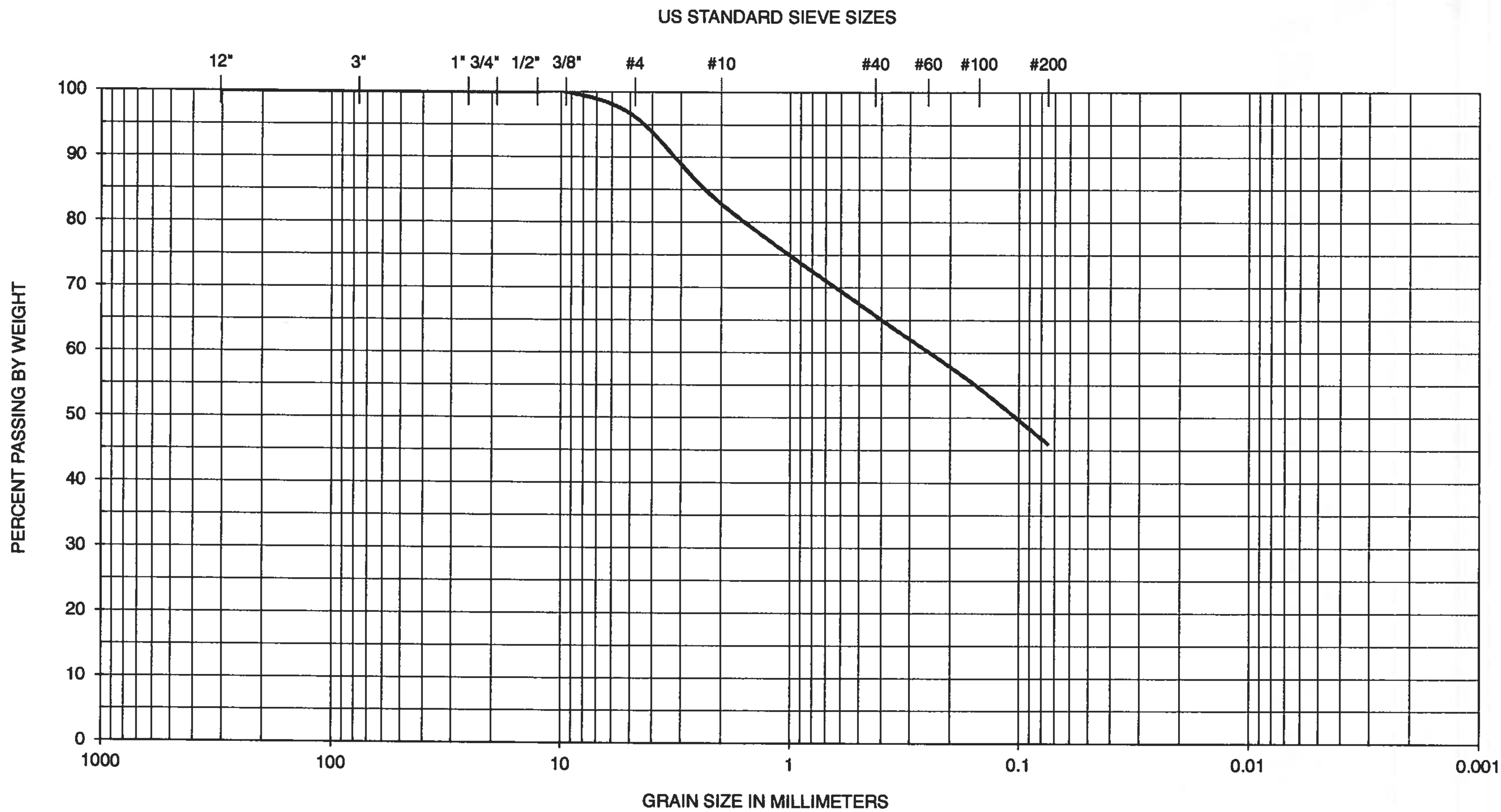

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	LOCATION FROM BOTTOM OF CORE (IN)	S (%)	LL	PL	PI	SOIL CLASSIFICATION
C-3	N/A	0 - 12	66.0	87	59	28	SM

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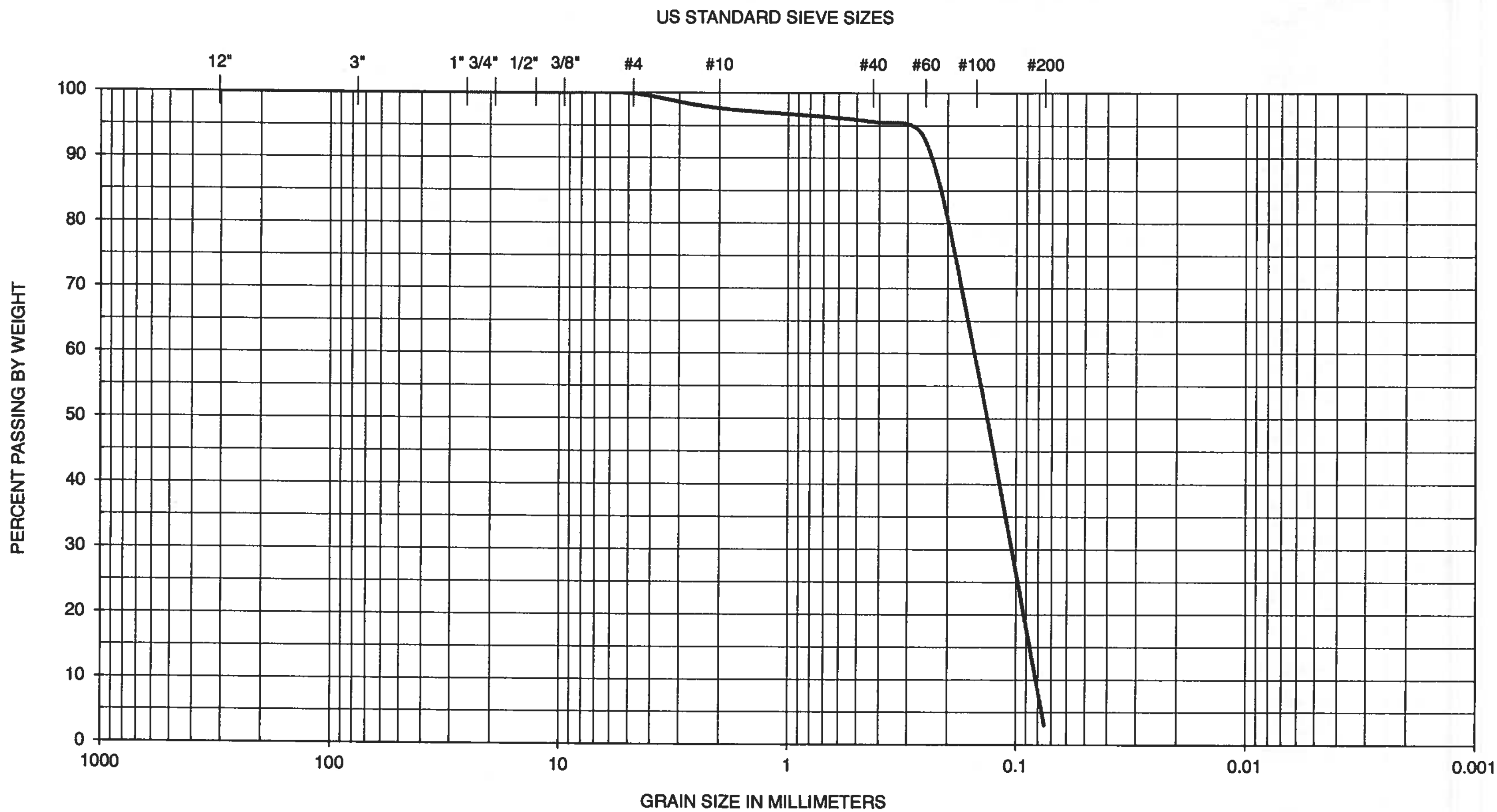

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	LOCATION FROM BOTTOM OF CORE (IN)	S (%)	LL	PL	PI	SOIL CLASSIFICATION
C-9	N/A	0 - 24	67.0	-	-	-	SP

GRAIN SIZE DISTRIBUTION

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CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

CSI Geo
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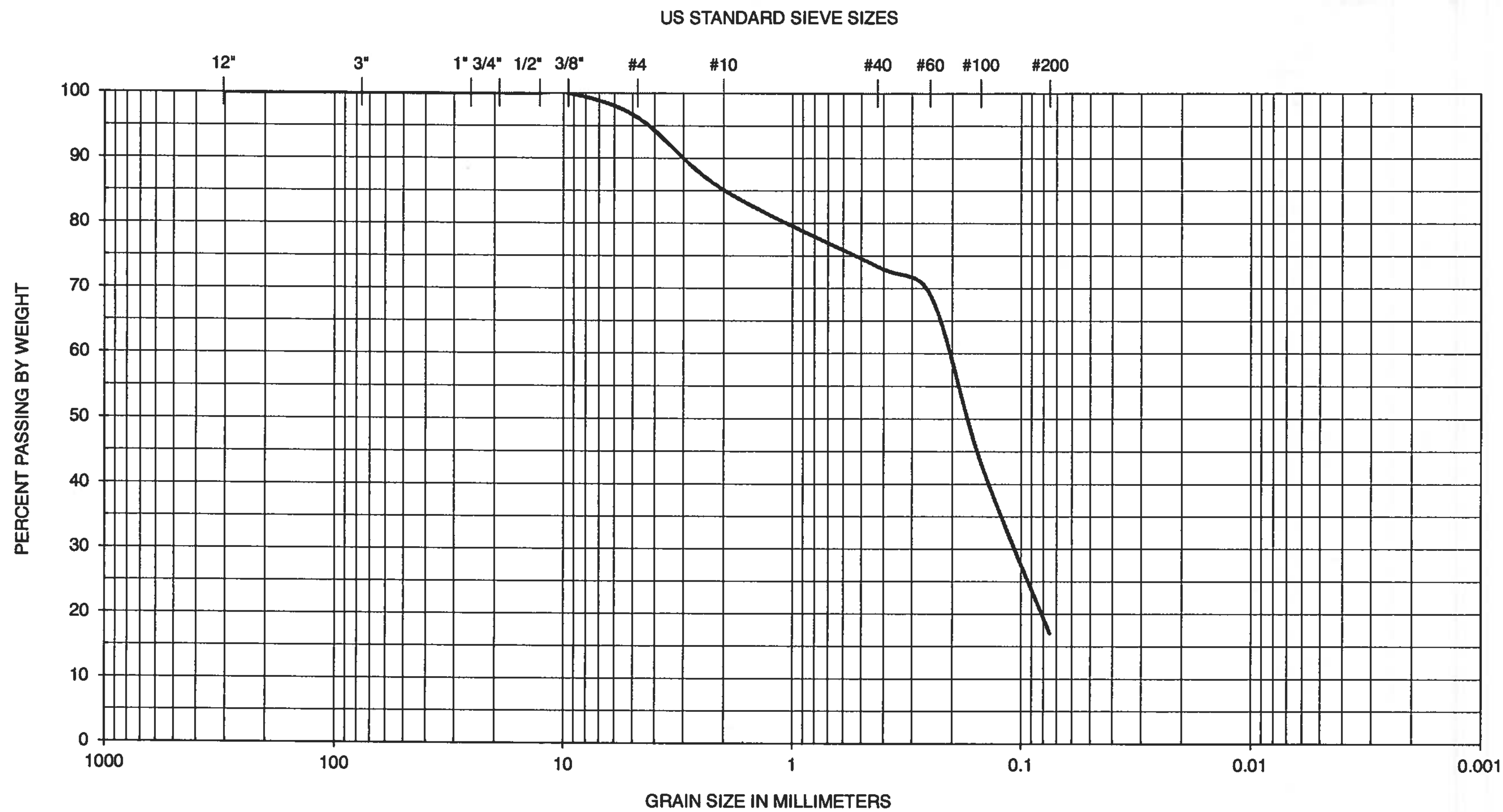

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

BORING NO.	SAMPLE NO.	LOCATION FROM BOTTOM OF CORE (IN)	S (%)	LL	PL	PI	SOIL CLASSIFICATION
C-10	N/A	0 - 5	35.0	-	-	-	SM

GRAIN SIZE DISTRIBUTION

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CSI Geo Project No.: 71-12-122-06

Date: 2/24/2013

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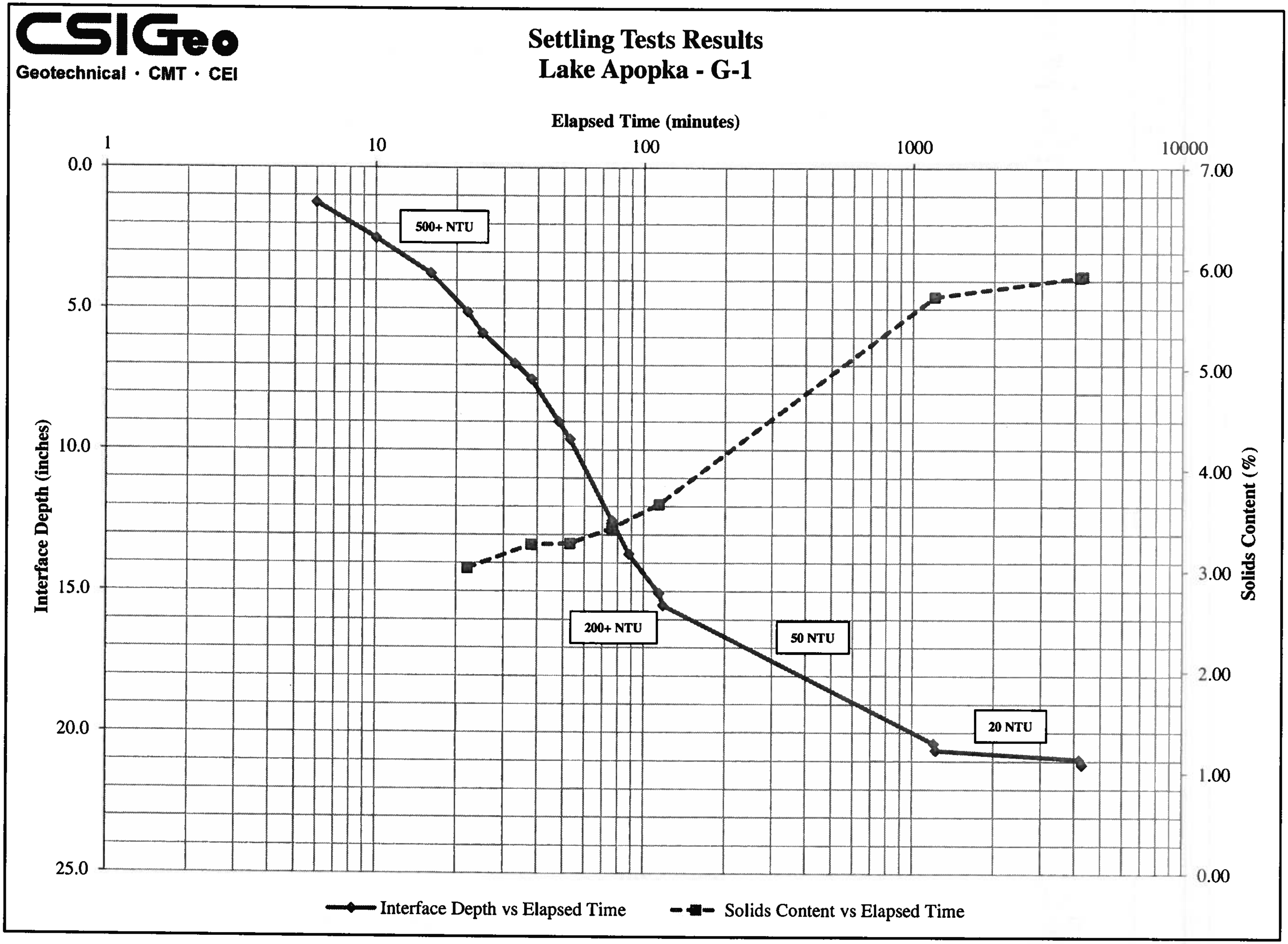
CSIGeo
Geotechnical · CMT · CEI
Settling Tests Results
Lake Apopka - G-1
Elapsed Time (minutes)
1
10
100
1000
10000
0.0
5.0
10.0
15.0
20.0
25.0
Interface Depth (inches)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Solids Content (%)
500+ NTU
200+ NTU
50 NTU
20 NTU
Interface Depth vs Elapsed Time
Solids Content vs Elapsed Time

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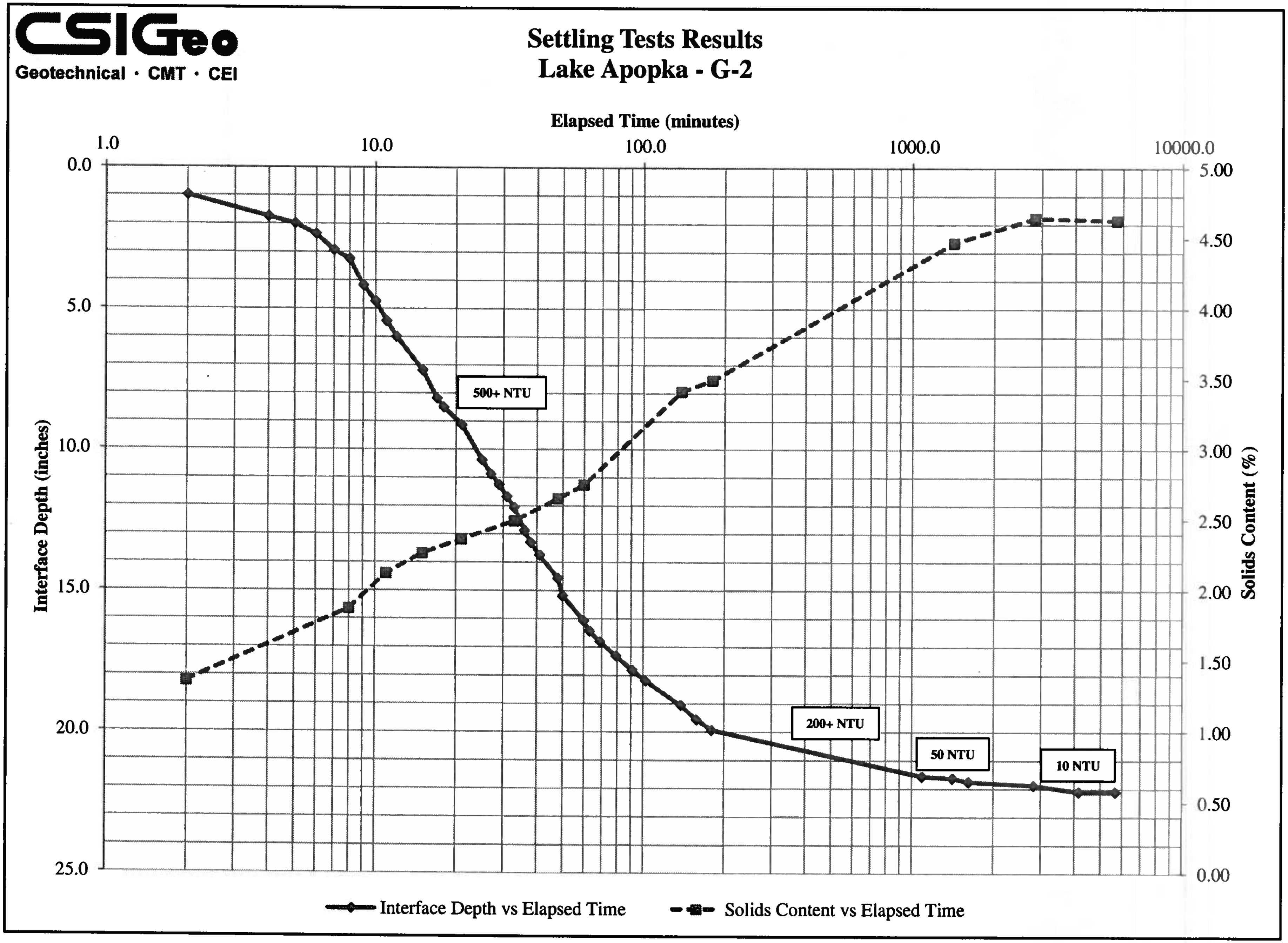
Project Name:	Lake Apopka	**Project No.:**	71-12-122-06
Sample No.:	G-1	**Date:**	1-Feb-13
Depth:	Muck Sediment Composite	**Tested By:**	KE
Initial Solids:	1.60%	**Checked By:**	JV
Initial Turbidity:	1000+ NTU		
Specific Gravity:	1.92		

Date/Time	Elapsed Time (minutes)	Interface Depth from Water Surface (inches)	Solids Content (%)	Approximate Turbidity (NTU)
2/1/13 3:37 PM	0	1.0	-	500+
2/1/13 3:43 PM	6	1.3	-	500+
2/1/13 3:47 PM	10	2.5	-	500+
2/1/13 3:53 PM	16	3.8	-	500+
2/1/13 3:59 PM	22	5.1	3.03	500+
2/1/13 4:02 PM	25	5.9	-	500+
2/1/13 4:10 PM	33	6.9	-	500+
2/1/13 4:15 PM	38	7.5	3.26	500+
2/1/13 4:25 PM	48	9.0	-	500+
2/1/13 4:30 PM	53	9.6	3.27	200+
2/1/13 4:53 PM	76	12.5	3.42	200+
2/1/13 5:05 PM	88	13.7	-	200+
2/1/13 5:31 PM	114	15.1	3.66	200+
2/1/13 5:35 PM	118	15.5	-	200+
2/2/13 11:41 AM	1204	20.4	5.72	50
2/2/13 11:59 AM	1222	20.6	-	50
2/4/13 1:02 PM	4165	20.9	5.92	20
2/4/13 2:47 PM	4270	21.1	5.93	20



CSIGeo
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Settling Tests Results
Lake Apopka - G-2
Elapsed Time (minutes)
1.0
10.0
100.0
1000.0
10000.0
0.0
5.0
10.0
15.0
20.0
25.0
Interface Depth (inches)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Solids Content (%)
500+ NTU
200+ NTU
50 NTU
10 NTU
Interface Depth vs Elapsed Time
Solids Content vs Elapsed Time

CSIGeo
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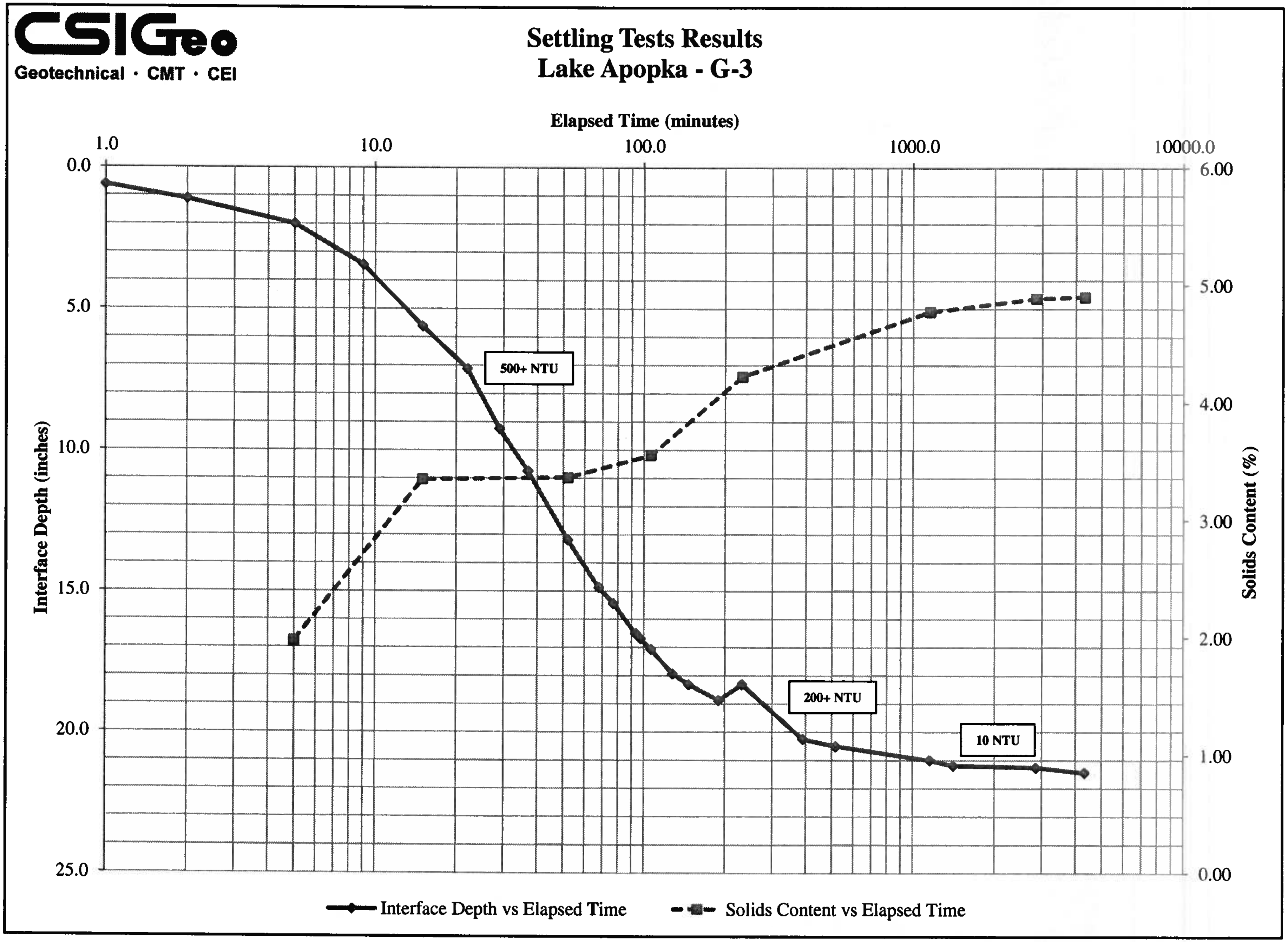
Project Name:	Lake Apopka	**Project No.:**	71-12-122-06
Sample No.:	G-2	**Date:**	7-Feb-13
Depth:	Muck Sediment Composite	**Tested By:**	KE
Initial Solids:	1.35%	**Checked By:**	JV
Initial Turbidity:	1000+ NTU		
Specific Gravity:	2.06		

Date/Time	Elapsed Time (minutes)	Interface Depth from Water Surface (inches)	Solids Content (%)	Approximate Turbidity (NTU)
2/7/13 2:00 PM	0	0.3	-	500+
2/7/13 2:02 PM	2	1.0	1.35	500+
2/7/13 2:04 PM	4	1.8	-	500+
2/7/13 2:05 PM	5	2.0	-	500+
2/7/13 2:06 PM	6	2.4	-	500+
2/7/13 2:07 PM	7	2.9	-	500+
2/7/13 2:08 PM	8	3.3	1.87	500+
2/7/13 2:09 PM	9	4.2	-	500+
2/7/13 2:10 PM	10	4.8	-	500+
2/7/13 2:11 PM	11	5.4	2.12	500+
2/7/13 2:12 PM	12	6.0	-	500+
2/7/13 2:15 PM	15	7.2	2.26	500+
2/7/13 2:17 PM	17	8.2	-	500+
2/7/13 2:18 PM	18	8.5	-	500+
2/7/13 2:21 PM	21	9.1	2.36	500+
2/7/13 2:25 PM	25	10.4	-	500+
2/7/13 2:27 PM	27	10.9	-	500+
2/7/13 2:29 PM	29	11.3	-	500+
2/7/13 2:31 PM	31	11.7	-	500+
2/7/13 2:33 PM	33	12.1	2.49	500+
2/7/13 2:36 PM	36	12.9	-	500+
2/7/13 2:38 PM	38	13.3	-	500+
2/7/13 2:41 PM	41	13.8	-	500+
2/7/13 2:48 PM	48	14.6	2.65	500+
2/7/13 2:50 PM	50	15.2	-	500+
2/7/13 3:00 PM	60	16.1	2.75	500+
2/7/13 3:03 PM	63	16.4	-	500+
2/7/13 3:09 PM	69	16.8	-	500+
2/7/13 3:19 PM	79	17.3	-	500+
2/7/13 3:31 PM	91	17.8	-	500+
2/7/13 3:42 PM	102	18.2	-	500+
2/7/13 4:18 PM	138	19.1	3.41	500+
2/7/13 4:38 PM	158	19.6	-	500+
2/7/13 5:00 PM	180	19.9	3.49	500+
2/8/13 8:13 AM	1093	21.6	-	100+
2/8/13 1:39 PM	1419	21.6	4.47	50
2/8/13 5:05 PM	1625	21.8	-	50
2/9/13 1:13 PM	2833	21.9	4.65	10
2/10/13 11:10 AM	4150	22.1	-	10
2/11/13 12:48 PM	5688	22.1	4.63	10



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Settling Tests Results
Lake Apopka - G-3
Elapsed Time (minutes)
1.0
10.0
100.0
1000.0
10000.0
0.0
5.0
10.0
15.0
20.0
25.0
Interface Depth (inches)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Solids Content (%)
500+ NTU
200+ NTU
10 NTU
Interface Depth vs Elapsed Time
Solids Content vs Elapsed Time

CSIGeo
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Project Name:	Lake Apopka	**Project No.:**	71-12-122-06
Sample No.:	G-3	**Date:**	12-Feb-13
Depth:	Muck Sediment Composite	**Tested By:**	KE/BM
Initial Solids:	1.53%	**Checked By:**	JV
Initial Turbidity:	1000+ NTU		
Specific Gravity:	1.98		

Date/Time	Elapsed Time (minutes)	Interface Depth from Water Surface (inches)	Solids Content (%)	Approximate Turbidity (NTU)
2/12/13 12:57 PM	0	0.0	-	1000+
2/12/13 12:58 PM	1	0.6	-	1000+
2/12/13 12:59 PM	2	1.1	-	500+
2/12/13 1:02 PM	5	2.0	1.97	500+
2/12/13 1:06 PM	9	3.4	-	500+
2/12/13 1:12 PM	15	5.6	3.35	500+
2/12/13 1:19 PM	22	7.1	-	500+
2/12/13 1:26 PM	29	9.3	-	500
2/12/13 1:34 PM	37	10.8	-	500
2/12/13 1:49 PM	52	13.2	3.37	500
2/12/13 2:05 PM	68	14.9	-	500
2/12/13 2:14 PM	77	15.4	-	500
2/12/13 2:30 PM	93	16.5	-	500
2/12/13 2:34 PM	97	16.7	-	500
2/12/13 2:43 PM	106	17.1	3.56	500
2/12/13 3:05 PM	128	17.9	-	500
2/12/13 3:24 PM	147	18.3	-	500
2/12/13 4:07 PM	190	18.9	-	500
2/12/13 4:49 PM	232	18.3	4.23	500
2/12/13 7:27 PM	390	20.3	-	200
2/12/13 9:34 PM	517	20.5	-	200
2/13/13 8:12 AM	1155	21.0	4.78	200
2/13/13 12:27 PM	1410	21.2	-	200
2/14/13 12:30 PM	2853	21.3	4.89	10
2/15/13 12:58 PM	4321	21.4	4.90	10

APPENDIX 6

Field & Laboratory Photos

Figure 1: Preservation of sample in jars

Figure 2: Sampling Spoon Contents

Figure 3: Capping Core Sampling Tubes

Figure 4: Settlement column with bottom sampling port

APPENDIX 7

Key to Soil Classification

KEY TO SOIL CLASSIFICATION

Correlation of Penetration Resistance with Relative Density and Consistency

Granular Materials			Silts and Clays		
Relative Density	**Safety Hammer SPT N-Value (Blows/foot)**	**Automatic Hammer SPT N-Value (Blows/foot)**	**Consisteny**	**Safety Hammer SPT N-Value (Blows/foot)**	**Automatic Hammer SPT N-Value (Blows/foot)**
Very Loose	Less than 4	Less than 3	Very Soft	Less than 2	Less than 1
Loose	4 – 10	3 – 8	Soft	2 – 4	1 – 3
Medium Dense	10 - 30	8 - 24	Firm	4 - 8	3 - 6
Dense	30 - 50	24 - 40	Stiff	8 - 15	6 - 12
Very Dense	Greater than 50	Greater than 40	Very Stiff	15 - 30	12 - 24
			Hard	Greater than 30	Greater than 24

Particle Size Identification (Unified Soil Classification System)

Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	Coarse - 3/4 to 3 inches in diameter
	Fine - 4.76 mm to 3/4 inch in diameter
Sand:	Coarse - 2.0 mm to 4.76 mm in diameter
	Medium - 0.42 mm to 2.0 mm in diameter
	Fine - 0.074 mm to 0.42 mm in diameter

Modifiers

These modifiers provide our estimate of the amount of fines (silt or clay size particles) in soil samples.

Approximate Fines Content	Modifiers
5% Fines 12%	Slightly silty or slightly clayey
12% Fines 30%	Silty or clayey
30% Fines 50%	Very silty or very clayey

These modifiers provide our estimate of shell, rock fragments, or roots in the soil sample.

Approximate Content, By Weight	Modifiers
1% to 5%	Trace
5% to 12%	Few
12% to 30%	Some
30% to 50%	Many

These modifiers provide our estimate of organic content in the soil sample.

Organic Content	Modifiers
1% to 3%	Trace
3% to 5%	Slightly Organic
5% to 20%	Organic
20% to 75%	Highly Organic (Muck)
> 75%	Peat

APPENDIX 8

Field & Laboratory Test Procedures

FIELD TEST PROCEDURES

Standard Penetration Test (SPT) Borings – The Standard Penetration Test (SPT) borings were made in general accordance with ASTM D-1586, "Penetration Test and Split-Barrel Sampling of Soils". A rotary drilling process was used to drill the test boreholes. Bentonite drilling fluid was circulated in the boreholes to stabilize the sides and flush the cuttings. At regular intervals, the drilling tools were removed and soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split tube sampler. The sampler was first seated six inches and then driven an additional foot with blows of a 140 pound hammer (manual rope-cathead system) falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated as the "Penetration Resistance". The penetration resistance, when properly interpreted, is an index to the soil strength and density. Representative portions of the soil samples, obtained from the sampler, were placed in glass jars and transported to our laboratory. The samples were then examined by an engineer in order to confirm the field classifications.

Core Samples – Core samples were collected using a 1.5-inch I.D., 96-inch length, clear PVC tube. The tube is inserted inside a steel core sampling sleeve with a shoe and sample retainer connected at the lower end. The entire sample device was lowered into the water column vertically until the first resistance was detected. The approximate height of the water column was then recorded. The vertical distance from the first perceived resistance until hand-pressure applied refusal was used to determine the depth of the sediment. The core samples were retrieved, capped and transported to our laboratory where they were examined by a geotechnical engineer in order to confirm the field classifications.

LABORATORY TEST PROCEDURES

Percent Organic Content – This test is based on the percent of organics by weight of the total sample. This test was conducted in accordance with FM I - T 267.

Percent Fines Content – To determine the percentage of soils finer than No. 200 sieve, the dried samples were washed over a 200 mesh sieve. The material retained on the sieve was oven dried and then weighed and compared with the unwashed dry weight in order to determine the weight of the fines. The percentage of fines in the soil sample was then determined as the percentage of weight of fines in the sample to the weight of the unwashed sample. This test was conducted in accordance with ASTM D 1140.

Natural Moisture Content – The water content is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. This test was conducted in the general accordance with FM 1-T 265.

Solids Content – The solids content is the ratio, expressed as a percentage, of the weight of dry solid particles in a soil mass to the total wet weight of the soil mass. This test is a variation of the Natural Moisture Content.

Plasticity (Atterberg Limits) – The soil's Plastic Index (PI) is bracketed by the Liquid Limit (LL) and Plastic Limit (PL). The LL is the moisture content at which the soil flows as a heavy viscous fluid and is determined in general accordance with FM 1-T 089. The PL is the moisture content at which the soil begins to crumble when rolled into a small thread and is also determined in general accordance with FM 1-T 090. The water-plasticity ratio is computed from the above test data. This ratio is an expression comparing the relative natural state of soil with its liquid and plastic consolidation characteristics.

Grain Size Distribution – The grain size tests were performed to determine the particle size and distribution of the samples tested. Each sample was dried, weighed, and washed over a No. 200 mesh sieve. The dried sample was then passed through a standard set of nested sieves to determine the grain size distribution of the soil particles coarser than the No. 200 sieve. This test is similar to that described by FM I - T 088.

Specific Gravity – The sample is oven dried and the dry unit weight of the sample determined. The sample is then crushed until it passes through No. 4 sieve. The specific gravity of the oven-dried sample is obtained from the ratio of the weight in air of a given volume of soil particles to the weight in air of an equal volume of water. This test was conducted in general accordance with ASTM D 854.

Column Settling Test – This test was performed in order to characterize and measure the settling characteristics of pre-prepared soil slurries. Soil slurries were prepared by mixing fine soil particles with tap water. After mechanically agitating the soil slurry, it was poured into the settlement column and homogenized by pumping air through an air stone placed at the bottom of the column. The settlement test was initiated after the air supply to the stone was cut off. The depth of the interface between the settling soil and clarified supernatant was recorded for the duration of the test. Samples were taken at a sampling port placed at the base of the column in order to monitor the solids content of the settled soil throughout the duration of the test. This test was conducted in general accordance with USACE EM 1110-2-5027.

Triaxial Test – Triaxial tests were performed on undisturbed samples in order to obtain the soils strength characteristics (internal friction angle and cohesion) under different loading conditions. Three different tests can be performed, these being Unconsolidated Undrained (UU), Consolidated Undrained (CU), and Consolidated Drained (CD). In general, the samples are palced in a triaxial chamber filled with water and subjected to a combination of confining and axial stresses, and depending on the type of test, drainage may be allowed. The axial stress is measured and plotted against the confining stress, with measurements of pore pressures taken as may be required. The tests are performed in accordance to ASTM D 2850 and ASTM D 4767.

Consolidation Test – This test is used to determine the magnitude and rate of consolidation of undisturbed fine grained soils and is covered by ASTM D2435. A soil sample is placed in a consolidometer, where it is restrained laterally and loaded axially with total stress increments. Each load increment is maintained until excess pore water pressures are dissipated. During each load increment period, measurements are made of changes in specimen height. All the data collected helps create a relationship between effective stress and void ratio or strain, and the rate at which consolidation can occur. The results are applied to estimate the magnitude and rate of settlement of a structure or embankment.

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ATTACHMENT C

ChemTreat,Inc. Polymer Evaluation

ChemTreat, Inc.

Solid-Liquid Separation Applications Support

To: Lake Apopka File

From: David Bishop/Mike Dacus

Date: January 4, 2013

Subject: **Lake Apopka Reclamation Project**
Lake Water Filtration Using TITAN Tube Technology

We met with Ali Kensi this morning from CSI Geo to pick up several (four) lake bottom core samples for polymer evaluation and testing. These samples were taken from the following locations:

- Core Section No.12
- Core Section No. 17
- Core Section No. 15
- Grab Section No. 16
- 5 gallons of Lake Water from the Boat Ramp

Our purpose – to develop a chemical treatment scheme that will successfully filter lake water mud, sediment, etc using TITANTube Technology.

Testing Evaluation:

We first mixed all four (4) sample tubes together in one container. Using a 5-gallon bucket and with the lake water we collected we made up one sample of 10% solids. We used this sample in order to evaluate our ability to select the correct product and dosage for treatment.

Working through a broad range of different polymer technologies we followed the testing protocol below:

- High mix – 60 seconds
- Low mix – 60 seconds
- Settling – 120 seconds

We found ChemTreat P-873L to be the best one-product program. At a relatively low dosage (~15ppm) we noted:

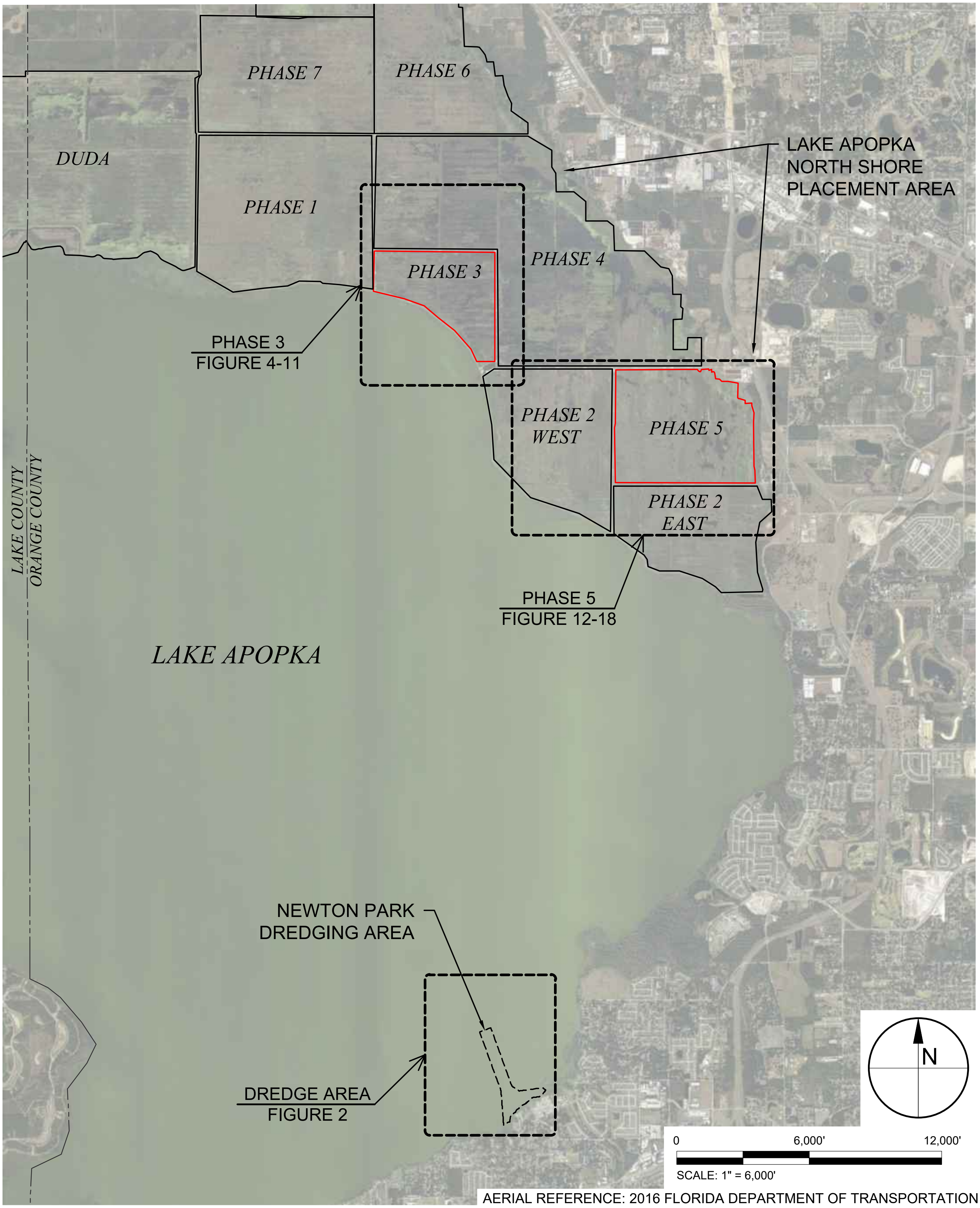
- ✓ Very fast reaction time.
- ✓ Large floc formation.

- ✓ Very quick settling rate.
- ✓ Good Supernatant clarity.
- ✓ Based on these results, we remixed the sample at high speed several times to evaluate shear resistance. Floc stability was very good.
- ✓ Our next step was to remix the same sample at high speed and pour through a piece of the TITANTube fabric.
- ✓ We noted very good de-watering characteristics with ~99% of the sludge held back by the fabric, and clean water released, (see photo below). Only a very small portion of fines were evident in the supernatant.

Based on our testing results ChemTreat P-873L is the product of choice.

ATTACHMENT D

Documentation Maps



AERIAL REFERENCE: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION

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TAYLOR ENGINEERING INC.
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FIGURE 1
PROJECT OVERVIEW
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	1 of 18	DEC 2017

SEAL

LORI S. BROWNELL P.E.# 60025 DATE

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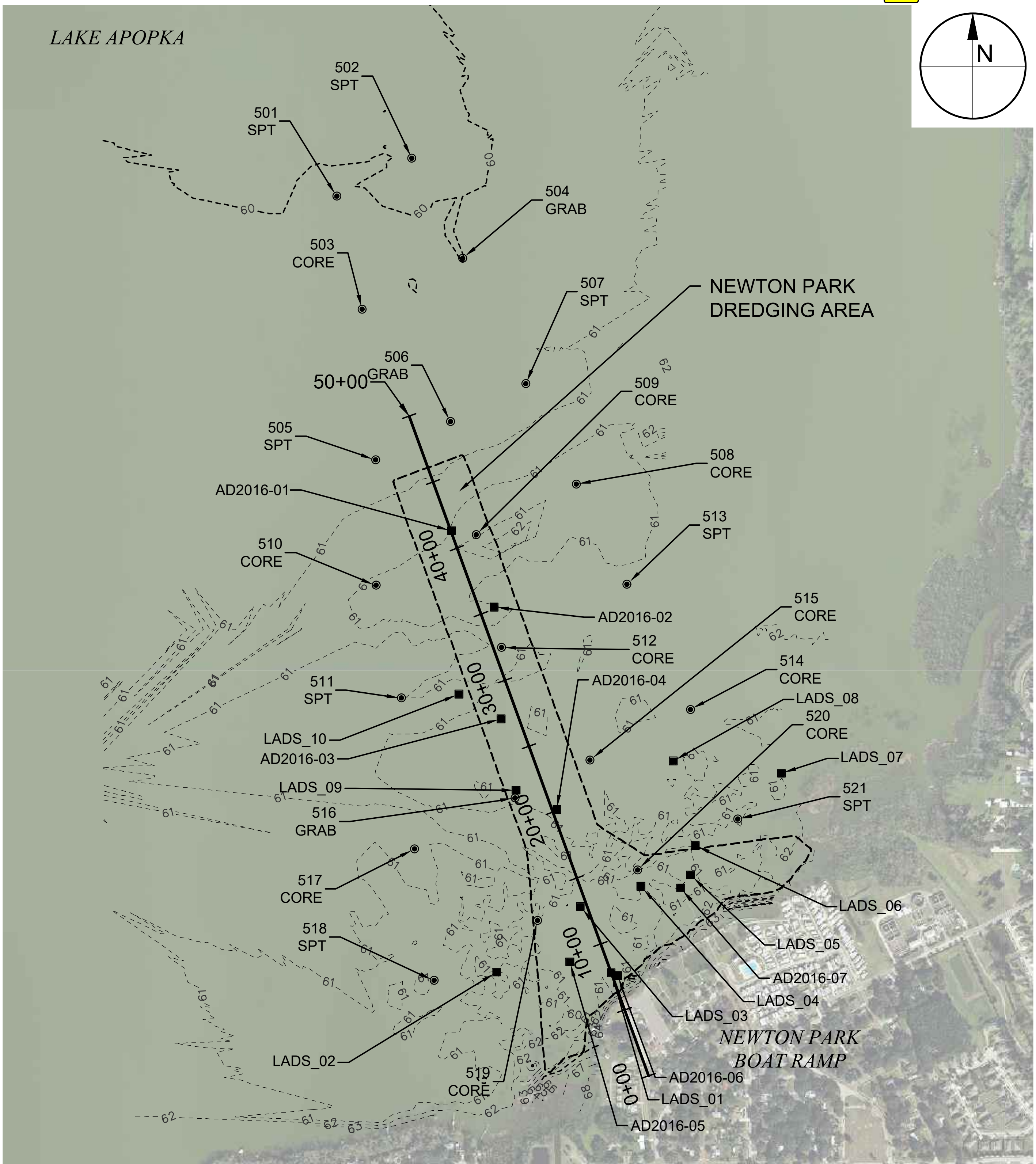

REFERENCES:
AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
BATHYMETRIC SURVEY: DEGROVE SURVEYORS 2013
WETLAND & SAV RESOURCES: TAYLOR ENGINEERING 2017
GEOTECHNICAL POINTS: APRIL 23, 2013 - PROJ. NO.: 71-12-122-06 ⦿
SEDIMENT SAMPLE POINTS: SJRWMD 2016 & TAYLOR ENGINEERING 2017 ■

0 1,000' 2,000'
SCALE: 1" = 1,000'

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FIGURE 2
NEWTON PARK DREDGING AREA
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	2 of 18	DEC 2017

SEAL
LORI S. BROWNELL P.E.# 60025 DATE

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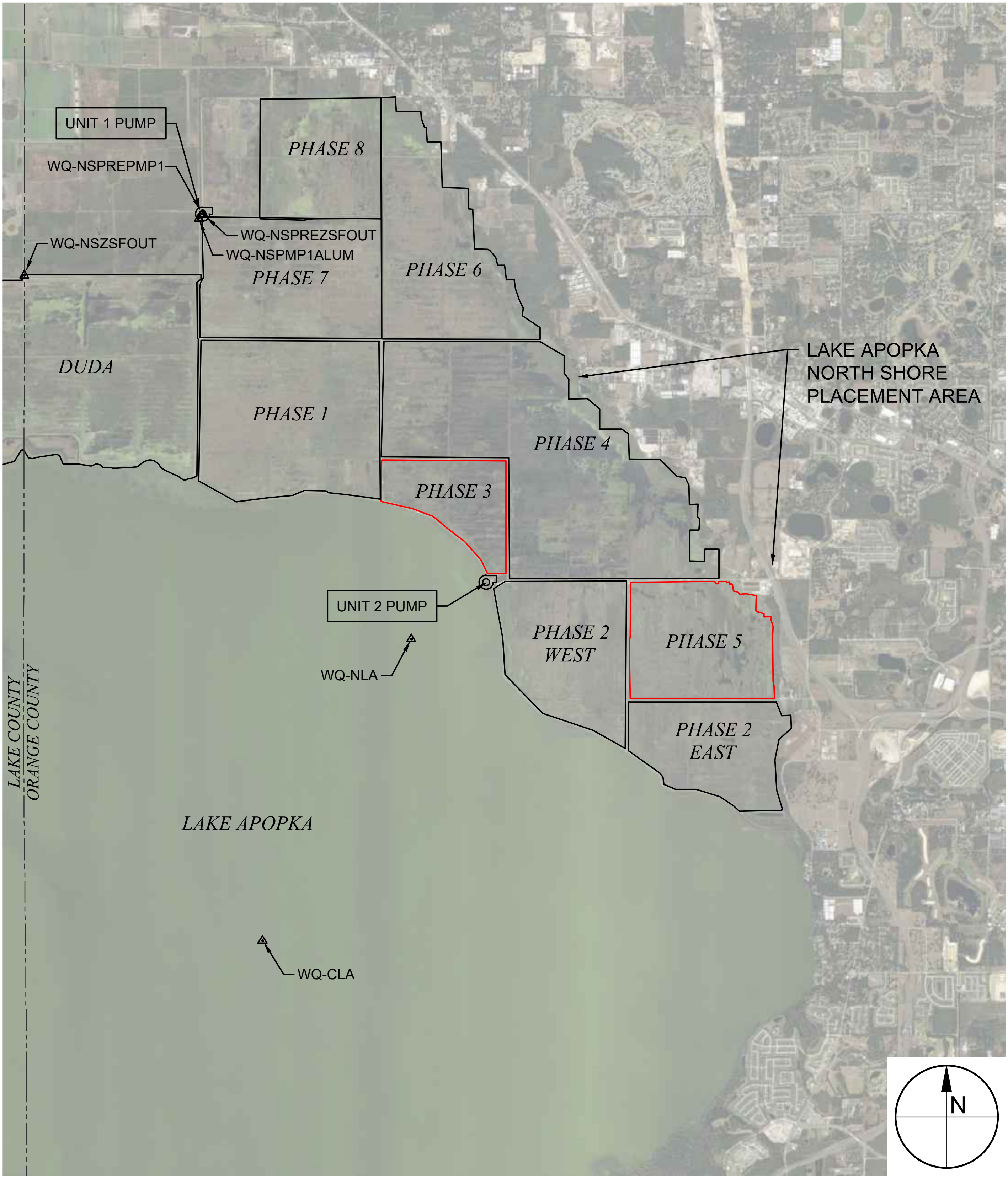

REFERENCES:

1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
2. WATER QUALITY POINTS & PUMP LOCATIONS: FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, WATERSHED ASSESSMENT SECTION, SEPTEMBER 19, 2003 △

0 6,000' 12,000'

SCALE: 1" = 6,000'

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FIGURE 3
WATER QUALITY SAMPLING POINTS
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	DRAWN BY	SHEET	DATE
C2017-030	RLJ	3 of 18	DEC 2017

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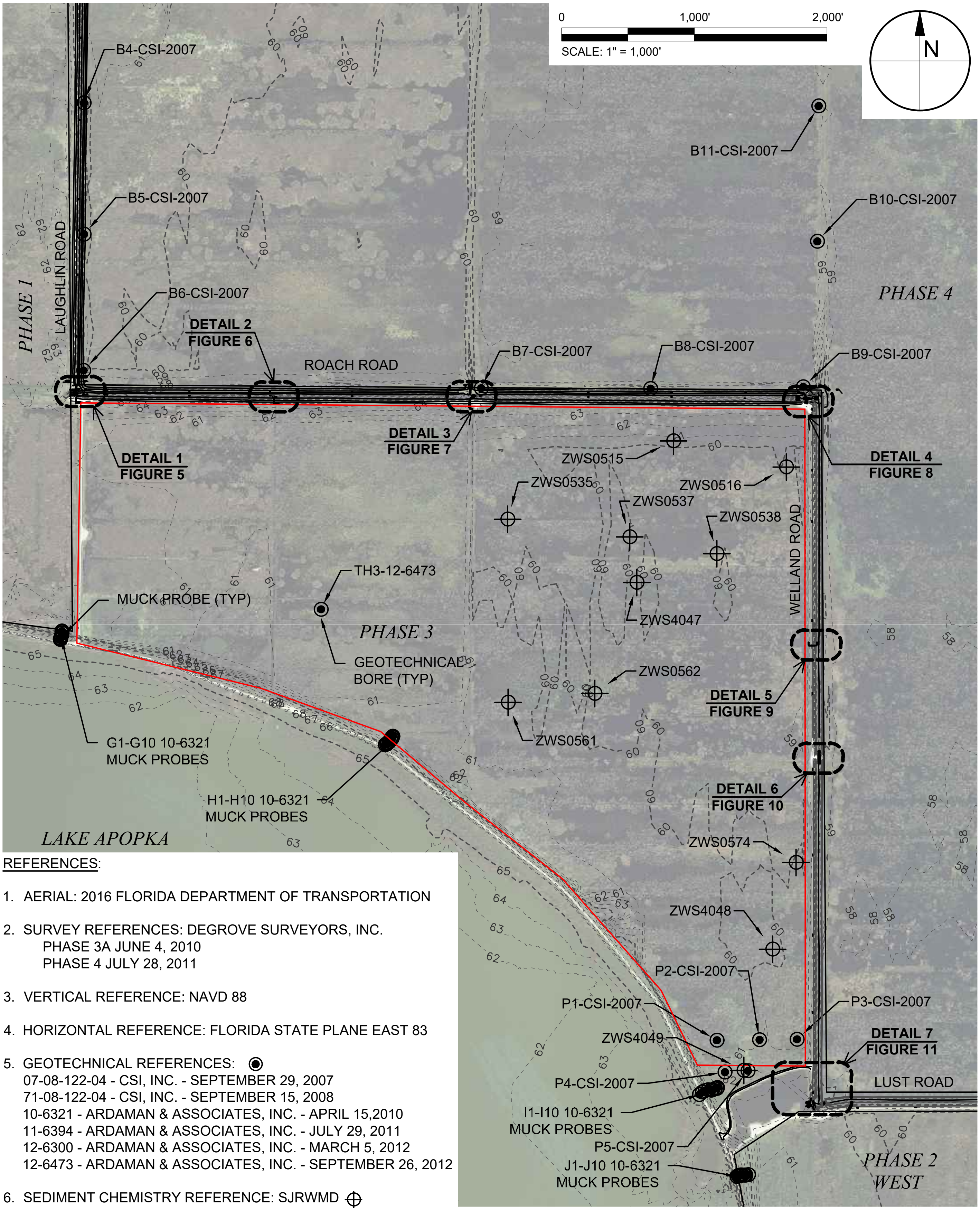

REFERENCES:

1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
2. SURVEY REFERENCES: DEGROVE SURVEYORS, INC.
   PHASE 3A JUNE 4, 2010
   PHASE 4 JULY 28, 2011
3. VERTICAL REFERENCE: NAVD 88
4. HORIZONTAL REFERENCE: FLORIDA STATE PLANE EAST 83
5. GEOTECHNICAL REFERENCES: ◉
   07-08-122-04 - CSI, INC. - SEPTEMBER 29, 2007
   71-08-122-04 - CSI, INC. - SEPTEMBER 15, 2008
   10-6321 - ARDAMAN & ASSOCIATES, INC. - APRIL 15,2010
   11-6394 - ARDAMAN & ASSOCIATES, INC. - JULY 29, 2011
   12-6300 - ARDAMAN & ASSOCIATES, INC. - MARCH 5, 2012
   12-6473 - ARDAMAN & ASSOCIATES, INC. - SEPTEMBER 26, 2012
6. SEDIMENT CHEMISTRY REFERENCE: SJRWMD ⊕

TAYLOR ENGINEERING INC. 10151 DEERWOOD PARK BLVD BLDG 300, SUITE 300 JACKSONVILLE, FLORIDA 32256 CERTIFICATE OF AUTHORIZATION # 4815	FIGURE 4 PHASE 3 AREA LAKE APOPKA NEWTON PARK ACCESS CHANNEL ORANGE COUNTY, FLORIDA	SEAL
	PROJECT C2017-030 / DRAWN BY RLJ / SHEET 4 of 18 / DATE DEC 2017	LORI S. BROWNELL P.E.# 60025 / DATE

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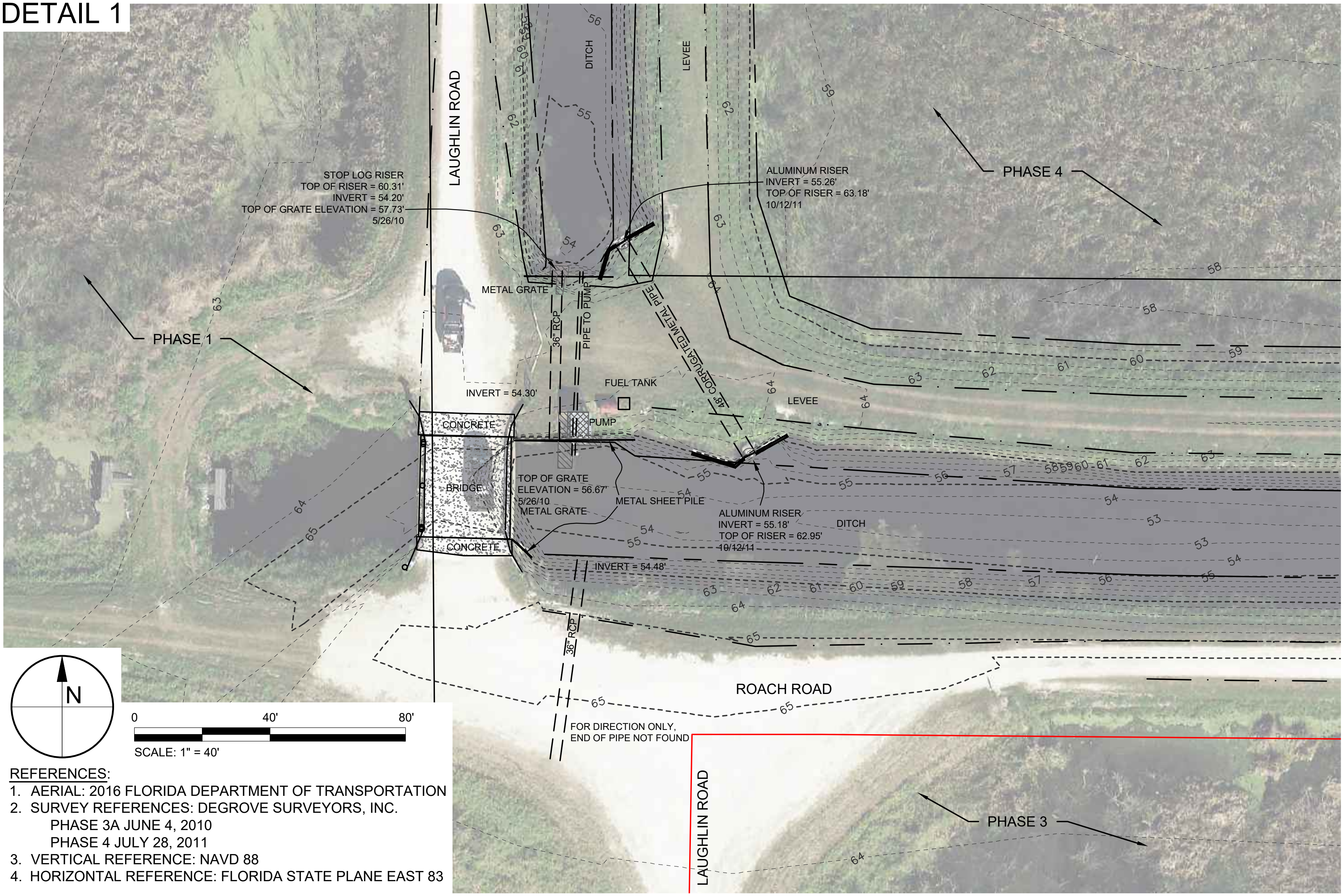

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FIGURE 5
DETAIL 1
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	C2017-030
DRAWN BY	RLJ
SHEET	5 of 18
DATE	DEC 2017

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LORI S. BROWNELL P.E.# 60025 DATE

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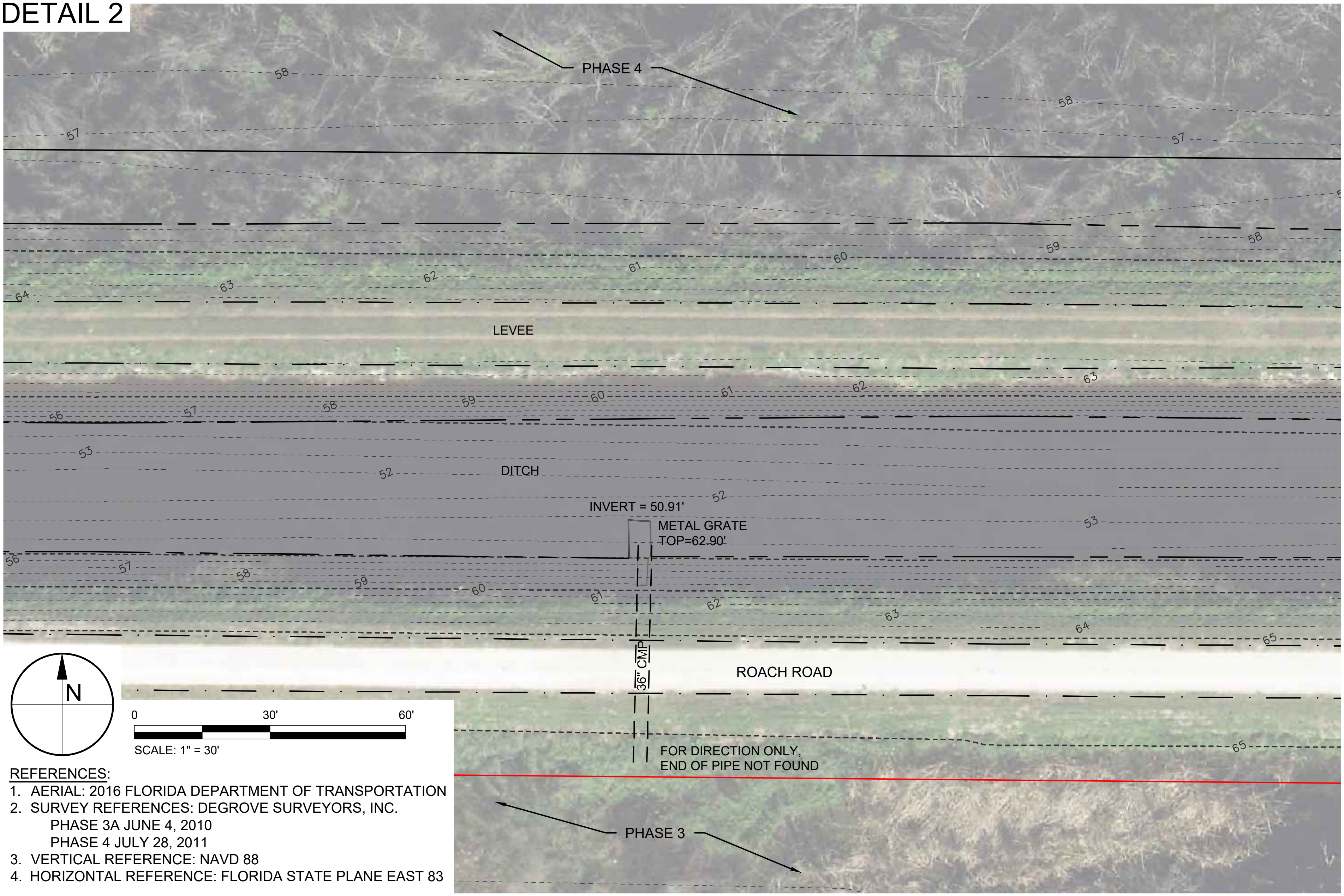

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   PHASE 4 JULY 28, 2011
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FIGURE 6
DETAIL 2
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	C2017-030
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DATE	DEC 2017

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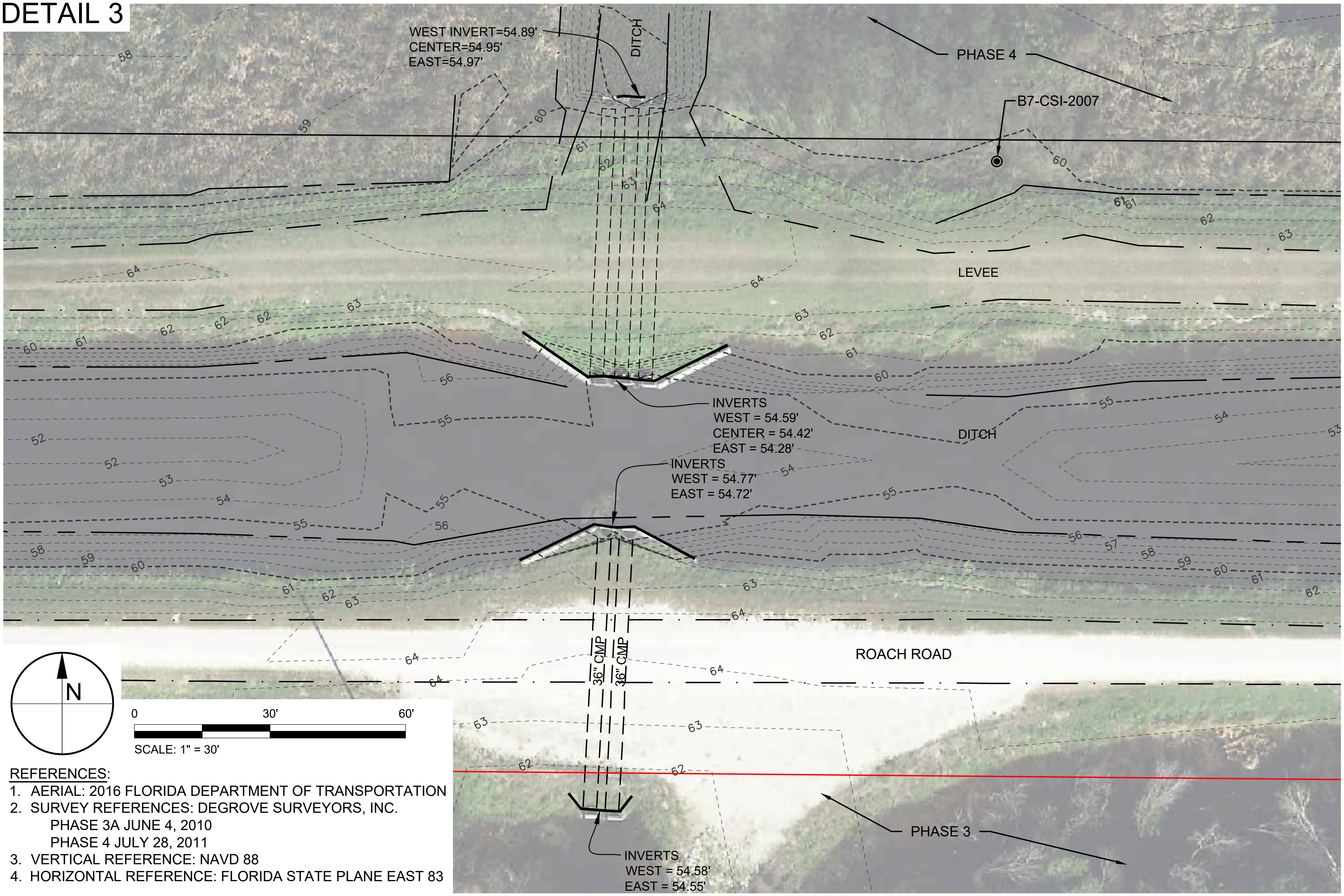

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   PHASE 4 JULY 28, 2011
3. VERTICAL REFERENCE: NAVD 88
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FIGURE 7
DETAIL 3
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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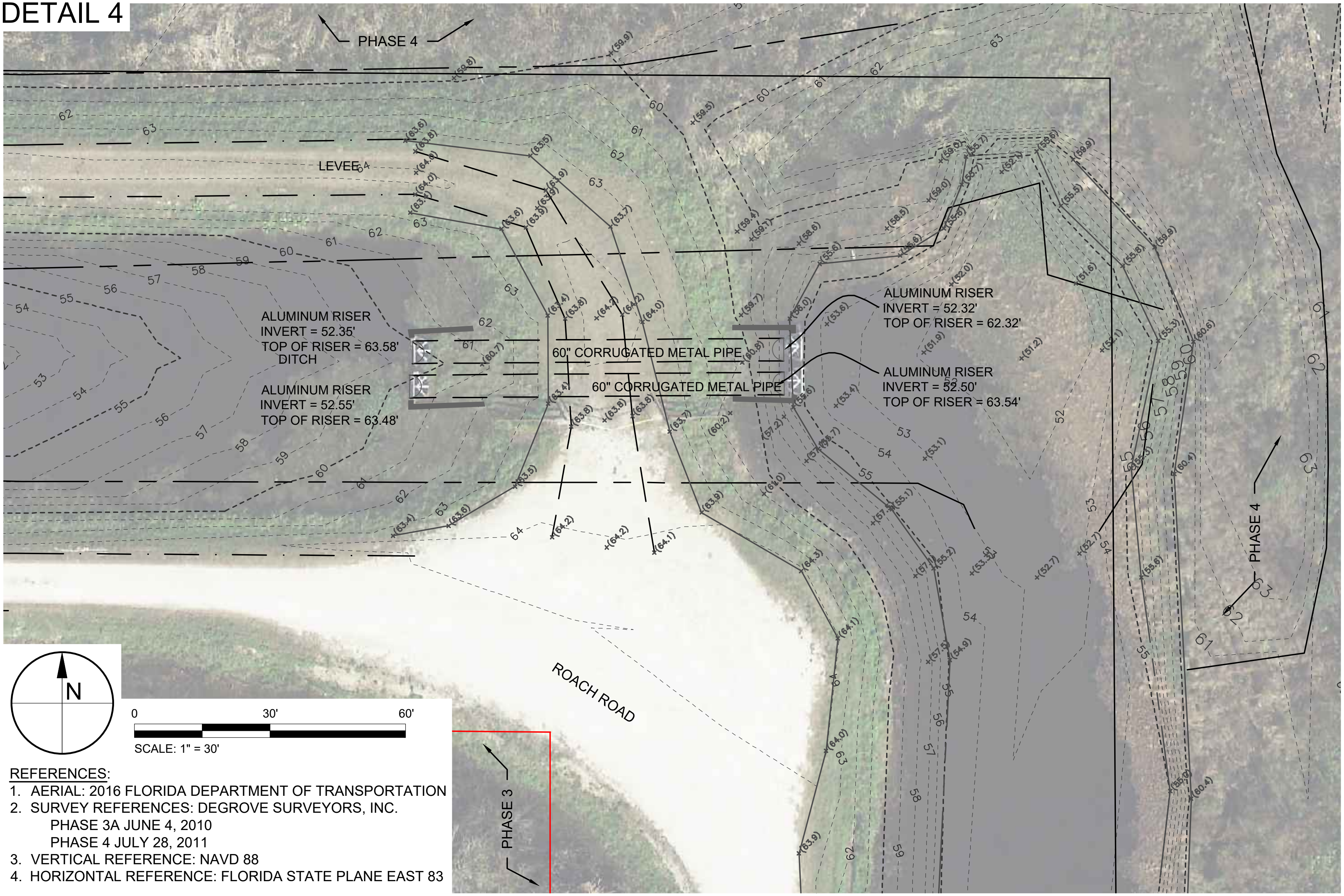
DETAIL 4



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1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
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   PHASE 4 JULY 28, 2011
3. VERTICAL REFERENCE: NAVD 88
4. HORIZONTAL REFERENCE: FLORIDA STATE PLANE EAST 83

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FIGURE 8
DETAIL 4
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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DATE	DEC 2017

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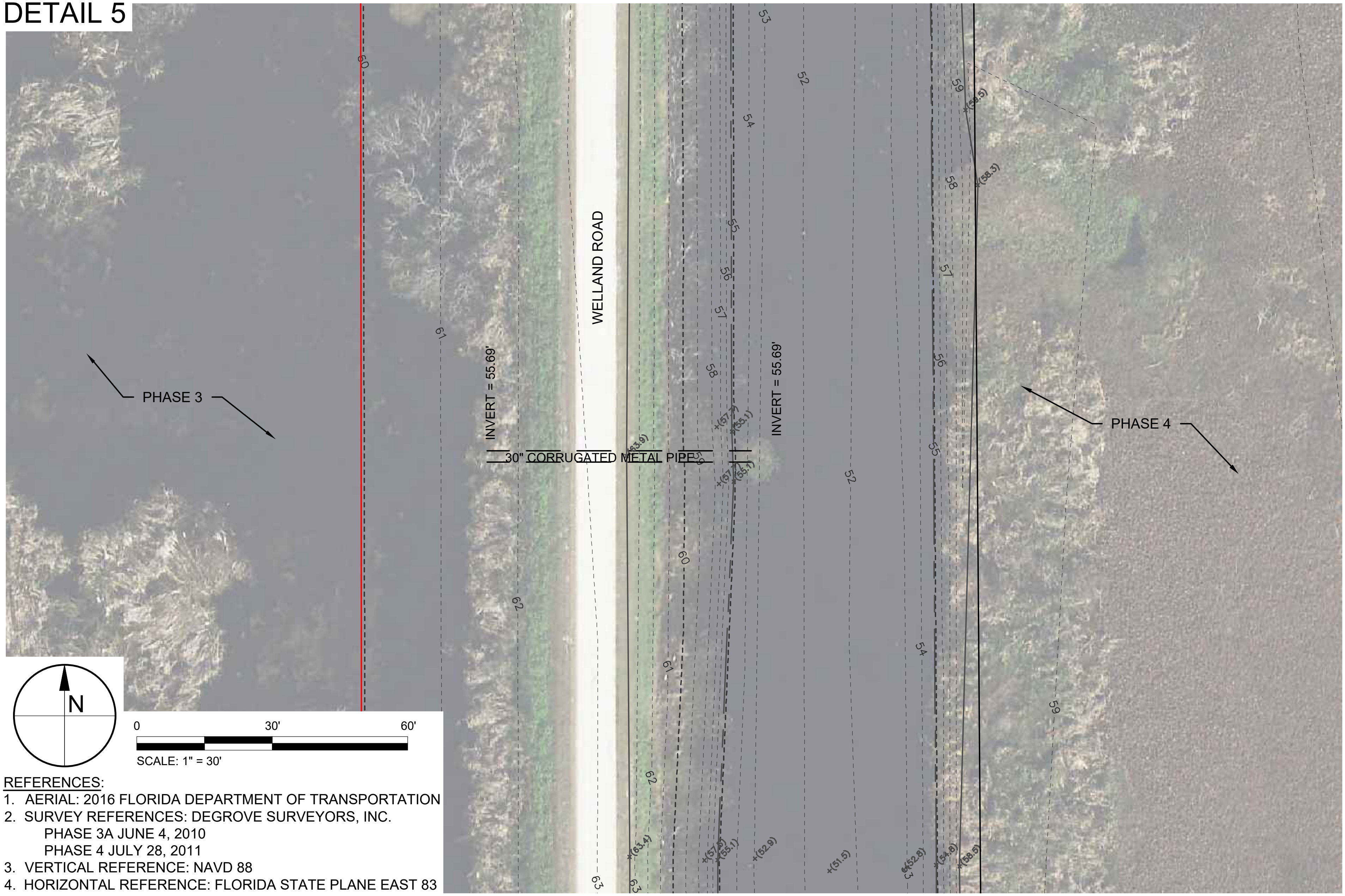
DETAIL 5



REFERENCES:

1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
2. SURVEY REFERENCES: DEGROVE SURVEYORS, INC.
   PHASE 3A JUNE 4, 2010
   PHASE 4 JULY 28, 2011
3. VERTICAL REFERENCE: NAVD 88
4. HORIZONTAL REFERENCE: FLORIDA STATE PLANE EAST 83

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FIGURE 9
DETAIL 5
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

PROJECT	C2017-030
DRAWN BY	RLJ
SHEET	9 of 18
DATE	DEC 2017

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LORI S. BROWNELL P.E.# 60025 DATE

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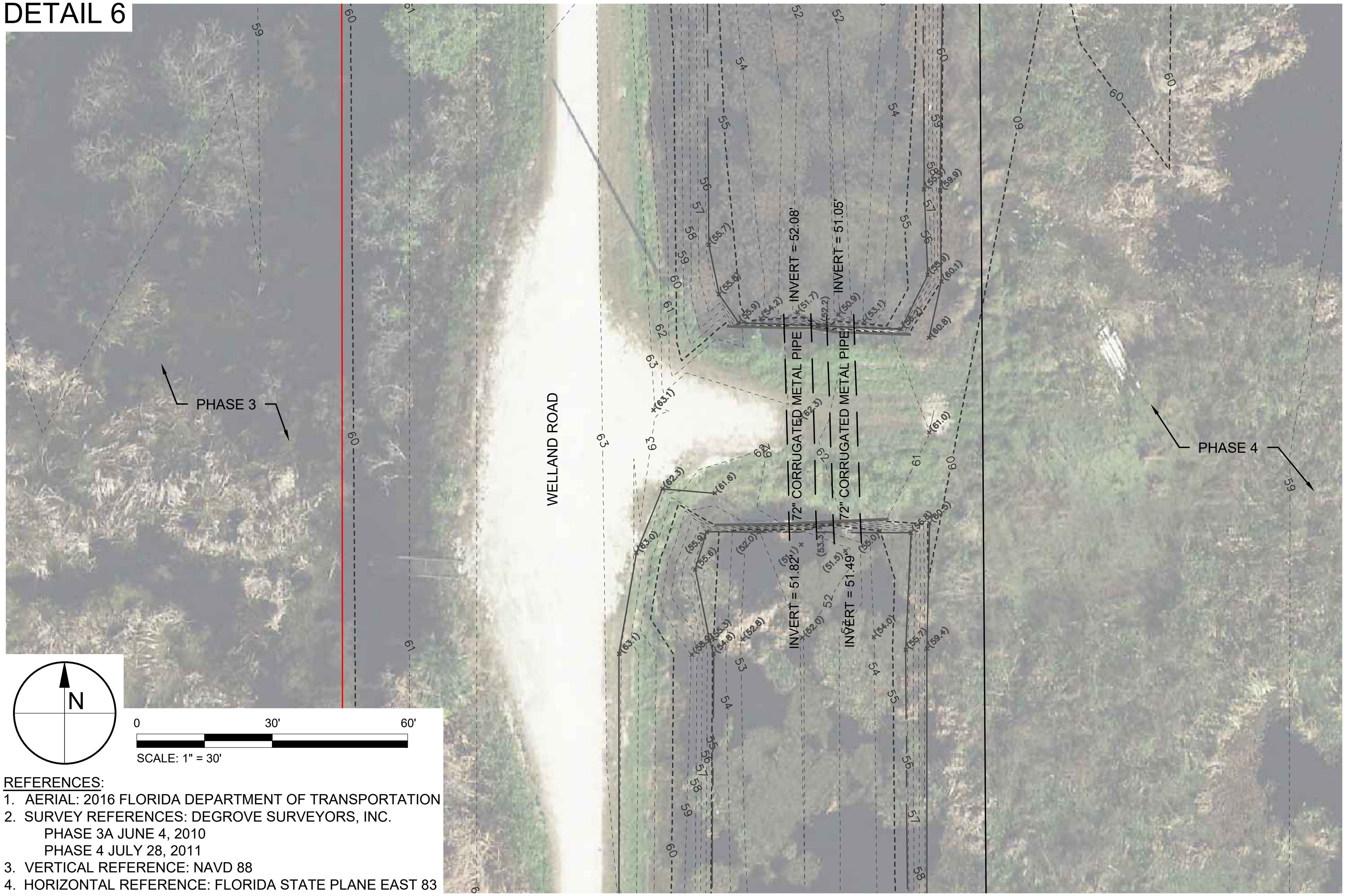
DETAIL 6



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1. AERIAL: 2016 FLORIDA DEPARTMENT OF TRANSPORTATION
2. SURVEY REFERENCES: DEGROVE SURVEYORS, INC.
   PHASE 3A JUNE 4, 2010
   PHASE 4 JULY 28, 2011
3. VERTICAL REFERENCE: NAVD 88
4. HORIZONTAL REFERENCE: FLORIDA STATE PLANE EAST 83

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FIGURE 10
DETAIL 6
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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DRAWN BY	RLJ
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DATE	DEC 2017

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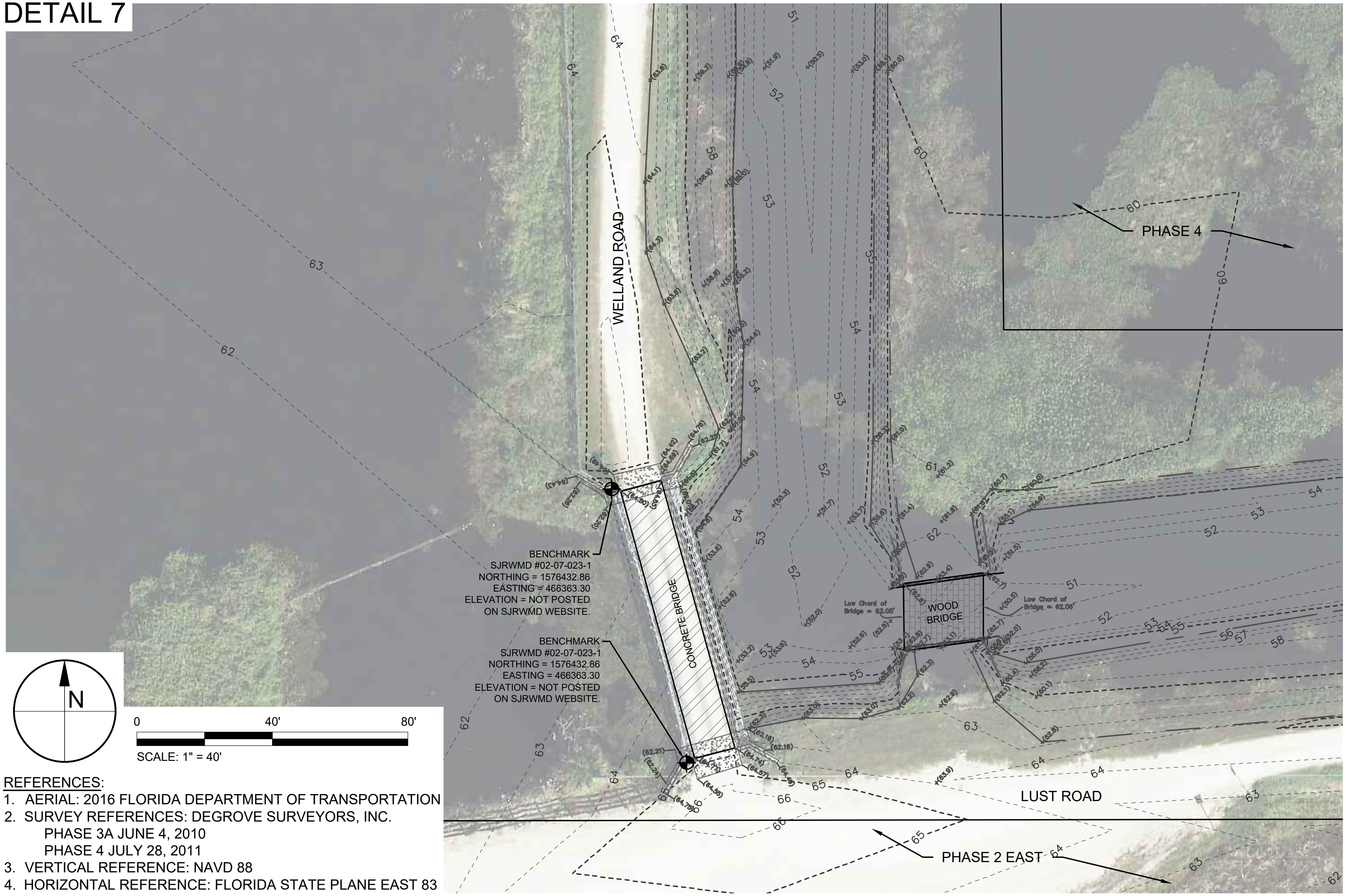

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FIGURE 11
DETAIL 7
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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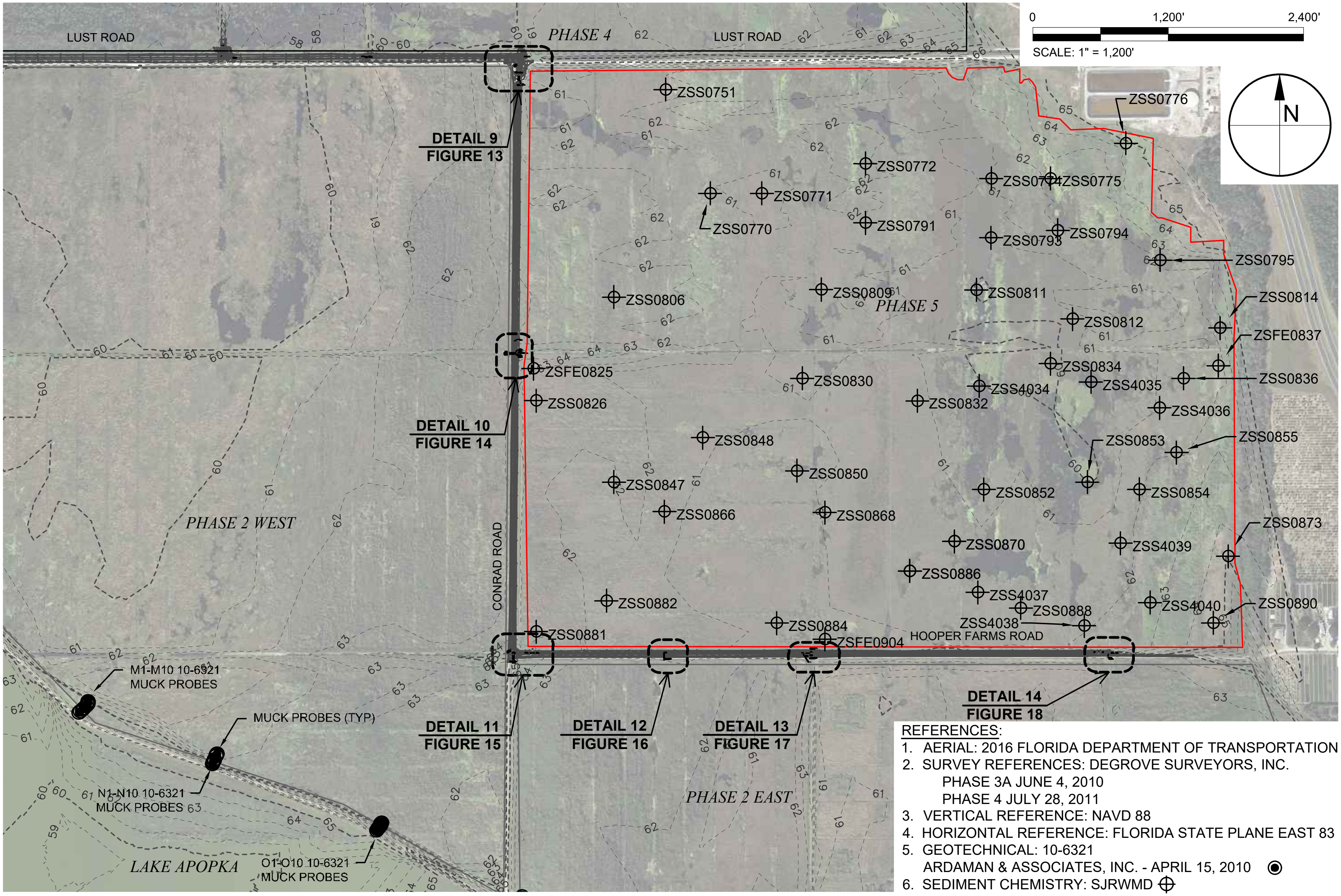

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3. VERTICAL REFERENCE: NAVD 88
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5. GEOTECHNICAL: 10-6321
   ARDAMAN & ASSOCIATES, INC. - APRIL 15, 2010
6. SEDIMENT CHEMISTRY: SJRWMD

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FIGURE 12
PHASE 5 OVERVIEW
LAKE APOPKA NEWTON PARK ACCESS CHANNEL
ORANGE COUNTY, FLORIDA

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DETAIL 9

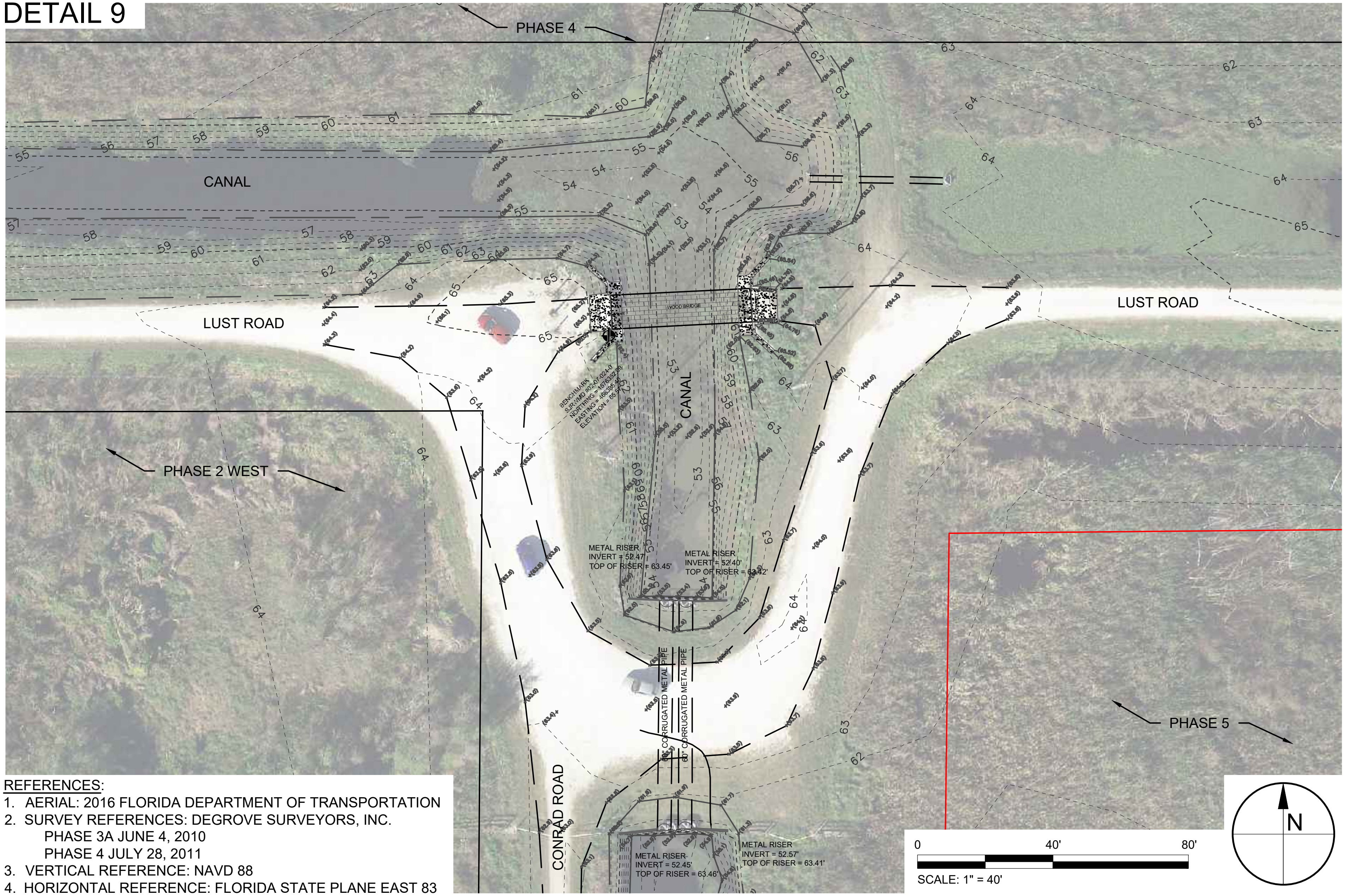

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FIGURE 13
DETAIL 9
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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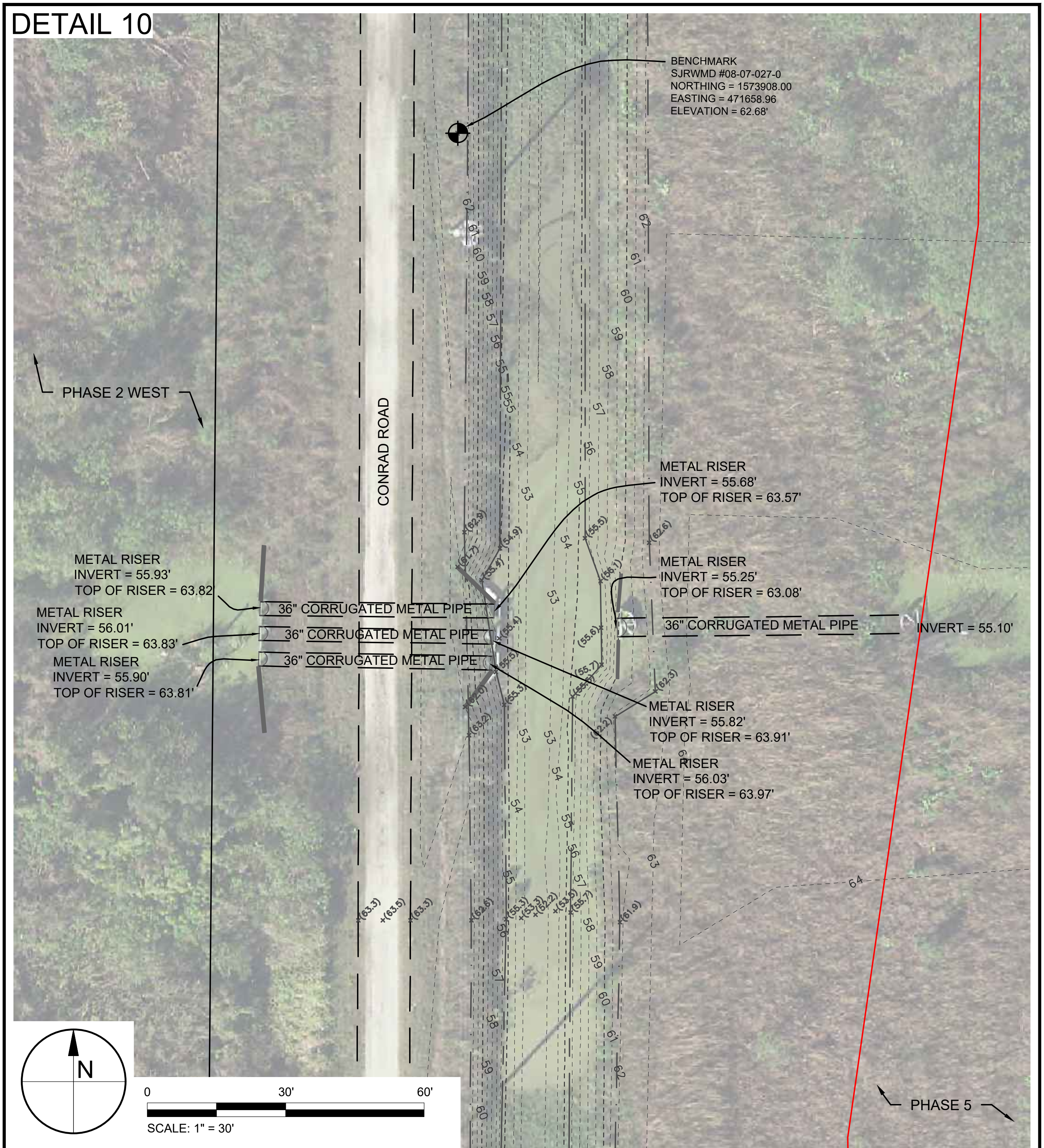

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FIGURE 14
DETAIL 10
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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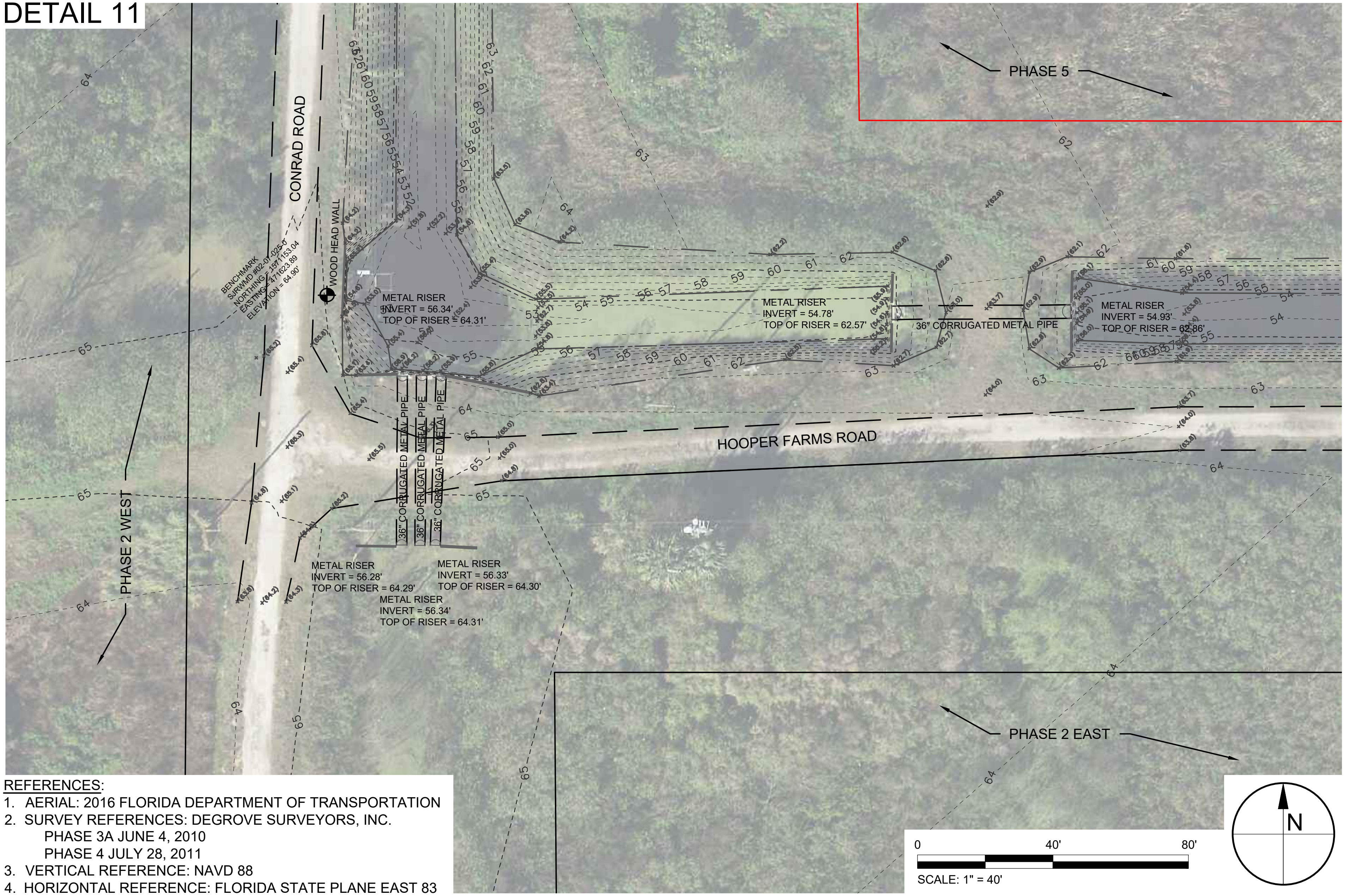

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FIGURE 15
DETAIL 11
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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DETAIL 12

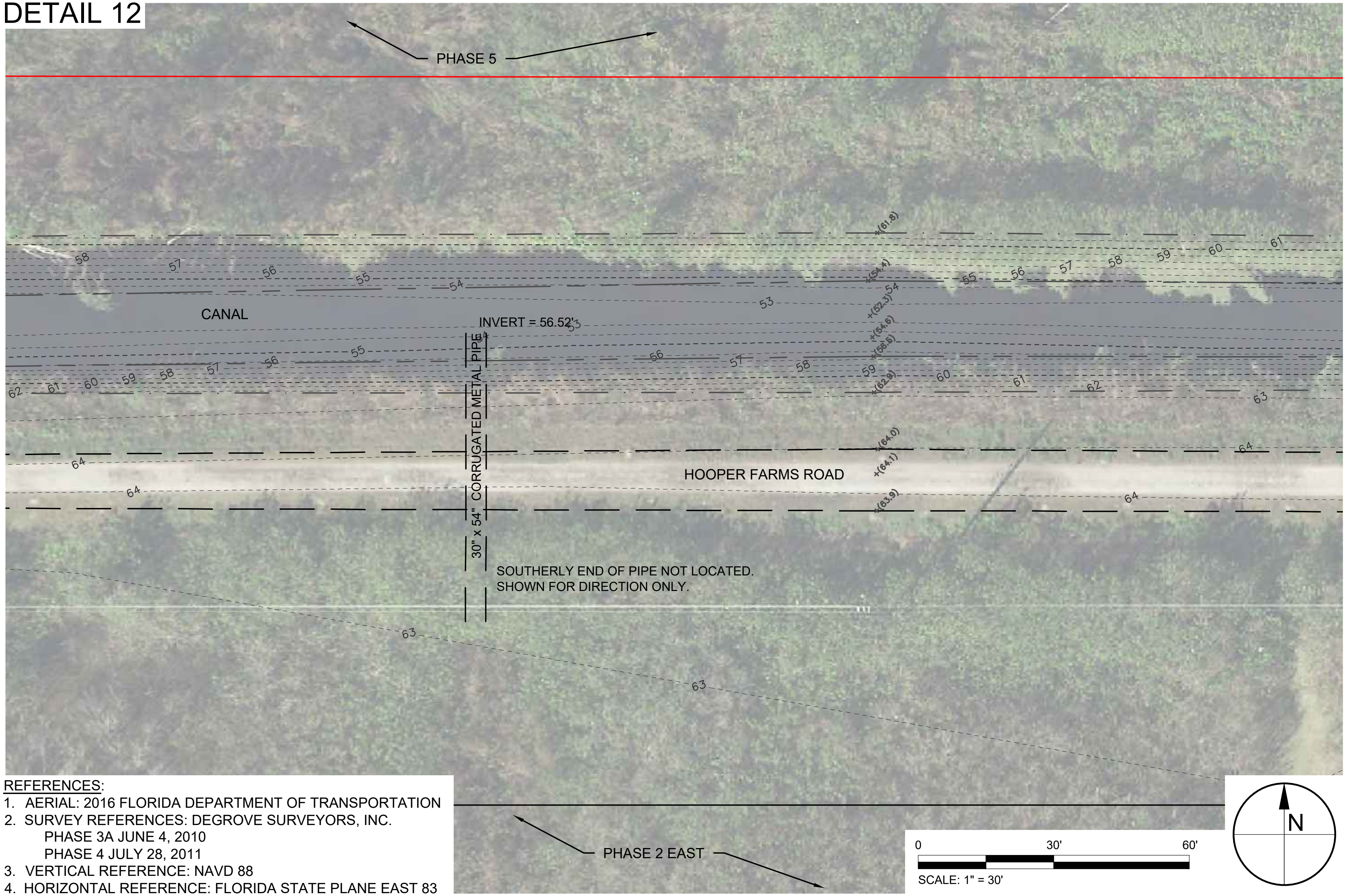

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FIGURE 16
DETAIL 12
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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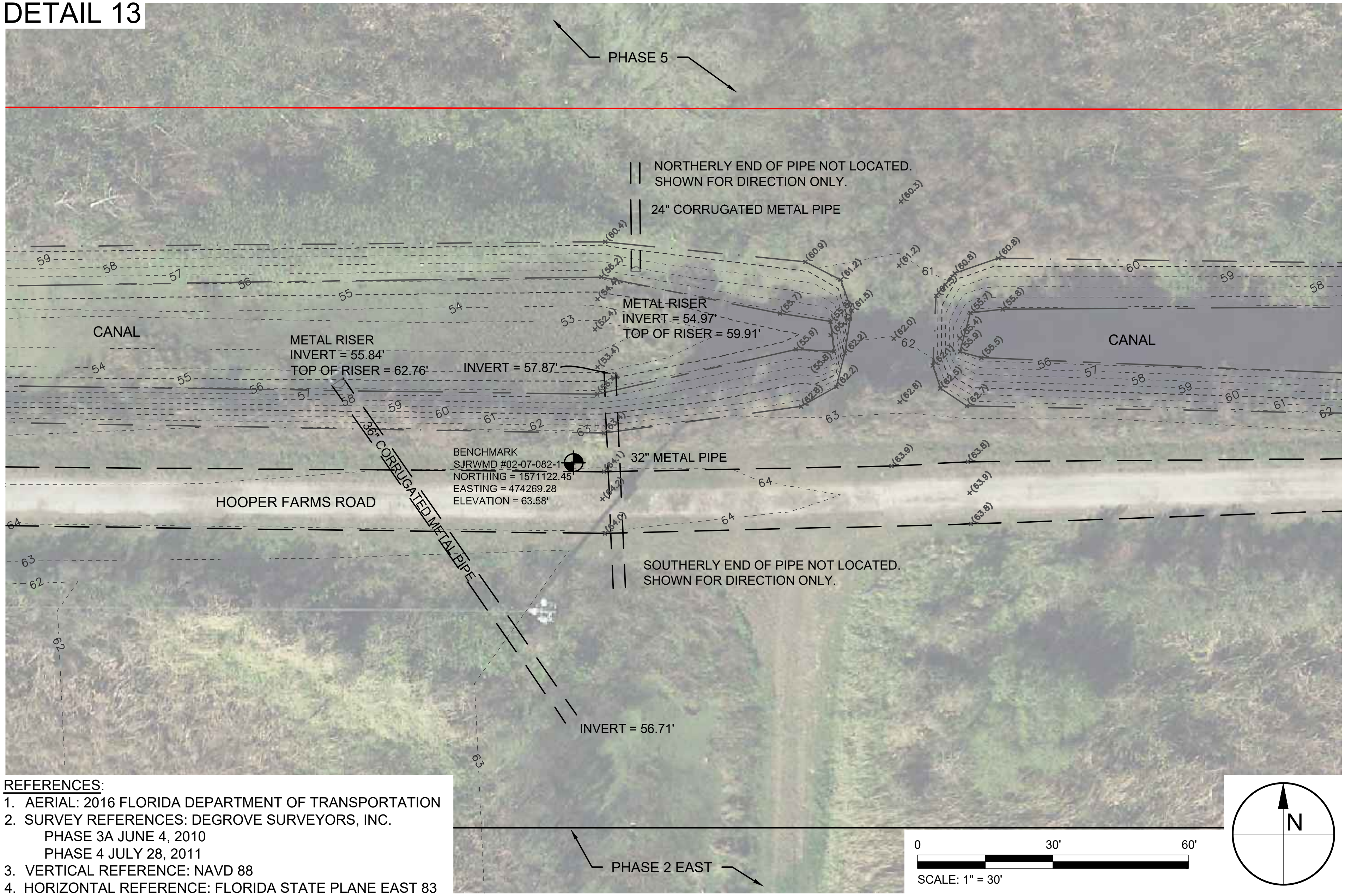

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FIGURE 17
DETAIL 13
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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DETAIL 14

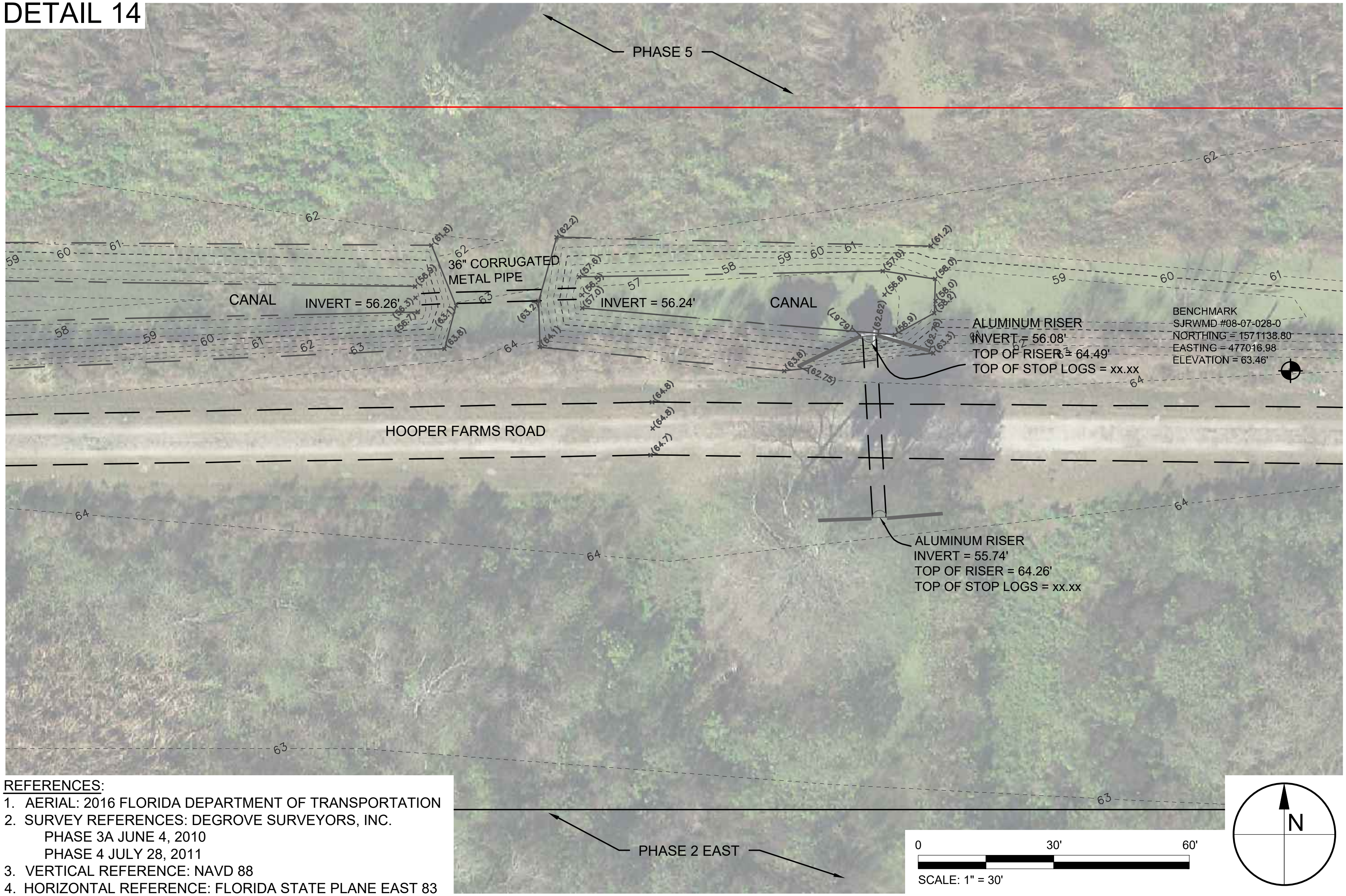

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FIGURE 18
DETAIL 14
LAKE APOPKA DESIGN & PERMITTING
ORANGE COUNTY, FLORIDA

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ATTACHMENT E

SJRWMD NRSA WETLAND ENVIRONMENTAL CRITIERIA

NSRA WETLAND ENVIRONMENTAL CRITERIA (NAVD 88)										
Phase Data				High water Criteria					Low water Criteria	
Phase	Typical low soil elevation	Median soil elevation	NWL Weir Elevation	Max High Water Level	4 ft depth <30 days	3.5 ft depth < 30 days 2 yr freq	3 ft depth < 90 days annual freq	2.5 ft depth <120 days annual freq	Water level less than 1.5 ft deep 50% 2 yr freq	Median soil surface exposed 30 days but no more than 60 days 5yr freq
1	59.00	60.50	62.00	63.25	63.00	62.50	62.00	61.50	62.00	60.50
2 E	58.50	59.50	61.50	62.75	62.50	62.00	61.50	61.00	61.00	59.50
2	57.50	59.00	60.50	61.75	61.50	61.00	60.50	60.00	60.50	59.00
3	58.00	58.50	61.00	62.25	62.00	61.50	61.00	60.50	60.00	58.50
4	55.50	57.50	58.50	59.75	59.50	59.00	58.50	58.00	59.00	57.50
5	57.50	59.00	60.50	61.75	61.50	61.00	60.50	60.00	60.50	59.00
6	57.50	58.50	60.50	61.75	61.50	61.00	60.50	60.00	60.00	58.50
7	58.50	59.50	61.50	62.75	62.50	62.00	61.50	61.00	61.00	59.50
8	58.00	59.50	61.00	62.25	62.00	61.50	61.00	60.50	61.00	59.50
Duda	60.00	61.50	63.00	64.25	64.00	63.50	63.00	62.50	63.00	61.50

Characterization of Surficial Unconsolidated Floc (UCF) and Consolidated Floc (CF) Sediments in Lake Apopka

Contract #28895: Design and Permitting for Lake Apopka Phosphorus Removal Projects through Sediment Dredging and Disposal
Work Order #1: Lake Apopka Dredging Programmatic Permit Applications
Task 1-4: UCF and CF Data Compilations and Analysis

Prepared for:

St Johns River Water Management District

PO Box 1429
Palatka, Florida 32178

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.

404 SW 140th Terrace
Newberry, FL 32669

Prepared by:
Michael F. Coveney
Principal Scientist

Reviewed by:
Shannon McMorrow
Senior Ecologist

Wood Project No.: 6735179417

July 2018

Characterization of Surficial Unconsolidated Floc (UCF) and Consolidated Floc (CF) Sediments in Lake Apopka

Work Order #1: Lake Apopka Dredging Programmatic Permit Applications
Lake Apopka
Project # 6735179417 | SJRWMD

Prepared for:

St Johns River Water Management District
PO Box 1429, Palatka, Florida 32178

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.
404 SW 140th Terrace
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USA
T: 352.332.3318

July 2018

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List of acronyms

CF	consolidated floc
FDEP	Florida Department of Environmental Protection
LANS	Lake Apopka North Shore
MDL	Method Detection Limit
mg/kg dwt	milligram per kilogram dry weight
µg/kg	microgram per kilogram
OCP	organochlorine pesticide
P	phosphorus
SAV	submersed aquatic vegetation
SCTL	Soil Cleanup Target Levels
SJRWMD	St. Johns River Water Management District
SWIM	Surface Water Improvement and Management
TMDL	Total Maximum Daily Load
TP	total phosphorus
UCF	unconsolidated flocculent sediments
USEPA	United States Environmental Protection Agency
Wood	Wood Environment & Infrastructure Solutions, Inc.

1.0 Executive Summary

This report is submitted in fulfilment of the deliverable requirements under Contract #28895, Work Order #1, Task 1-4 - Unconsolidated flocculent sediments (UCF) and consolidated floc (CF) Data Compilations and Analysis. The specific objective of Work Order #1 is to procure long-term, 10 and 20-year permits to cover anticipated dredging and material placement projects associated with dredging activities. Proposed dredging projects will enhance and recover submersed aquatic vegetation (SAV) within Lake Apopka and minimize risk to, or improve, the environmental condition of sediment placement areas on former agricultural properties adjacent to Lake Apopka. The objective of Task 1-4 is to summarize spatial, chemical, and physical sediment data from previous studies of Lake Apopka and to outline a sediment sampling and analysis plan for dredging projects.

Lake Apopka is in the Ocklawaha Chain of Lakes, is the fourth largest lake in Florida (31,000 acres), and lies within Orange and Lake Counties. Prior to the 1940s, the Lake had abundant submersed vegetation and was famous for its sport fishery. Large-scale conversion for agriculture of about 19,800 acres of mostly floodplain marshes at the north end of Lake Apopka began in the 1940s. Farming of the peat (“muck”) soils increased nutrient loading to the Lake and precipitated a shift from submersed vegetation to algal blooms. Because of oxidation of the drained muck soils, surface elevations in the farm areas subsided below lake level.

Legislation in 1985 (Lake Apopka Restoration Act) and 1987 (Surface Water Improvement and Management [SWIM] Act) directed the St. Johns River Water Management District (SJRWMD) to restore Lake Apopka to Class III water quality. Implementation of the SWIM plan had four main components: 1) Reduce phosphorus (P) loading from the watershed; 2) Remove P and flocculent sediments from the lake to accelerate recovery; 3) Improve food-web structure to improve water quality and production of game fish; and 4) Restore lake littoral zone habitat. The 1996 Lake Apopka Improvement and Management Act provided funding to initiate purchase of the floodplain muck farms on the north shore.

Phosphorus concentrations in Lake Apopka declined along with reductions in P loading. Other key water quality indicators also improved. Patches of SAV began to grow in the littoral zone after an absence of several decades. This resurgence in SAV was an important milestone, because SAV provides spawning, nursery, and feeding habitat for native fish and other wildlife. However, the total SAV area remains insufficient for a healthy littoral zone and thriving fisheries.

Recent analyses indicate that poor light availability has limited colonization of SAV into deeper areas of Lake Apopka and may have slowed infill of plants. Water clarity has improved through reduced algal growth, but suspended solids continue to be responsible for more than 50% of light attenuation. A surficial layer of UCF covers the lake bed and is underlain in most areas by CF. These sediments have high water and low solids contents and high nutrient levels. Wind-driven resuspension of floc sediments in Lake Apopka can contribute to suspended solids. Proposed dredging projects will target bottom areas in Lake Apopka where resuspension of sediments is most intense with the long-term goal of reducing suspended sediments in the water column and improving the light climate for SAV.

The material removed will be placed and contained on reflooded farm fields in the Lake Apopka North Shore (LANS), which provides two benefits: First, existing soils will be covered by sediments with lower levels of organochlorine pesticide (OCP) residues to help reduce OCPs in fish. LANS soils were remediated to achieve contaminant levels in fish that were protective for fish-eating birds. The long-term goal is to reach lower contaminant levels in soils and fish that are classified as protective for human health.

Placement of lake sediments, which are cleaner than existing soils, on areas of the LANS will help to achieve that goal. A second benefit from strategic placement of sediment on the LANS is to raise soil elevations to help create a diversity of wetland habitats through diversity in water depth. Surface elevations of portions of the LANS decreased as much as 6 ft below lake levels during the farming period.

This report includes a sediment sampling and analysis plan that will be followed for each specific dredging area that has not been sampled in the previous five years. Based on data collected to support other dredging projects in Lake Apopka (Test Sump Dredging, Newton Park Access Channel Dredging), we anticipate that mean concentrations of metals in dredged sediments will fall below the United States Environmental Protection Agency (USEPA) maximal pollutant concentrations for land application of biosolids. We further expect that mean concentrations of OCPs and metals (except arsenic) in dredged sediments will fall below residential thresholds in Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTL). We anticipate that mean levels of arsenic will fall below the SCTL commercial threshold.

2.0 Introduction

2.1 Background

Lake Apopka, in the headwaters of the Ocklawaha Chain of Lakes, is the fourth largest lake in Florida (approximately 125 km^2 or 31,000 acres). The lake is located approximately 15 miles northwest of Orlando. Lake Apopka lies mostly within Orange County; the western part of the lake lies in Lake County.

Prior to the 1940s, Lake Apopka had abundant submersed, rooted vegetation and was nationally famous for its clear water and abundant game fish (Clugston 1963; Lowe et al. 1999). Large-scale conversion for agriculture of about 80 km^2 (19,800 acres) of mostly floodplain marshes at the north end of Lake Apopka began in the 1940s. Drainage and farming of the peat ("muck") soils increased nutrient loading, water color, and lake stage, and precipitated a shift in the primary producer community from submersed macrophytes to phytoplankton (Schelske et al. 2010). Drainage water discharges from farm lands increased P loading sevenfold and were the primary cause of eutrophication (Battoe et al. 1999, Lowe et al. 1999). Because of oxidation of the drained muck soils, surface elevations in the farm areas subsided up to 1.8 m (6 ft) below lake level (Coveney 2016).

Legislation passed in 1985 and 1987 directed the SJRWMD to restore Lake Apopka to Class III water quality. SJRWMD began diagnostic and feasibility studies for the lake under the 1985 Lake Apopka Restoration Act, and the 1987 SWIM Act included the lake as a priority water body for restoration. The final Lake Apopka SWIM Plan included diagnostic, feasibility, and restoration efforts as well as planning, regulation, public information, land acquisition, and technical support for a total of 32 projects (Hoge et al. 2003). Implementation of the SWIM plan had four main components: 1) Reduce P loading from the watershed; 2) Remove P and flocculent sediments from the lake to accelerate recovery; 3) Improve food-web structure to improve water quality and production of game fish; and 4) Restore lake littoral zone habitat.

The 1996 Lake Apopka Improvement and Management Act authorized SJRWMD to set a P concentration target for the lake and provided funding to initiate purchase of the remaining floodplain muck farms on the north shore. SJRWMD adopted the total phosphorus (TP) concentration target in lake water of 0.055 mg/L in 1996 and established a P loading target for Lake Apopka of 15.9 metric tons P per year (Coveney et al. 2005). The FDEP and the USEPA adopted SJRWMD's loading limit as a Total Maximum Daily Load (TMDL) (Magley 2003). The P loading target represented a 74% reduction from baseline loading. Because many sources of P (e.g. atmospheric deposition and spring input) were not directly controllable, P loading from the farm/former farm areas had to be decreased by almost 90%.

TP concentrations in Lake Apopka declined along with reductions in phosphorous loading. Despite worsened conditions during droughts, key water quality indicators TP, chlorophyll-*a*, and Secchi transparency have improved (Coveney 2016). Beginning in 1995, patches of SAV, primarily eelgrass (*Vallisneria americana*) and muskgrass (*Chara* sp.), began to grow in the littoral zone of Lake Apopka after an absence of several decades (Coveney 2016). SJRWMD scientists found SAV species colonizing all types of sediments in the Lake including the soft, organic "muck" sediments that some have argued would preclude the establishment of rooted plants (Dobberfuhl et al. 2015). This modest resurgence in SAV is an important milestone for Lake Apopka, since SAV provides spawning, nursery, and feeding habitat for native fish and other wildlife. However, the total area colonized through 2016 by SAV and floating-leaved vegetation (34 ha, 84 acres) is insufficient for a healthy littoral zone and thriving fisheries.

Recent analyses indicate that poor light availability has limited the colonization of SAV into deeper areas of Lake Apopka (Amec Foster Wheeler 2018) and may have slowed infill of plants in shallower water. These analyses did not support a conclusion that sediment type has limited SAV development. Water clarity has improved through restoration efforts that reduce algal growth, but suspended solids other than algae are responsible for more than 50% of light attenuation. Other studies have concluded that wind-driven resuspension of surficial floc sediments can contribute to suspended solids in Lake Apopka (Mehta et al. 2009, Pollman 2016). Proposed dredging projects will target bottom areas in Lake Apopka where wind-driven resuspension of surficial sediments is estimated to be most intense. The material removed will be placed and contained on former farm fields on the LANS. Projects also may be proposed for improved boat access.

2.2 Task Objectives

The following information is submitted in fulfilment of the deliverable requirements under Contract #27971, Work Order #1, Task 1-4 - UCF and CF Data Compilations and Analysis. This task is part of the Design and Permitting for Lake Apopka Phosphorus Removal Projects through Sediment Dredging and Disposal project.

The primary objective of the Design and Permitting for Lake Apopka Phosphorus Removal Projects through Sediment Dredging and Disposal project is to prepare design drawings and acquire permits for various targeted dredging projects. These projects will enhance and recover SAV within Lake Apopka and minimize risk to, or improve, the environmental condition of sediment placement areas, while advancing recreational uses of the lake and LANS. Former agricultural properties adjacent to Lake Apopka owned by SJRWMD will be used for material handling and beneficial use of dredged material.

The specific objective of Work Order #1 is to procure long-term, 10-year (United States Army Core of Engineers) and 20-year (FDEP) permits to cover anticipated dredging and material placement projects associated with dredging activities. The objective of Task 1-4 is to summarize and analyze sediment data from previous lake-wide studies of Lake Apopka. These data include spatial distribution and physical and chemical characteristics of the UCF and CF sediment layers that are pertinent to requirements of a conceptual permit. Section 6 of this report outlines plans for sediment sampling and analyses to be conducted as each dredging project is implemented.

3.0 Characterization of Lake Apopka Sediments

3.1 General Description of Sediments in Lake Apopka

A surficial layer of UCF covers almost the entire lake bed of Lake Apopka. Reddy and Graetz (1991) measured a mean UCF thickness of 32 cm (12.6 in) at 90 sites in 1987 (Fig. 1). This UCF averaged 96% water and had total organic carbon content of about 30% dry weight (Reddy and Graetz 1991). A CF sediment layer was below the UCF over most of the lake bottom. The CF sediments averaged 92% water and had total organic carbon content of about 32% dry weight (Reddy and Graetz 1991). Reddy and Graetz (1991) measured an average depth of the CF sediment layer of 82 cm (32 in) (Fig. 2). However, their coring device did not completely penetrate the CF layer at about 70% of sampling sites, so this average thickness is a minimal estimate. Further, underestimates of CF thickness would have occurred at locations with thick UCF and CF sediments. It is likely that many areas with thick CF sediments (Fig. 2) have even thicker CF layers.

Schelske (1997) collected sediment cores from Lake Apopka in 1995 and 1996. He determined sediment chronology (^{210}Pb dating), analyzed diatom microfossils, and sectioned all cores for a series of chemical and physical measurements. Schelske (1997) and Schelske et al. (2000) concluded from many lines of evidence that the UCF and the underlying CF sediments were qualitatively different materials that were formed by different dominant plant communities in the history of the lake: phytoplankton for the recent UCF sediments and higher plants for the older, underlying CF sediments. The UCF layer was produced during the period of phytoplanktonic dominance in Lake Apopka that began in the late 1940s.

Sand, peat, clay, and marl deposits are found as deeper strata in Lake Apopka and are present at or near the surface in some areas, especially in shallow water. Physical and chemical data on these layers also are found in Reddy and Graetz (1991). However, targeted environmental dredging projects proposed for Lake Apopka will not include these sediment types unless removal is incidental to removal of floc sediments. These underlying sediment types may be encountered in access dredging projects. Section 6 of this report outlines the sampling of sediments in specific areas to be conducted when projects are developed.

Figure 1. Thickness of UCF sediments in Lake Apopka

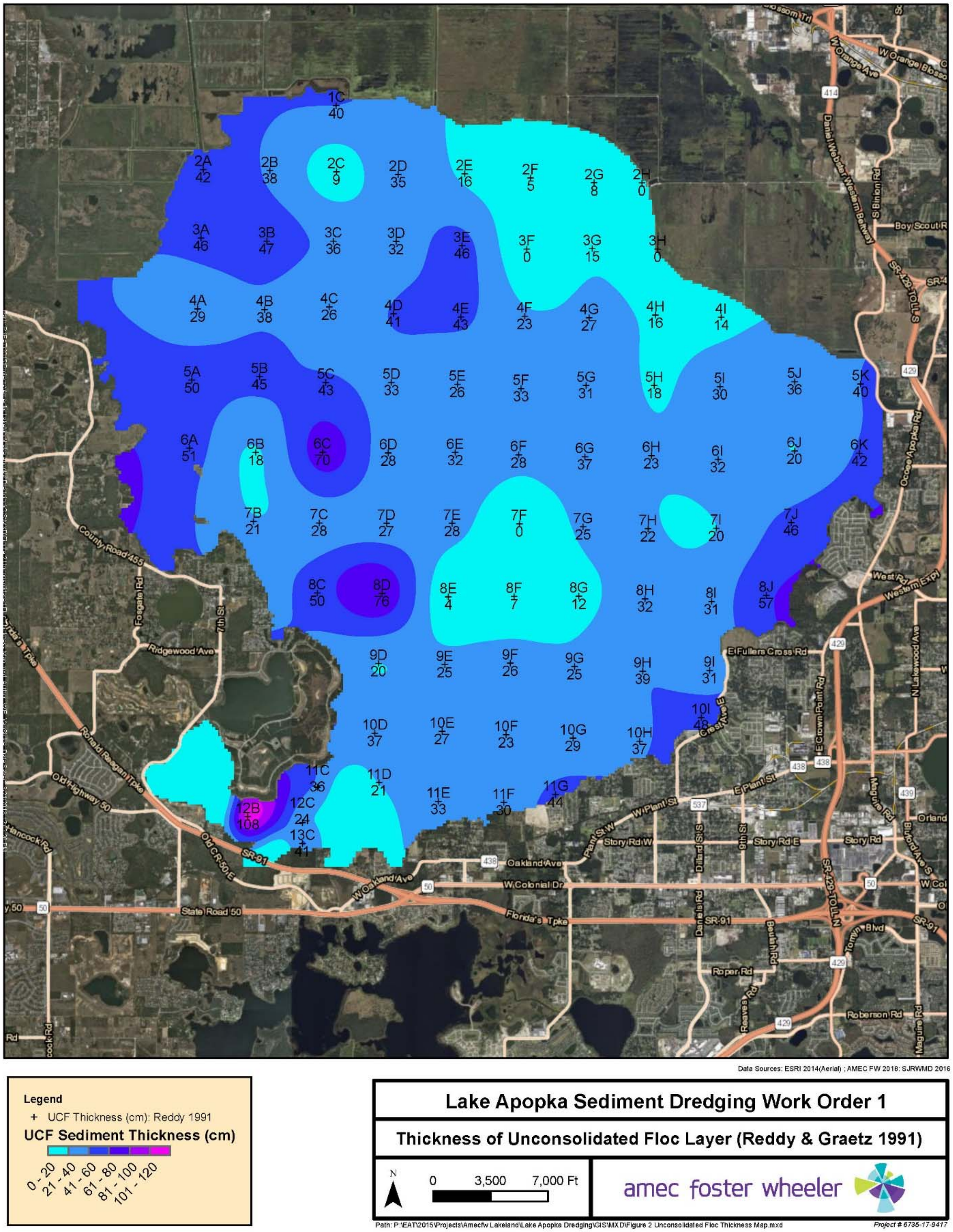
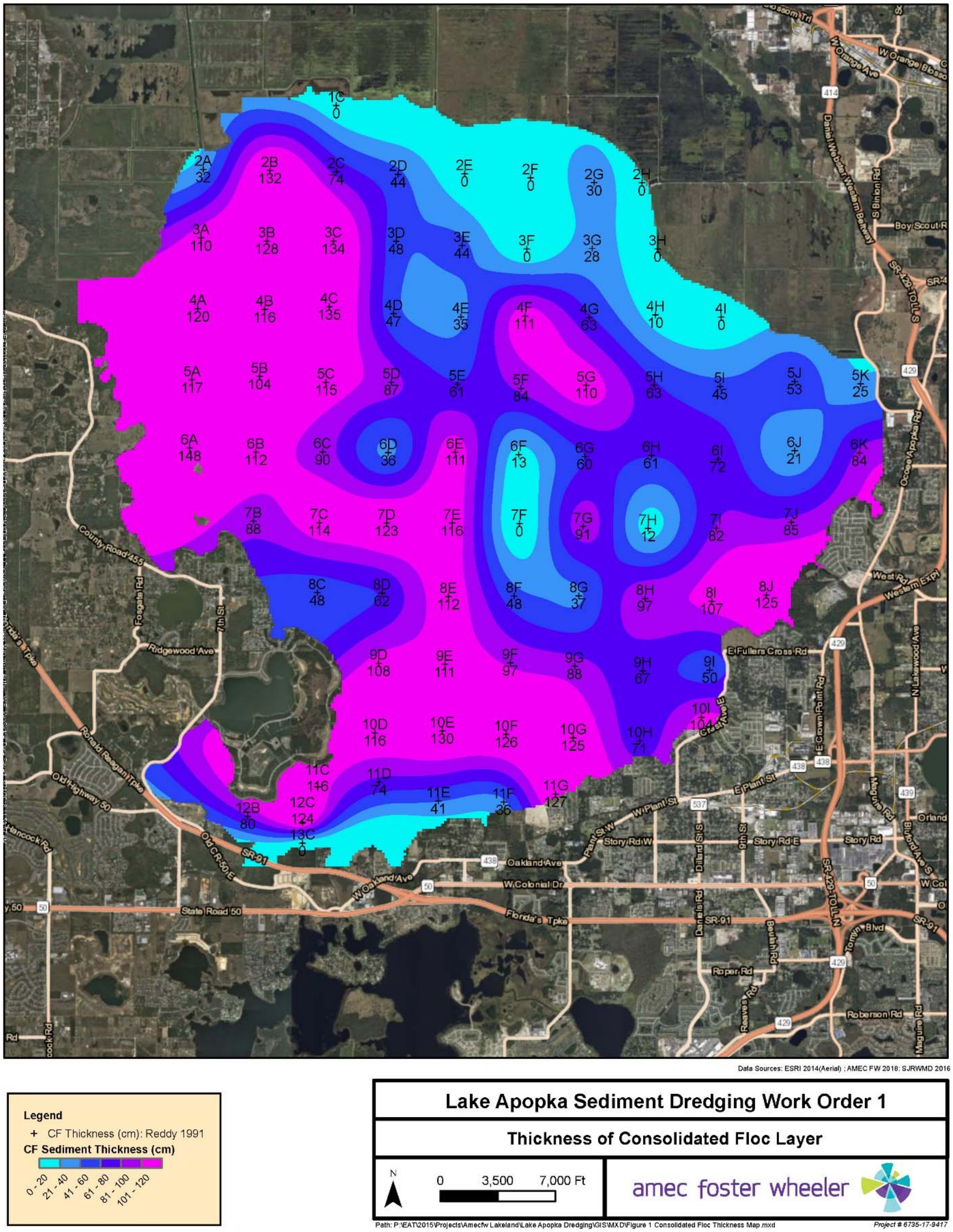


Figure 2. Thickness of CF sediments in Lake Apopka



Note: These are minimal estimates for some areas (see text).

3.2 Previous Studies

Previous studies have been conducted concerning Lake Apopka's sediment thickness, sediment quality, sediment deposition, and sediment transport. Notable studies are summarized below. We use results from Reddy and Graetz (1991) as the primary source of information in this report because that study was the most comprehensive in terms of both spatial and depth coverage and breadth of analyses. We include here (below) select physical and chemical data from the most recent study (Thomas 2009) to compare with Reddy and Graetz (1991).

Schneider and Little (1969)

Schneider & Little (1969) were tasked with 1) mapping the unconsolidated sediments in Lake Apopka, 2) measuring physical and chemical characteristics of the sediments, and 3) analyzing major sources of nitrogen and P to the lake. They collected sediment cores in 1968 at approximately 90 sites on a regular grid over Lake Apopka. They found unconsolidated sediment to cover 90% of the lake bottom to an average depth (based on probing) of 5 ft (150 cm). This sediment would have included the UCF and CF layers and likely some peat. They described exposed sand, clay, and shell over about 5% of the bottom area. Schneider & Little (1969) made recommendations for restoration of Lake Apopka that put top priority on reduction in nutrient loading followed by consideration of removal of nutrients from the lake.

Reddy and Graetz (1991)

Reddy and Graetz (1991) conducted a 3-year research effort to develop an internal nutrient budget for Lake Apopka. The study included characterization of Lake Apopka sediments in terms of nutrient sources and physical characteristics (bulk density, water content, and spatial distribution of sediments). Dissolved nutrient flux from sediments to the overlying water column was evaluated along with transformations of carbon, nitrogen, and phosphorous in the sediment-water column. Additionally, the study evaluated sediment resuspension effects on nitrogen and phosphorous flux across the sediment-water interface along with seasonal changes in carbon and nitrogen fixation in the lake. As part of the study, sediment samples were obtained in 1987 from 90 stations with the lake with a spacing of approximately 4,000 ft. along a regularly spaced grid. The study noted that compared to Schneider and Little (1969), the average depth of the UCF layer increased from approximately 10.4 cm to 32.2 cm from 1968 to 1987 (approximately 22 cm or 1.2 cm per year).

Segal and Pollman (1992)

Segal and Pollman (1992) analyzed 152 potentially toxic elements and compounds in sediment samples from two depths (0 – 10 cm, 10 – 20 cm) at ten locations in Lake Apopka. In addition to reporting the results, they attempted to determine the potential deleterious effects of these substances on lake biota, fisheries, and recreational uses. The only contaminant criteria available for comparison were for lake water (USEPA) or for sediments in the Laurentian Great Lakes, Wisconsin, and Canada. The authors recognized the uncertainty in using these criteria from very different systems for comparison. Thirteen of the 152 elements and compounds occurred in sufficiently high concentrations to warrant detailed examination. Based on their comparisons with water and north-temperate sediment standards, copper and lead appeared to pose the greatest threat of toxicity to Lake Apopka. Concentrations of arsenic and selenium exceeded some of their standards but not all. Their analytical methods for most organic compounds including OCPs had high method detection limits, so most of the analyte concentrations were below detection. However, their analyses of several of the metals resulted in detectable levels that can be compared with more recent data.

Schelske (1997)

Schelske (1997) conducted a study to: (1) characterize and determine the origins of Lake Apopka sediments, and (2) to estimate lake basin sedimentation of mass, organic matter, TP, and non-apatite inorganic phosphorous after 1947, when the lake presumably shifted from macrophyte dominance to phytoplankton dominance. Field sampling was conducted during 1995 and 1996 at 57 locations within Lake Apopka. At each sampling station, the thickness of soft sediment was determined using a steel spudding rod calibrated in 5 cm intervals and a Secchi disc. Water depth was determined by lowering a 20-cm Secchi disc to the sediment surface and the depth was subtracted from the spudding value to determine soft sediment depth. The results of the study showed that sediment storage is highly variable across Lake Apopka. The variability is attributable to sedimentation and transport dynamics. Areas with low storage may be indicative of high resuspension and transport rates. Soft sediment thicknesses varied from 30 to 705 cm (mean 245 cm / standard deviation +/- 163 cm). UCF thickness varied between 1 and 136 cm (mean 47 cm / standard deviation +/- 32 cm).

Durell et al. (2004)

Surface sediment samples (top 10 cm) were collected and analyzed for 92 organic compounds and 15 metals across the SJRWMD during 1996-1997, 1998-1999, and 2002. Within Lake Apopka, 19 sites were sampled; 3 as part of the districtwide assessment and 19 (including the three districtwide locations) as part of a follow-up, detailed assessment study. Durell et al. (2004) made ancillary measurements including percent clay, percent sand, percent silt, percent solids, percent total organic carbon, and percent volatile solids for the top 10-cm of the sediment column at each of the 19 locations. For Lake Apopka, Durell et al. (2004) found that “total DDT” (DDT+DDD+DDE) presented the greatest potential risk to sediment-dwelling organisms. Arsenic presented a lower but possible risk. However, they noted that the high organic content of sediments in Lake Apopka could result in DDT being less bioavailable to benthic organisms than in sediments with more typical, lower organic contents. DDT and arsenic concentrations reported by Durell et al. (2004) were similar to more-recent values reported here.

Mehta et al. (2009)

Mehta et al. (2009) developed and presented the results of a sediment resuspension model to predict lakewide suspended sediment concentration distributions at different wind velocities and water levels. Two approaches were used: (1) an analytic model based on suspended sediment mass balance in the vertical direction, and (2) a fully three-dimensional numerical model. The report describes sediment studies undertaken to document the potential and occurrence of resuspension of lake sediments and to relate site-specific sediment properties with corresponding yield strength measurements. Four stations were sampled twice during the study (three corresponded with Schelske [1997] sites). Sediment cores were collected during August 2007 and May 2008 and analyzed to determine stratigraphy, bulk density, total organic matter, total organic carbon and nitrogen, total biogenic silica, viscosity, yield stress, and activities of the radioisotope 7Be. Measurements were made in the upper 12 cm of sediment (unconsolidated sediment layers) at all four locations. Additional measurements to 26 cm were made a one location.

Thomas (2009)

Thomas (2009) conducted a study to identify and quantify total phosphorous, total carbon, and total nitrogen storages in the UCF, CF, and underlying sediments. Sampling was conducted during July 2009. UCF sediments were sampled at 30 sites that overlapped with a subset of Schelske (1997) sites. Deeper sediments were sampled at 5 additional sites for a total of 35 locations. The depths of water, UCF, and CF were estimated at each location based on coring and probing results. Deep sediment cores were generally sectioned at 2.5 to 5 cm intervals and tested to determine sediment pH, water content, solids content, total organic content, bulk density, total carbon, total inorganic carbon, total phosphorous, and total nitrogen. UCF sediments were analyzed for the same parameters.

3.3 Physical and Chemical Characteristics of UCF and CF Sediments

Tables 1 and 2 summarize pertinent physical and chemical data for the UCF and CF sediment layers in Lake Apopka taken from Reddy & Graetz (1991) and Thomas (2009). Reddy & Graetz reported only total Kjeldahl nitrogen, and Thomas reported only total nitrogen. These two quantities will be almost identical in Lake Apopka sediments because levels of nitrate and nitrite are negligible. We report both measurements here as total nitrogen. The uncertainty in summary statistics for the CF layer from Thomas is larger because deep cores were taken at only five sites. Here, we aggregated 79 samples taken from CF sediment sections in the five cores.

For UCF sediments, Thomas (2009) reported somewhat higher water content and lower solids content than Reddy & Graetz (1991). Thomas also found significantly higher total P in UCF sediments (Wilcoxon rank sum test, $p < 0.05$). Higher total P in 2009 is feasible given the elapsed time between the two studies under continued eutrophic conditions. However, these differences also could have originated from slightly different sampling techniques. Reddy & Graetz (1991) sampled the entire UCF layer for chemical and physical analyses. Thomas (2009) sampled the top 10 cm. The top of the UCF layer would have lower solids content but higher total P levels in dry matter than deeper UCF.

Table 1. Pertinent physical characteristics of UCF and CF sediments from Reddy & Graetz (1991) and Thomas (2009).

		UCF		CF	
		Reddy & Graetz 1991	Thomas 2009	Reddy & Graetz 1991	Thomas 2009
No. of Sites		**81 - 82**	**35**	**76 - 77**	**5**
Percent Moisture	Min	87.8	94.2	80.3	90.9
	Median	96.8	97.8	92.6	93.5
	Mean	96.3	97.6	91.9	93.4
	Max	99.6	98.6	95.5	96.2
	StdDev	1.8	0.8	2.3	1.1
Percent Solids	Min	0.42	1.45	4.52	3.78
	Median	3.20	2.18	7.39	6.53
	Mean	3.65	2.36	8.07	6.57
	Max	12.20	5.80	19.74	9.09
	StdDev	1.83	0.84	2.34	1.15
Wet Bulk Density g/ml	Min	0.03	0.65	0.33	0.78
	Median	1.03	0.98	1.05	1.08
	Mean	0.99	0.96	1.04	1.07
	Max	1.45	1.06	1.43	1.60
	StdDev	0.21	0.08	0.10	0.12

Table 2. Pertinent chemical characteristics of UCF and CF sediments from Reddy & Graetz (1991) and Thomas (2009)

		UCF		CF	
		Reddy & Graetz 1991	Thomas 2009	Reddy & Graetz 1991	Thomas 2009
No. of Sites		**86 - 87**	**35**	**67 - 68**	**5**
Total P mg/g dwt	Min	0.10	0.57	0.05	0.29
	Median	0.93	1.57	0.54	0.43
	Mean	0.96	1.51	0.59	0.58
	Max	2.26	2.01	2.91	1.73
	StdDev	0.44	0.36	0.38	0.32
Total N mg/g dwt	Min	1.4	6.2	2.7	14.4
	Median	22.3	25.0	22.0	29.3
	Mean	23.7	24.4	22.0	29.2
	Max	34.7	35.1	35.2	39.9
	StdDev	7.5	4.7	4.9	3.9
Total Organic Carbon % dwt	Min	1.3	11.0	3.6	15.3
	Median	31.2	29.5	33.5	36.4
	Mean	29.0	28.6	31.5	34.9
	Max	48.1	33.0	42.8	44.0
	StdDev	8.3	3.9	8.3	5.0

4.0 Beneficial Use of Sediment Placement

The intended beneficial use of dredged sediments is placement on former farms in the LANS wetland restoration area. This plan provides two benefits to the wetlands. First, existing soils will be covered by sediments with lower levels of OCP residues to help reduce OCPs in fish. LANS soils were remediated to achieve OCP levels in fish that are protective for fish-eating birds. The long-term goal for the LANS is to reach OCP levels in soils and fish that are considered to be protective for human health. Placement of lake sediments, which have lower OCP levels than existing soils, on areas of the LANS will help to achieve that goal. In the Lake Apopka Test Sump Dredging project (Amec Foster Wheeler 2016), sediment contaminants often were below detection limits for pesticides and metals, and concentrations typically were lower than those in the original soils in the placement areas (LANS Cells F and G). A second benefit from strategic placement of sediment on areas of the LANS is to raise soil elevations to help create a diversity of wetland habitats through diversity in water depths. Surface elevations of portions of the LANS decreased as much as 1.8m (6 ft) below lake levels during the farming period through oxidation of organic soils and subsidence.

5.0 Contaminant Levels in Lake Apopka Sediments

The USEPA has adopted maximal pollutant concentrations for the land application of biosolids (e.g. treated sewage sludge residuals) for selected metals (CFR Title 40, Chapter I, Subchapter O, Part 503.13 Pollutant Limits). Based on data collected to support other dredging projects in Lake Apopka (Test Sump Dredging, Newton Park Access Channel Dredging), we expect that mean concentrations of metals calculated for the volume of dredge material will fall below the biosolids thresholds, indicating likely acceptability for these sediments in agricultural settings.

FDEP SCTLs are risk-based thresholds intended to protect public health after contaminated sites have been remediated and placed back into beneficial use. These thresholds are published (https://floridadep.gov/waste/district-business-support/documents/table-ii-soil-cleanup-target-levels) for a variety of metals and pesticides and must be considered if sediments are used in residential, commercial, or industrial sites. We expect that all OCPs and metals (except arsenic) in potential dredged sediments will fall below the residential thresholds. Based on previous sediment sampling in Lake Apopka, mean arsenic concentrations likely will exceed the residential threshold [2.1 milligrams per kilogram dry weight (mg/kg dwt)], and individual samples may exceed the commercial/industrial threshold (12 mg/kg dwt). However, we expect that mean levels of arsenic calculated for the volume of dredge material will lie between residential and commercial thresholds.

Data and summary statistics for recent sediment contaminant analyses for Lake Apopka are found in Appendix A. Sediment samples were analysed both for the Test Sump Dredging project (Amec Foster Wheeler 2016) and in preparation for the Newton Park Access Channel dredging (Taylor Engineering, Inc. 2017). Summary statistics were calculated using the MDL value in cases where measured values were below the detection limit (U laboratory code) and thus represent high estimates for analytes with a large percentage of non-detects. Analytes included organochlorine pesticides (OCPs) and metals. Sediment samples were taken both in discrete layers (e.g. UCF) and as vertical composite samples.

Even with the large number of non-detects – up to 100% for some analytes – means, medians, and third-quartile values lie below the USEPA biosolids criteria and the FDEP SCTL residential targets for all analytes except arsenic. High detection limits were caused by the low solids content of these sediments. SJRWMD dried subsets of the samples and reran some of the analyses (Tables A-3 and A-5). Solids contents increased approximately 11-fold for one sample set and 9-fold for the other, and detection limits decreased. Concentration of UCF samples by drying or other means as well as improved analytical precision will be necessary to achieve some of the MDL targets specified in Table 3.

Median arsenic concentrations in Lake Apopka sediments for the actual proposed dredging volume were 6.2 mg/kg dwt (Test Sump Dredging, Amec Foster Wheeler 2016) and 6.6 mg/kg dwt (Newton Park Access Channel dredging, Taylor Engineering, Inc. 2017). These median values are within the natural background levels for Florida histosols (highly organic soils or muck) of 0.25 to 11.7 mg/kg dwt (Chen et al. 2002). These comparisons suggest that sites already comprised of histosols on the LANS would be appropriate candidates for placement of the dredged material.

Segal and Pollman (1992) measured arsenic at 10 sites (two depths) in Lake Apopka sediments. Their median value of 9.6 mg/kg dwt was significantly higher (Kendall-Wallis non-parametric ANOVA, $p < 0.05$) than the median value of surface (0 to 2 ft) samples from the Test Sump Dredging, indicating that arsenic in surficial sediments in Lake Apopka may have declined with time. This was not the case for arsenic data from Newton Park (no significant difference vs Segal and Pollman), but the Newton Park data consisted of only seven samples, which limited the power of the test.

6.0 Proposed Sediment Sampling and Analysis Plan

If sediments in the footprint of each proposed dredging project have not been sampled in the previous five years, then new sediment sampling will be conducted using a sediment coring device on a regularly-spaced grid. A minimum of 10 sites will be sampled for projects up to 800 acres in area. For larger projects, one sample will be collected for every 80 acres of area. Samples will extend from the top of the sediment surface to the elevation proposed for dredging. If the entire vertical extent of the proposed dredging at a site cannot be captured in a single core, then a second core will be taken to complete the profile. Sample collection will follow applicable FDEP standard operating procedures.

Chemical analyses will include the following:

- Resource Conservation and Recovery Act -8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver)
- Copper
- Organochlorine pesticides 8081 (Lake Apopka protocol or equivalent)
- Mix-C OCPs 8081 (cis-nonachlor, trans-nonachlor and oxychlordane)
- Toxaphene (Lake Apopka 5-point protocol or equivalent)
- % Solids (or % Moisture)
- TP
- Total nitrogen (or total Kjeldahl nitrogen)
- Total organic carbon

Laboratory sample method detection limits (MDL) for metals and OCPs will meet or exceed target values in Table 3 below. Samples will be concentrated by drying or centrifugation, and analytical precision will be improved as necessary to meet these detection limits. These values are specified to ensure that resulting data can be compared with various regulatory criteria and target levels.

Further geotechnical testing of sediments will be done as needed to design the dredging and placement components of each project.

Sediment concentrations of metals and OCPs will be compared with the most stringent USEPA Biosolids Criteria (maximal pollutant concentrations), FDEP SCTLs, and with soil concentrations in the proposed placement area(s) to evaluate suitability of placement of sediments in the LANS. Both individual sample results and means calculated for the entire dredged sediment volume will be compared with the USEPA criteria and FDEP target levels.

The suitability of sediments for placement in the LANS will be based on mean concentrations of contaminants in the sediment volume to be removed. Mean concentrations of metals should fall below the biosolids criteria. Mean concentrations of all OCPs and metals (except arsenic) should fall below SCTL residential thresholds. Individual arsenic values may exceed the SCTL commercial/industrial threshold. However, the mean arsenic concentration for the volume of dredged sediment should fall below the commercial threshold.

If sediment sampling done for each proposed dredging project finds mean contaminant values exceeding these limits, then SJRWMD will consult with appropriate regulatory agencies.

Table 3. Sample Method Detection Limit (MDL) targets for analyses of OCPs and metals in sediment samples from Lake Apopka

Parameter	MDL
Organochlorine Pesticides	
4,4'-DDT	4.2 µg/kg
4,4'-DDD	4.9 µg/kg
4,4'-DDE	3.2 µg/kg
alpha-Chlordane	0.46 µg/kg
gamma-Chlordane	0.46 µg/kg
Oxychlordane	0.46 µg/kg
cis-nonachlor	0.46 µg/kg
trans-nonachlor	0.46 µg/kg
Toxaphene	0.10 µg/kg
Dieldrin	1.9 µg/kg
Aldrin	60 µg/kg
Heptachlor	200 µg/kg
Endrin	2.2 µg/kg
Heptachlor epoxide	2.5 µg/kg
gamma-BHC (Lindane)	2.4 µg/kg
Metals	
Arsenic	2.1 mg/kg
Barium	20 mg/kg
Cadmium	1.0 mg/kg
Chromium	43 mg/kg
Copper	32 mg/kg
Lead	36 mg/kg
Mercury	0.18 mg/kg
Silver	1.0 mg/kg
Selenium	1.0 mg/kg

Source: SJRWMD

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Appendix A
Data and Summary Statistics for Recent Sediment Contaminant Analyses for Lake Apopka

Appendix A Data and Summary Statistics for Recent Sediment Contaminant Analyses for Lake Apopka

Sediment samples were analysed both for the Test Sump Dredging project (Amec Foster Wheeler 2016) and in preparation for the Newton Park Access Channel dredging (Taylor Engineering, Inc. 2017).

Summary statistics were calculated using the MDL value in cases where measured values were below the detection limit (U laboratory code) and thus represent high estimates for analytes with a large percentage of non-detects. In the summary, %ND is the percentage non-detects, and %I is the percentage I coded data.

Analytes included organochlorine pesticides (OCPs) and metals. Sediment nutrients were included in the Test Sump Dredging sampling program. Sediment samples were taken both in discrete layers (e.g. UCF) and as vertical composite samples. All data sets were provided by SJRWMD.

The characters following many of the analytical values are laboratory data qualifier codes. In the case of calculated values (e.g. Total Chlordane), the qualifier codes are aggregated for all components of the calculated values. Definitions of the primary qualifier codes are as follows:

Primary Qualifier Codes	Definition
A	Value reported is the mean (average) of two or more determinations.
I	Reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J	Estimated value. Used with additional codes in parentheses that provide details.
L	Off-scale high. Actual value is known to be greater than value given.
M	Presence of material is verified but not quantified.
Q	Sample held beyond the accepted holding time.
T	Value reported is less than the laboratory method detection limit.
U	Compound was analyzed for but not detected.
V	Analyte was detected in both the sample and the associated method blank.
W	Value observed is less than lowest value reportable under T code.

Table A-1. Sediment data from the Test Sump Dredging project (Amec Foster Wheeler 2016)

SiteName	0 TOC mg/kg	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	4,4'-DDTr ug/kg	4,4'-DDTx ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Aluminum ug/kg	Arsenic ug/kg	Barium ug/kg	beta-BHC ug/kg	Cadmium ug/kg	Chromium ug/kg
LA-01-1FT	#N/A	54 U	25 U	40 U	52.4666667 UUU	119 UUU	24 U	28 U	15 U	7500000	4600 U	51000	32 U	460 U	11900
LA-01-2FT	413000	55 U	26 U	41 U	53.7333333 UUU	122 UUU	25 U	29 U	16 U	7470000	4500 U	49700	33 U	450 U	11500
LA-01-4FT	446000	49 U	32 I	36 U	47.9333333 UIU	117 UIU	22 U	26 U	14 I	7030000	5100 U	56500	29 U	510 U	11400
LA-01-UCF	446000	150 U	250 I	110 U	156.6666667 UIU	510 UIU	67 U	80 U	43 I	10700000 J(M1)	12100 U	72000	89 U	1200 U	19600
LA-02-1FT	375000 A	89 U	110 I	65 U	90.1333333 UIU	264 UIU	39 U	47 U	25 U	7280000	6900 U	54700	52 U	690 U	11800
LA-02-2FT	390000	66 U	42 I	49 U	65 UIU	157 UIU	29 U	35 U	19 U	6150000	5000 U	47600	39 U	500 U	10200
LA-02-5FT	4e+05	43 U	20 U	31 U	40.9333333 UUU	94 UUU	19 U	23 U	12 U	5010000	3700 U	39200	25 U	370 U	8100
LA-02-UCF	366000	110 U	210 I	78 U	114 UIU	398 UIU	47 U	56 U	30 U	7250000	9300	55000	63 U	260 U	12100
LA-03-10FT	314000	24 U	11 U	18 U	23.5333333 UUU	53 UUU	11 U	13 U	7.5 I	6210000	2700 U	56800	14 U	270 U	9100
LA-03-1FT	375000	59 U	68 I	45 I	61.3333333 UII	172 UII	26 U	31 U	17 U	7250000	6000 I	54500	34 U	470 U	11900
LA-03-2FT	391000	48 U	22 U	35 U	46.0666667 UUU	105 UUU	21 U	25 U	14 U	7640000	4100 U	49400	28 U	410 U	12000
LA-03-5FT	393000	78 U	36 U	57 U	75 UUU	171 UUU	35 U	41 U	26 I	8970000	5900 U	54800	46 U	590 U	13300
LA-03-UCF	335000	180 U	210 I	130 U	180 UIU	520 UIU	78 U	93 U	50 U	10600000	12200	96400	100 U	350 U	18900
LA-04-10FT	231000	20 U	9.4 U	15 U	19.6266667 UUU	44.4 UUU	8.9 U	11 U	5.7 U	8760000	2500 I	81900	12 U	230 U	12500
LA-04-1FT	322000	68 I	180 I	44 U	69.6 IIU	292 IIU	26 U	31 U	17 U	8140000	7700 I	74000	35 U	650 U	15200
LA-04-2FT	323000	61 I	160	16 I	38.8666667 II	237 II	3.5 U	4.1 U	2.2 U	7060000	15500	60300	4.6 U	510 U	12400
LA-04-5FT	329000	74 I	130 I	28 U	51.4666667 IIU	232 IIU	17 U	20 U	11 U	8950000	10200	72300	22 U	440 U	14300
LA-04-UCF	335000	90 U	58 I	66 U	87.8666667 UIU	214 UIU	40 U	47 U	25 U	6270000	5300	58600	53 U	220 U	10600
LA-05-10FT	274000	40 U	19 U	30 U	39.2666667 UUU	89 UUU	18 U	21 U	11 U	10300000	6800	82400	24 U	270 U	15800
LA-05-1FT	335000	70 U	110 I	51 U	72.3333333 UIU	231 UIU	31 U	37 U	20 U	6710000	7500 I	64100	41 U	510 U	11600
LA-05-2FT	363000	57 U	26 U	42 U	55.1333333 UUU	125 UUU	25 U	30 U	16 U	5810000	4100 U	48200	33 U	410 U	9400
LA-05-5FT	398000	52 U	24 U	38 U	50 UUU	114 UUU	23 U	27 U	15 U	6690000 J(M1)	3800 I	55600	30 U	370 U	11100
LA-05-UCF	325000	250 U	280 I	180 U	248.6666667 UIU	710 UIU	110 U	130 U	140 I	13700000	16300	152000	150 U	510 U	24800
LA-06-1FT	410000	51 U	24 U	38 U	49.8 UUU	113 UUU	23 U	27 U	15 U	4830000	4100 I	41500	30 U	400 U	7800
LA-06-2FT	448000 A	44 U	20 U	32 U	42.1333333 UUU	96 UUU	19 U	23 U	12 U	3250000	3600 I	35200	26 U	340 U	5700
LA-06-UCF	403000	12 U	17 I	8.8 U	12.3333333 UIU	37.8 UIU	5.3 U	6.3 U	3.4 U	4130000	7200	31000	7.1 U	160 U	6700
LA-07-1FT	417000	82 U	38 U	60 U	78.9333333 UUU	180 UUU	37 U	43 U	23 U	6600000	6600 U	41900	48 U	660 U	10700
LA-07-UCF	388000	140 U	76 I	100 U	133.0666667 UIU	316 UIU	60 U	72 U	38 U	8240000	9300	55400	80 U	220 U	13100
LA-08-1FT	396000	65 U	30 U	48 U	63 UUU	143 UUU	29 U	34 U	18 U	7730000	5100 U	46200	38 U	510 U	12000
LA-08-UCF	354000	160 U	75 U	120 U	157 UUU	355 UUU	71 U	85 U	46 U	9360000	14300	73000	95 U	290 U	17000
LA-09-1FT	374000	63 U	29 U	46 U	60.5333333 UUU	138 UUU	28 U	33 U	18 U	5830000	5500 U	40700	37 U	550 U	9700
LA-09-UCF	327000	170 U	81 U	130 U	169.4 UUU	381 UUU	77 U	91 U	49 U	7570000	9400	69100	100 U	280 U	13500
LA-10-1FT	386000	58 U	27 U	42 U	55.4 UUU	127 UUU	26 U	30 U	16 U	8740000	5000 U	57000	34 U	500 U	13600
LA-10-2FT	385000	54 U	25 U	39 U	51.4666667 UUU	118 UUU	24 U	28 U	15 U	7620000	4600 U	47800	32 U	460 U	11600
LA-10-UCF	327000	180 U	84 U	130 U	171.6 UUU	394 UUU	79 U	95 U	51 U	7800000	11800	69100	110 U	290 U	14000
LA-11-1FT	340000	69 I	160 I	45 U	69.4666667 IIU	274 IIU	27 U	32 U	17 U	6650000	8800 I	54400	36 U	510 U	11000
LA-11-UCF	319000	140 U	63 U	100 U	132.2 UUU	303 UUU	60 U	72 U	38 U	7940000	9800	73400	80 U	250 U	13700
LA-12-1FT	309000	42 U	31 I	31 U	41.4666667 UIU	104 UIU	19 U	22 U	12 U	4840000	4800 I	48100	25 U	390 U	9300
LA-12-UCF	315000	69 U	32 U	51 U	66.9333333 UUU	152 UUU	31 U	37 U	20 U	5070000	6500	48100	41 U	160 U	9000
LA-13-1FT	355000	46 U	21 U	34 U	44.6 UUU	101 UUU	20 U	24 U	13 U	7120000	5900 I	59900	27 U	410 U	11400
LA-13-UCF	320000	110 U	59 I	81 U	106.9333333 UIU	250 UIU	49 U	58 U	31 U	9170000	21200	78600	65 U	200 U	14600
LA-14-1FT	286000	25 U	12 U	18 U	23.8 UUU	55 UUU	11 U	13 U	7 U	8240000 J(M1)	5400	85600	15 U	230 U	11800
LA-14-2FT	281000	21 U	9.7 U	15 U	19.8466667 UUU	45.7 UUU	9.2 U	11 U	5.9 U	7200000	6200	67300	12 U	210 U	10600
LA-14-UCF	343000	62 U	29 U	46 U	60.3333333 UUU	137 UUU	28 U	33 U	18 U	3020000	3300	36600	37 U	120 U	4900
LA-15-1FT	296000 A	52 U	24 U	38 U	50 UUU	114 UUU	23 U	27 U	15 U	6010000	5700 I	76700	30 U	500 U	10900
LA-15-UCF	307000	110 U	51 U	80 U	105.4 UUU	241 UUU	48 U	57 U	31 U	7660000	8600	87500	64 U	240 U	13400
LA-16-1FT	391000	6.1 U	2.9 U	4.5 U	5.9133333 UUU	13.5 UUU	2.7 U	3.2 U	1.7 U	6420000	5400 I	48100	3.6 U	380 U	10300
LA-16-UCF	308000	17 U	22 I	23 I	27.8666667 UII	62 UII	7.7 U	9.2 U	4.9 U	4640000	4700	48300	10 U	230 U	8100
LA-17-1FT	313000	7.7 I	37 I	7.7 I	11.7066667 III	52.4 III	3.4 U	4 U	2.1 U	5200000	8900 I	52300	4.5 U	490 U	9800
LA-17-UCF	315000	24 U	30 I	17 U	23.8 UIU	71 UIU	10 U	12 U	6.7 U	5430000	5500 I	57600	14 U	300 U	9600
LA-18-1FT	388000	7.2 U	4.1 I	5.4 I	7.1133333 UII	16.7 UII	3.2 U	3.8 U	2 U	6940000	7200 I	49600	4.2 U	460 U	38300
LA-18-2FT	393000	6.7 U	6 I	5.5 I	7.24 UII	18.2 UII	3 U	3.6 U	1.9 U	6730000	5900 I	45800	4 U	420 U	10500
LA-18-UCF	327000	13 U	32 I	11 I	15.7333333 UII	56 UII	5.5 U	6.6 U	3.5 U	3590000	5600	34200	7.4 U	160 U	6600
LA-19-1FT	380000	5.3 U	2.5 I	4.2 I	5.4266667 UII	12 UII	2.4 U	2.8 U	1.5 U	5110000	5000 I	40500	3.1 U	330 U	8600
LA-19-UCF	334000	28 I	13 U	31 I	37.4666667 IUI	72 IUI	12 U	14 U	7.7 U	8750000	14600	81400	16 U	350 U	15200
LA-20-1FT	387000	5.6 U	2.6 U	9.3 I	10.5933333 UUI	17.5 UUI	2.5 U	5.7 I	1.6 U	5960000	4200 I	40000	3.3 U	350 U	9000
LA-20-UCF	374000	13 U	14 I	10 I	13.5333333 UII	37 UII	5.7 U	6.8 U	3.6 U	4930000	6200	37100	7.5 U	160 U	8400

SiteName	cis-Nonachlor ug/kg	Copper ug/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg
LA-01-1FT	9.6 UH3	8200	36 U	16 U	10 U	23 U	18 U	21 U	27 U	33 U	61 U	28 U
LA-01-2FT	9.4 UH3, M1	7300	37 U	17 U	11 U	24 U	18 U	22 U	28 U	34 U	63 U	29 U
LA-01-4FT	10.8 UH3	7100	32 U	15 U	9.3 U	21 U	16 U	19 U	25 U	30 U	55 U	25 U
LA-01-UCF	24.3 UH3	26200	100 U	46 U	29 U	66 U	50 U	60 U	76 U	93 U	170 U	79 U
LA-02-1FT	13.5 UH3	15000	59 U	27 U	17 U	39 U	29 U	35 U	45 U	54 U	100 U	46 U
LA-02-2FT	10.6 UH3	9100	44 U	20 U	13 U	29 U	22 U	26 U	33 U	41 U	75 U	34 U
LA-02-5FT	7.5 UH3	4500	28 U	13 U	8.2 U	19 U	14 U	17 U	22 U	26 U	48 U	22 U
LA-02-UCF	26.3 UH3	18100	71 U	33 U	20 U	46 U	35 U	42 U	54 U	65 U	120 U	55 U
LA-03-10FT	5.5 UH3	4900	16 U	7.3 U	4.6 U	10 U	7.9 U	9.5 U	12 U	15 U	27 U	12 U
LA-03-1FT	9.9 UH3	12100	39 U	18 U	11 U	26 U	19 U	23 U	30 U	36 U	66 U	30 U
LA-03-2FT	8.7 UH3	7000	32 U	15 U	9.1 U	21 U	16 U	19 U	24 U	29 U	54 U	25 U
LA-03-5FT	11.8 UH3	7700	52 U	24 U	15 U	34 U	26 U	31 U	39 U	48 U	88 U	40 U
LA-03-UCF	35.5 UH3	36000	120 U	54 U	34 U	77 U	58 U	70 U	89 U	110 U	200 U	92 U
LA-04-10FT	51.6 UH3	7300	13 U	7.7 I	3.8 U	8.8 U	6.6 U	8 U	10 U	12 U	23 U	10 U
LA-04-1FT	13.1 UH3	25000	39 U	18 U	11 U	26 U	20 U	24 U	30 U	36 U	67 U	31 U
LA-04-2FT	8.6 UH3	20100	5.2 U	2.4 U	1.5 U	3.4 U	2.6 U	3.1 U	4 U	4.8 U	8.9 U	4.1 U
LA-04-5FT	4.4 UH3	16500	25 U	12 U	7.2 U	17 U	12 U	15 U	19 U	23 U	43 U	20 U
LA-04-UCF	22.4 UH3	17200	60 U	27 U	17 U	39 U	30 U	36 U	45 U	55 U	100 U	47 U
LA-05-10FT	7.9 UH3	15600	27 U	12 U	7.7 U	18 U	13 U	16 U	20 U	25 U	46 U	21 U
LA-05-1FT	8.4 UH3	13900	46 U	21 U	13 U	30 U	23 U	28 U	35 U	43 U	79 U	36 U
LA-05-2FT	7.9 UH3	7200	38 U	17 U	11 U	25 U	19 U	23 U	29 U	35 U	64 U	30 U
LA-05-5FT	5.6 UH3	7400	34 U	16 U	9.9 U	23 U	17 U	21 U	26 U	32 U	58 U	27 U
LA-05-UCF	9.9 UH3	46900	160 U	76 U	47 U	110 U	81 U	98 U	120 U	150 U	280 U	130 U
LA-06-1FT	22 UH3	4900	34 U	16 U	9.8 U	22 U	17 U	20 U	26 U	31 U	58 U	27 U
LA-06-2FT	12.8 UH3	3300 I	29 U	13 U	8.4 U	19 U	14 U	17 U	22 U	27 U	50 U	23 U
LA-06-UCF	6.9 UH3	10700	8 U	3.7 U	2.3 U	5.2 U	4 U	4.8 U	6.1 U	7.4 U	14 U	6.3 U
LA-07-1FT	10.5 UH3	5700 I	55 U	25 U	16 U	36 U	27 U	33 U	42 U	50 U	93 U	43 U
LA-07-UCF	29.9 UH3	16900	90 U	42 U	26 U	59 U	45 U	54 U	69 U	83 U	150 U	71 U
LA-08-1FT	11.3 UH3	6200	43 U	20 U	12 U	28 U	21 U	26 U	33 U	40 U	74 U	34 U
LA-08-UCF	29.1 UH3	108000	110 U	49 U	31 U	70 U	53 U	64 U	81 U	99 U	180 U	84 U
LA-09-1FT	10.4 UH3	6800	42 U	19 U	12 U	28 U	21 U	25 U	32 U	39 U	71 U	33 U
LA-09-UCF	29.3 UH3	25000	110 U	53 U	33 U	75 U	57 U	69 U	87 U	110 U	200 U	90 U
LA-10-1FT	25.5 UH3	8200	38 U	18 U	11 U	25 U	19 U	23 U	29 U	35 U	65 U	30 U
LA-10-2FT	10.3 UH3	6700	36 U	16 U	10 U	23 U	18 U	21 U	27 U	33 U	61 U	28 U
LA-10-UCF	9.3 UH3	25700	120 U	55 U	34 U	78 U	59 U	71 U	90 U	110 U	200 U	93 U
LA-11-1FT	7.7 UH3	12800	41 U	19 U	12 U	27 U	20 U	24 U	31 U	38 U	70 U	32 U
LA-11-UCF	16.2 UH3	22400	90 U	42 U	26 U	59 U	45 U	54 U	69 U	83 U	150 U	71 U
LA-12-1FT	8 UH3	15100	28 U	13 U	8 U	18 U	14 U	17 U	21 U	26 U	48 U	22 U
LA-12-UCF	20.8 UH3	16000	46 U	21 U	13 U	30 U	23 U	28 U	35 U	42 U	78 U	36 U
LA-13-1FT	4.6 UH3	9900	31 U	14 U	8.8 U	20 U	15 U	18 U	23 U	28 U	52 U	24 U
LA-13-UCF	12.5 UH3	20300	74 U	34 U	21 U	48 U	36 U	44 U	56 U	68 U	130 U	58 U
LA-14-1FT	24.7 UH3	5500	16 U	7.6 U	4.7 U	11 U	8.1 U	9.8 U	12 U	15 U	28 U	13 U
LA-14-2FT	10.1 UH3	4800	14 U	6.4 U	4 U	9.1 U	6.8 U	8.3 U	11 U	13 U	24 U	11 U
LA-14-UCF	4.4 UH3	4100	41 U	19 U	12 U	27 U	20 U	25 U	31 U	38 U	70 U	32 U
LA-15-1FT	7.9 UH3	18800	34 U	16 U	9.8 U	22 U	17 U	20 U	26 U	31 U	58 U	27 U
LA-15-UCF	22.9 UH3	21200	72 U	33 U	21 U	47 U	36 U	43 U	55 U	67 U	120 U	57 U
LA-16-1FT	9.9 UH3	5100	4.1 U	1.9 U	1.2 U	2.7 U	2 U	2.4 U	3.1 U	3.8 U	6.9 U	3.2 U
LA-16-UCF	30.8 UH3	11600	12 U	5.3 U	3.3 U	7.6 U	5.7 U	6.9 U	8.8 U	11 U	20 U	9 U
LA-17-1FT	8.8 UH3	15900	5 U	2.3 U	1.4 U	3.3 U	2.5 U	3 U	3.8 U	4.6 U	8.6 U	3.9 U
LA-17-UCF	9.2 UH3	15000	16 U	7.2 U	4.5 U	10 U	7.8 U	9.4 U	12 U	14 U	27 U	12 U
LA-18-1FT	6.9 UH3	12200	4.7 U	2.2 U	1.4 U	3.1 U	2.3 U	2.8 U	3.6 U	4.4 U	8.1 U	3.7 U
LA-18-2FT	16.6 UH3	5400	4.5 U	2.1 U	1.3 U	2.9 U	2.2 U	2.7 U	3.4 U	4.1 U	7.6 U	6.3 I
LA-18-UCF	35.5 UH3	12100	8.3 U	3.8 U	2.4 U	5.4 U	4.1 U	5 U	6.3 U	7.6 U	14 U	6.5 U
LA-19-1FT	10.2 UH3	4200	3.5 U	1.6 U	1 U	2.3 U	1.8 U	2.1 U	2.7 U	3.3 U	6 U	2.8 U
LA-19-UCF	7.3 UH3	27600	18 U	8.3 U	5.2 U	12 U	9 U	11 U	14 U	17 U	31 U	14 U
LA-20-1FT	16.4 UH3	4500	3.7 U	1.7 U	1.1 U	2.5 U	2.4 I	3.1 I	2.8 U	3.4 U	6.4 U	2.9 U
LA-20-UCF	15.8 UH3	10900	8.5 U	3.9 U	2.4 U	5.6 U	4.2 U	5.1 U	6.5 U	7.8 U	14 U	6.7 U

Summary

Parameter	0 TOC mg/kg	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	4,4'-DDTr ug/kg	4,4'-DDTx ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Aluminum ug/kg	Arsenic ug/kg	Barium ug/kg	beta-BHC ug/kg	Cadmium ug/kg	Chromium ug/kg
Count	56	57	57	57	57	57	57	57	57	57	57	57	57	57	57
%ND	0	89	0	81	96	96	100	98	91	0	0	0	100	100	0
%I	0	11	0	19	49	49	0	2	9	0	0	0	0	0	0
Min	231,000	5.3	2.5	4.2	5.4	12.0	2.4	2.8	1.5	3,020,000	2,500	31,000	3.1	120	4,900
1stQuart	321,500	25.0	20.0	18.0	27.9	71.0	11.0	13.0	7.0	5,830,000	4,800	47,800	14.0	260	9,600
Mean	354,911	65.7	56.9	47.5	64.4	170.1	28.2	33.5	19.3	7,013,509	7,153	58,702	37.5	389	12,104
Median	354,500	55.0	30.0	39.0	51.5	122.0	24.0	28.0	15.0	7,060,000	5,900	54,800	32.0	380	11,500
3rdQuart	390,250	78.0	68.0	57.0	75.0	237.0	35.0	41.0	23.0	7,940,000	8,800	69,100	46.0	500	13,400
Max	448,000	250.0	280.0	180.0	248.7	710.0	110.0	130.0	140.0	13,700,000	21,200	152,000	150.0	1,200	38,300

Parameter	cis-Nonachlor ug/kg	Copper ug/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg
Count	57	57	57	57	57	57	57	57	57	57	57	57
%ND	100	0	100	98	100	100	98	98	100	100	100	98
%I	0	0	0	2	0	0	2	2	0	0	0	2
Min	4.40	3,300	3.5	1.6	1.0	2.3	1.8	2.1	2.7	3.3	6.0	2.8
1stQuart	8.40	6,800	16.0	7.6	4.6	10.0	7.9	9.5	12.0	15.0	27.0	12.0
Mean	14.70	14,804	42.2	19.5	12.1	27.7	20.9	25.2	32.0	39.0	71.7	33.1
Median	10.40	11,600	36.0	16.0	10.0	23.0	18.0	21.0	27.0	33.0	61.0	28.0
3rdQuart	20.80	17,200	52.0	24.0	15.0	34.0	26.0	31.0	39.0	48.0	88.0	40.0
Max	51.60	108,000	160.0	76.0	47.0	110.0	81.0	98.0	120.0	150.0	280.0	130.0

Note that units for both OCPs and metals are µg/kg dwt. Sample depth intervals are indicated by the last characters in SiteName. These were: UCF < 1ft; 1FT 0 to 1 ft; 2FT 1 to 2 ft; 4Ft 2 to 4 ft; 5FT 2 to 5 ft; 10 FT 5 to 10 ft; 15FT 10 to 15 ft.
Some OCP values were calculated, as follows:

- 4,4'-DDTr: weighted sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT intended to estimate acute toxicity in DDT equivalents. Calculated after Stickel et al. (1970): DDT equivalents = DDTr = (DDD/5) + (DDE/15) + DDT.
- 4,4'-DDTx: sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT
- Total Chlordane: sum of alpha-Chlordane, cis-Nonachlor, gamma-Chlordane, Heptachlor, Heptachlor epoxide, Oxychlordane, and trans-Nonachlor

Table A-1. Sediment data from the Test Sump Dredging project (Amec Foster Wheeler 2016)

SiteName	Heptachlor	Heptachlor epoxide	Iron	Lead	Mercury	Methoxychlor	Nitrogen, Ammonia	Nitrogen, Kjeldahl, Total	Nitrogen, NO2 plus NO3	Oxychlordane	Percent Moisture	Phosphorus, Total (as P)	Selenium	Silver	Total Chlordane	Total Nitrogen Soil	Toxaphene	trans-Nonachlor
	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	%	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
LA-01-1FT	16 U	46 U	6340000	6000 I	140 I	430 U	670000	27600000	4600 U	9.5 UH3	94.7	384000	7000 U	2300 U	133.5 UUH3UUUUH3UH3	27600000	267 UH3	9.4 UH3
LA-01-2FT	16 U	47 U	6420000	4500 U	160	440 U	714000	26300000	4600 U	9.3 UH3, M1	94.6	379000	6700 U	2200 U	135.9 UUH3, M1UUUUH3, M1UH3, M1	26300000	262 UH3	9.2 UH3, M1
LA-01-4FT	15 U	41 U	6350000	5100 U	120 I	390 U	825000	31900000	5200 U	10.6 UH3	95.3	489000	7700 U	2600 U	126.9 IUH3UUUUH3UH3	31900000	299 UH3	10.5 UH3
LA-01-UCF	45 U	130 U	9270000 J(M1)	25200	210 V	1200 U	6.41e+09	20800000	11900 U	23.9 UH3	97.9	1240000	18200 U	6100 U	369 IUH3UUUUH3UH3	20800000	675 UH3	23.8 UH3
LA-02-1FT	26 U	75 U	5910000	11800 I	220	710 U	975000	29400000	6600 U	13.2 UH3	96.2	835000	10300 U	3400 U	211.9 UUH3UUUUH3UH3	29400000	374 UH3	13.2 UH3
LA-02-2FT	20 U	56 U	5360000	8600 I	210	530 U	1120000	32200000	5200 U	10.4 UH3	95.2	880000	7600 U	2500 U	160.4 UUH3UUUUH3UH3	32200000	296 UH3	10.4 UH3
LA-02-5FT	13 U	36 U	4e+06	3700 U	130	340 U	952000	22100000	3600 U	7.4 UH3	93.2	392000	5500 U	1800 U	105.2 UUH3UUUUH3UH3	22100000	209 UH3	7.3 UH3
LA-02-UCF	32 U	91 U	5550000	18000	200 V	860 U	701000	27500000	12900 U	25.8 UH3	98.1	1130000	3900 U	1300 U	285.8 UUH3UUUUH3UH3	27500000	729 UH3	25.7 UH3
LA-03-10FT	7.1 U	20 U	5500000	2700 U	68 I	190 U	967000	2.2e+07	2700 U	5.4 UH3	90.8	635000	4100 U	1400 U	62.9 IUH3UUUUH3UH3	2.2e+07	153 UH3	5.4 UH3
LA-03-1FT	17 U	50 U	6160000	11900	200	470 U	1180000	2.2e+07	4800 U	9.7 UH3	94.8	763000	7100 U	2400 U	143.2 UUH3UUUUH3UH3	2.2e+07	274 UH3	9.6 UH3
LA-03-2FT	14 U	41 U	6660000	4400 I	98 I	380 U	1420000	2e+07	4200 U	8.5 UH3	94.1	622000	6200 U	2100 U	119.7 UUH3UUUUH3UH3	2e+07	241 UH3	8.5 UH3
LA-03-5FT	23 U	66 U	7410000	5900 U	95 I	620 U	1920000	23500000	5800 U	11.6 UH3	95.7	641000	8800 U	2900 U	189.9 IUH3UUUUH3UH3	23500000	327 UH3	11.5 UH3
LA-03-UCF	53 U	150 U	7620000	33700	320 V	1400 U	1230000	31800000	17400 U	34.8 UH3	98.6	1590000	5300 U	1800 U	450 UUH3UUUUH3UH3	31800000	985 UH3	34.7 UH3
LA-04-10FT	6 U	17 U	6880000	3700 I	48 I	160 U	1940000	16200000	2200 U	50.7 UH3	99	620000	3400 U	1100 U	191.5 UUH3UUUUH3UH3	16200000	1430 UH3	50.5 UH3
LA-04-1FT	18 U	50 U	5870000	28500	150 I	480 U	3500000	24600000	6300 U	12.8 UH3	96.1	2310000	9700 U	3200 U	154.7 UUH3UUUUH3UH3	24600000	363 UH3	12.8 UH3
LA-04-2FT	2.3 U	6.7 U	5010000	23900	130 I	63 U	3190000	19500000	5000 U	8.4 UH3	94.1	960000	7600 U	2500 U	40.7 UUH3UUUUH3UH3	19500000	238 UH3	8.4 UH3
LA-04-5FT	11 U	32 U	7260000	15700	130	300 U	3170000	21400000	4200 U	4.3 UH3	88.5	937000	6700 I	2200 U	87 UUH3UUUUH3UH3	21400000	123 UH3	4.3 UH3
LA-04-UCF	27 U	76 U	4500000	14900	130	720 U	1970000	15700000	11000 U	21.9 UH3	97.7	1440000	3300 U	1100 U	241.2 UUH3UUUUH3UH3	15700000	621 UH3	21.9 UH3
LA-05-10FT	12 U	34 U	8090000	8500	72 I	320 U	1230000	22700000	2800 U	7.7 UH3	93.5	567000	4500 I	1400 U	101.3 UUH3UUUUH3UH3	22700000	218 UH3	7.7 UH3
LA-05-1FT	21 U	59 U	5940000	14800	140 I	560 U	1330000	26500000	4800 U	8.2 UH3	93.9	880000	7700 U	2600 U	160.8 UUH3UUUUH3UH3	26500000	233 UH3	8.2 UH3
LA-05-2FT	17 U	48 U	5320000	5500 I	120 I	460 U	1480000 J(M1)	27700000	4100 U	7.8 UH3	93.6	1030000	6200 U	2100 U	134.4 UUH3UUUUH3UH3	24600000	219 UH3	7.7 UH3
LA-05-5FT	15 U	44 U	6120000 J(M1)	5500 I	93 I	410 U	1530000	30100000	3800 U	5.5 UH3	91	808000	5600 U	1900 U	117.6 UUH3UUUUH3UH3	30100000	156 UH3	5.5 UH3
LA-05-UCF	74 U	210 U	10600000	45600	350	2000 U	1580000	28900000	25200 U	9.7 UH3	94.9	1910000	7600 U	2500 U	583.3 IUH3UUUUH3UH3	28900000	276 UH3	9.7 UH3
LA-06-1FT	15 U	44 U	4740000	4000 U	87 I	410 U	646000	26400000	3800 U	21.6 UH3	97.7	528000	6500 I	2000 U	166.1 UUH3UUUUH3UH3	26400000	611 UH3	21.5 UH3
LA-06-2FT	13 U	37 U	3400000	3400 U	54 I	350 U	642000	24600000	3400 U	12.6 UH3	96	345000	5100 U	1700 U	122.9 UUH3UUUUH3UH3	24600000	355 UH3	12.5 UH3
LA-06-UCF	3.6 U	10 U	3490000	11100	120	97 U	573000	25300000	7700 U	6.8 UH3	92.7	1060000	2300 U	780 U	43.8 UUH3UUUUH3UH3	25300000	192 UH3	6.8 UH3
LA-07-1FT	25 U	70 U	5690000	6600 U	100 U	660 U	495000	22800000	6300 U	10.3 UH3	95.2	348000	9800 U	3300 U	192.1 UUH3UUUUH3UH3	22800000	691 IH3	10.3 UH3
LA-07-UCF	41 U	120 U	6350000	15000	130	1100 U	335000	19200000	10700 U	29.3 UH3	98.3	749000	5600 I	1100 U	358.4 UUH3UUUUH3UH3	19200000	829 UH3	29.2 UH3
LA-08-1FT	19 U	55 U	6680000	5900 I	98 I	520 U	556000	32700000	5100 U	11.1 UH3	95.5	498000	7600 U	2500 U	159.4 UUH3UUUUH3UH3	32700000	314 UH3	11 UH3
LA-08-UCF	48 U	140 U	7220000	41600	210	1300 U	433000	3e+07	14500 U	28.5 UH3	98.3	1110000	7600 I	1400 U	404 UUH3UUUUH3UH3	3e+07	807 UH3	28.4 UH3
LA-09-1FT	19 U	54 U	4500000	7500 I	140 I	510 U	1240000	25500000	5500 U	10.2 UH3	95.1	680000	8200 U	2700 U	154.8 UUH3UUUUH3UH3	25500000	290 UH3	10.2 UH3
LA-09-UCF	51 U	150 U	5380000	22400	180	1400 U	1180000	32600000	14300 U	28.7 UH3	98.3	1650000	5100 I	1400 U	426.6 UUH3UUUUH3UH3	32600000	812 UH3	28.6 UH3
LA-10-1FT	17 U	49 U	7240000	7800 I	120 I	460 U	1640000	31200000	5100 U	25 UH3	98	918000	7500 U	2500 U	187.5 UUH3UUUUH3UH3	31200000	708 UH3	25 UH3
LA-10-2FT	16 U	46 U	5950000	6400 I	120 I	430 U	1620000	26700000	4600 U	10.1 UH3	95.1	667000	6800 U	2300 U	135.5 UUH3UUUUH3UH3	26700000	286 UH3	10.1 UH3
LA-10-UCF	53 U	150 U	5500000	27000	230	1400 U	1400000	34700000	14300 U	9.2 UH3	94.6	1690000	9000	1400 U	374.6 UUH3UUUUH3UH3	34700000	259 UH3	9.1 UH3
LA-11-1FT	18 U	52 U	5080000	17000	160	490 U	1580000	17300000	5000 U	7.5 UH3	93.4	762000	9100 I	2600 U	141.7 UUH3UUUUH3UH3	17300000	213 UH3	7.5 UH3
LA-11-UCF	41 U	120 U	5460000	23300	160	1100 U	1030000	24500000	12500 U	15.9 UH3	96.9	1350000	5600 I	1300 U	318 UUH3UUUUH3UH3	24500000	450 UH3	15.9 UH3
LA-12-1FT	13 U	36 U	3420000	20000	140	340 U	1340000	11200000	3800 U	7.9 UH3	93.7	726000	5900 U	2000 U	106.8 UUH3UUUUH3UH3	11200000	223 UH3	7.9 UH3
LA-12-UCF	21 U	59 U	3650000	17400	110	560 U	789000	12700000	8000 U	20.4 UH3	97.6	706000	3300 I	800 U	197.5 UUH3UUUUH3UH3	12700000	577 UH3	20.3 UH3
LA-13-1FT	14 U	39 U	5910000	11200	150	370 U	2260000	21900000	3900 U	4.5 UH3	88.9	764000	6100 U	2000 U	103.6 UUH3UUUUH3UH3	21900000	127 UH3	4.5 UH3
LA-13-UCF	33 U	94 U	6500000	25200	33 U	890 U	947000	16700000	10200 U	12.3 UH3	95.9	731000	4400 I	1000 U	253 UUH3UUUUH3UH3	16700000	347 UH3	12.2 UH3
LA-14-1FT	7.4 U	21 U	6670000 J(M1)	3400 I	49 I	200 U	499000	13600000	2200 U	24.2 UH3	97.9	478000	3500 U	1200 U	121.4 UUH3UUUUH3UH3	19800000	684 UH3	24.1 UH3
LA-14-2FT	6.2 U	18 U	5910000	2800 I	50 I	170 U	556000	16700000	2200 U	9.9 UH3	94.9	450000	3100 U	1000 U	70.9 UUH3UUUUH3UH3	19500000	279 UH3	9.8 UH3
LA-14-UCF	19 U	53 U	2530000	3100	49	500 U	433000	20600000	6100 U	4.3 UH3	88.5	719000	2100 I	620 U	135 UUH3UUUUH3UH3	25600000	123 UH3	4.3 UH3
LA-15-1FT	15 U	44 U	4730000	19500	250	410 U	2220000	19800000	4900 U	7.8 UH3	93.6	1150000	7400 U	2500 U	124.5 UUH3UUUUH3UH3	19800000	220 UH3	7.8 UH3
LA-15-UCF	32 U	92 U	5580000	19000	150	870 U	1780000	25600000	12100 U	22.4 UH3	97.8	1670000	5500 I	1200 U	279.7 UUH3UUUUH3UH3	25600000	635 UH3	22.4 UH3
LA-16-1FT	1.8 U	5.2 U	6190000	3800 I	100 I	49 U	846000	21900000	3900 U	9.7 UH3	94.9	486000	5700 U	1900 U	41.2 UUH3UUUUH3UH3	21900000	274 UH3	9.7 UH3
LA-16-UCF	5.2 U	15 U	3480000	12000	130	140 U	814000	19500000	11100 U	30.2 UH3	98.4	1090000	3400 U	1100 U	125.2 UUH3UUUUH3UH3	19500000	855 UH3	30.1 UH3
LA-17-1FT	2.3 U	6.4 U	3820000	24300	170	61 U	2510000	1.3e+07	4800 U	8.6 UH3	94.2	3050000	7400 U	2500 U	40.7 UUH3UUUUH3UH3	1.3e+07	244 UH3	8.6 UH3
LA-17-UCF	7.1 U	20 U	3900000	14800	170	190 U	2170000	17400000	15000 U	9 UH3	94.5	1560000	4600 U	1500 U	73 UUH3UUUUH3UH3	17400000	256 UH3	9 UH3
LA-18-1FT	2.1 U	6.1 U	5950000	7600 I	140 I	57 U	1230000	22700000	4500 U	6.8 UH3	92.6	588000	6900 U	2300 U	34.4 UUH3UUUUH3UH3	22700000	192 UH3	6.8 UH3
LA-18-2FT	2 U	5.7 U	5510000	6300 I	100 I	54 U	1140000	29500000	4300 U	16.3 UH3	96.9	619000	6300 U	2100 U	65.1 UUH3IUUUH3UH3	29500000	462 UH3	16.3 UH3
LA-18-UCF	3.7 U	11 U	2640000	13600	140	100 U	654000	22500000	8000 U	34.8 UH3	98.6	978000	2400 U	810 U	129.7 UUH3UUUUH3UH3	22500000	986 UH3	34.7 UH3
LA-19-1FT	1.6 U	4.5 U	4470000	3800 I	90 I	43 U	795000	2.7e+07	3400 U	10 UH3	95	538000	5000 U	1700 U	40.6 UUH3UUUUH3UH3	2.7e+07	284 UH3	10 UH3
LA-19-UCF	8.1 U	23 U	6390000	32100	230	220 U	1170000	22200000	17400 U	7.1 UH3	93	1390000	5300 U	1800 U	74.3 UUH3UUUUH3UH3	22200000	202 UH3	7.1 UH3
LA-20-1FT	1.7 U	4.8 U	5280000	3500 U	120	45 U	473000	21600000	3600 U	16.1 UH3	96.9	414000	5200 U	1700 U	59.5 UUH3UUUUH3UH3	21600000	455 UH3	16 UH3
LA-20-UCF	3.8 U	11 U	4020000	10800	150	100 U	453000	17400000	8100 U	15.5 UH3	96.8	733000	2400 U	810 U	71.8 UUH3UUUUH3UH3	17400000	438 UH3	15.4 UH3

Summary

Parameter	Heptachlor	Heptachlor epoxide	Iron	Lead	Mercury	Methoxychlor	Nitrogen, Ammonia	Nitrogen, Kjeldahl, Total	Nitrogen, NO2 plus NO3	Oxychlordane	Percent Moisture	Phosphorus, Total (as P)	Selenium	Silver	Total Chlordane	Total Nitrogen Soil	Toxaphene	trans-Nonachlor
	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	%	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Count	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57
%ND	100	100	0	0	0	100	0	0	100	100	0	0	0	100	100	0	98	100
%J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	2	0
Min	1.6	4.5	2,530,000	2,700	33.0	43	335,000	11,200,000	2,200	4.3	88.5	345,000	2,100	620	34.4	11,200,000	123.0	4.3
1stQuart	7.1	20.0	4,730,000	5,500	100.0	190	701,000	19,800,000	4,100	8.2	93.9	588,000	4,600	1,300	101.3	19,800,000	233.0	8.2
Mean	18.9	54.2	5,638,070	13,356	139.7	509	113,685,000	23,463,160	7,179	14.4	95.2	923,456	6,182	1,946	169.1	23,654,390	414.9	14.4
Median	16.0	46.0	5,690,000	11,100	130.0	430	1,170,000	22,700,000	5,100	10.2	95.1	762,000	6,100	1,900	135.0	22,800,000	290.0	10.2
3rdQuart	23.0	66.0	6,390,000	19,000	160.0	620	1,580,000	27,500,000	10,200	20.4	97.6	1,110,000	7,600	2,500	192.1	27,000,000	611.0	20.3
Max	74.0	210.0	10,600,000	45,600	350.0	2,000	6,410,000,000	34,700,000	25,200	50.7	99.0	3,050,000	18,200	6,100	583.3	34,700,000	1,430.0	50.5

Note that units for both OCPs and metals are µg/kg dwt. Sample depth intervals are indicated by the last characters in SiteName. These were: UCF < 1ft; 1FT 0 to 1 ft; 2FT 1 to 2 ft; 4Ft 2 to 4 ft; 5FT 2 to 5 ft; 10 FT 5 to 10 ft; 15FT 10 to 15 ft.
Some OCP values were calculated, as follows:

- 4,4'-DDTr: weighted sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT intended to estimate acute toxicity in DDT equivalents. Calculated after Stickel et al. (1970): DDT equivalents = DDTr = (DDD/5) + (DDE/15) + DDT.
- 4,4'-DDTx: sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT
- Total Chlordane: sum of alpha-Chlordane, cis-Nonachlor, gamma-Chlordane, Heptachlor, Heptachlor epoxide, Oxychlordane, and trans-Nonachlor

Table A-2. Sediment data collected in 2016 in preparation for Newton Park Access Channel dredging (Taylor Engineering, Inc. 2017)

Station Name	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Arsenic mg/kg	Barium mg/kg	beta-BHC ug/kg	Cadmium mg/kg	Chromium mg/kg	cis-Nonachlor ug/kg	Copper mg/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg
AD2016-01	9.9 U	9.5 U	10.2 U	5.5 U	7.9 UJN	5 U	7.1 U	56.1	7.2 U	0.74 U	8.1 I	6.7 U	1.9 I	7.2 U	10.2 U	5.1 UJ(C2), JN	9.8 U	10.2 U	13 U
AD2016-02	13 U	12.5 U	13.4 U	7.2 U	10.4 UJ(C2), JN	6.5 U	10.6 U	54	9.5 U	1.1 U	13.1 I	8.8 U	4.5 I	9.5 U	13.4 U	6.7 U	12.8 U	13.4 U	17 U
AD2016-03	9.4 U	9 U	9.7 U	5.2 U	7.5 U	4.7 U	7.5 U	58	6.9 U	0.78 U	9.8 I	6.4 U	1.8 U	6.9 U	9.7 U	4.9 U	9.3 U	9.7 U	12.3 U
AD2016-04	10.5 UJ(C2), JN	10.1 U	10.9 U	5.9 U	8.4 U	5.3 U	8.6 U	48.5	7.7 U	0.9 U	14.5	7.1 U	4.7 I	7.7 U	10.9 U	5.5 U	10.4 U	10.9 U	13.8 U
AD2016-05	10.4 U	10 U	10.7 U	5.8 U	8.3 U	5.2 U	12.5 I	44.3	7.6 U	0.86 U	14.3	7 U	3.1 I	7.6 U	10.7 UJ(C2), JN	5.4 U	10.3 U	10.7 U	13.6 U
AD2016-06	5.4 U	21 I	5.6 UJ(C2), JN	3 U	4.3 U	2.7 UJ(C2), JN	7.2 I	47	4 U	0.42 U	16.5	3.7 U	28.5	4 U	5.6 UJ(C2), JN	2.8 U	5.4 U	5.6 U	7.1 U
AD2016-07	12.8 U	12.3 U	13.2 U	7.1 U	10.2 U	6.4 U	10.3 I	59.7	9.4 U	1 U	18.2	8.7 U	21	9.4 U	13.2 U	6.7 U	12.7 U	13.2 U	16.8 U
AD2016-07 (DUP)	12.6 U	12.1 U	12.9 U	7 U	10 UJN	6.3 U	10.2 U	53.4	9.2 U	1.1 U	16.8	8.5 U	10 I	9.2 U	12.9 U	6.5 U	12.4 U	12.9 UJ(C2), JN	16.5 U

Summary

Analyte Name	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Arsenic mg/kg	Barium mg/kg	beta-BHC ug/kg	Cadmium mg/kg	Chromium mg/kg	cis-Nonachlor ug/kg	Copper mg/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg
Count	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
%ND	100	88	100	100	100	100	63	0	100	100	0	100	0	100	100	100	100	100	100
%I	0	13	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0
Min	5.4	9.0	5.6	3.00	4.30	2.70	7.10	44.3	4.00	0.420	8.1	3.70	1.80	4.00	5.6	2.80	5.4	5.6	7.1
1stQuart	9.8	9.9	10.1	5.43	7.80	4.93	7.43	48.1	7.13	0.770	12.3	6.63	2.80	7.13	10.1	5.05	9.7	10.1	12.8
Mean	10.5	12.1	10.8	5.84	8.38	5.26	9.25	52.6	7.69	0.863	13.9	7.11	9.44	7.69	10.8	5.45	10.4	10.8	13.8
Median	10.5	11.1	10.8	5.85	8.35	5.25	9.40	53.7	7.65	0.880	14.4	7.05	4.60	7.65	10.8	5.45	10.4	10.8	13.7
3rdQuart	12.7	12.4	13.0	7.03	10.05	6.33	10.38	56.6	9.25	1.025	16.6	8.55	12.75	9.25	13.0	6.55	12.5	13.0	16.6
Max	13.0	21.0	13.4	7.20	10.40	6.50	12.50	59.7	9.50	1.100	18.2	8.80	28.50	9.50	13.4	6.70	12.8	13.4	17.0

Note: Units for OCPs are µg/kg dwt, and units for metals are mg/kg dwt. Seven samples of surficial sediments from 0 to 8 inches depth were collected along the proposed footprint for dredging. These samples likely consisted of UCF.

Table A-2. Sediment data collected in 2016 in preparation for Newton Park Access Channel dredging (Taylor Engineering, Inc. 2017)

Station Name	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg	Heptachlor ug/kg	Heptachlor epoxide ug/kg	Lead mg/kg	Mercury mg/kg	Methoxychlor ug/kg	Oxychlordane ug/kg	Percent Moisture %	Selenium mg/kg	Silver mg/kg	Toxaphene ug/kg	trans-Nonachlor ug/kg
AD2016-01	20.5 UJ(C2), JN	9.5 U	5.2 UJ(C2), JN	5.9 UJ(C2), JN	6 U	4.6 U	7.6 I	0.45 U	73 U	6.6 U	92.4	10.3 IV	3.1 U	186 U	6.5 U
AD2016-02	26.9 UJ(C2), JN	12.4 U	6.8 U	7.8 UJ(C2), JN	7.9 UJ(C2), JN	6.1 U	8 I	0.6 U	95.8 U	8.6 U	94.2	20.1 IV	4.6 U	244 U	8.6 U
AD2016-03	19.5 UJ(C2), JN	9 U	4.9 U	5.6 U	5.7 U	4.4 U	9 I	0.44 U	69.5 U	6.3 U	92	9.1 U	3.3 U	177 U	6.2 U
AD2016-04	21.9 UJ(C2), JN	10.1 U	5.5 U	6.3 U	6.4 U	4.9 U	10.9 I	0.46 U	77.8 U	7 U	92.9	14.7 IV	3.8 U	198 U	7 U
AD2016-05	21.5 U	10 U	5.4 U	6.2 UJ(C2), JN	6.3 U	4.9 U	7.8 I	0.46 U	76.7 U	6.9 U	92.8	10 U	3.6 U	195 U	6.9 U
AD2016-06	11.3 U	5.2 U	2.8 UJ(C2), JN	3.3 UJ(C2), JN	3.3 U	2.5 UJ(C2), JN	43.1	0.24 U	40.1 U	3.6 U	86.2	5.6 IV	1.8 U	102 U	3.6 UJ(C2), JN
AD2016-07	26.6 UJ(C2), JN	12.3 U	6.7 U	7.7 U	7.8 U	6 U	25	0.58 U	94.5 U	8.5 U	94.1	19.3 IV	4.2 U	241 U	8.5 U
AD2016-07 (DUP)	26.1 UJ(C2), JN	12 U	6.5 U	7.5 U	7.7 U	5.9 U	17.5 I	0.57 U	92.7 UJ(C2), JN	8.3 UJ(C2), JN	94	17.8 IV	4.5 U	236 U	8.3 U

Summary

Analyte Name	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg	Heptachlor ug/kg	Heptachlor epoxide ug/kg	Lead mg/kg	Mercury mg/kg	Methoxychlor ug/kg	Oxychlordane ug/kg	Percent Moisture %	Selenium mg/kg	Silver mg/kg	Toxaphene ug/kg	trans-Nonachlor ug/kg
Count	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
%ND	100	100	100	100	100	100	0	100	100	100	0	25	100	100	100
%I	0	0	0	0	0	0	0	0	0	0	0	75	0	0	0
Min	11.3	5.2	2.80	3.30	3.30	2.50	7.6	0.240	40.1	3.60	86.2	5.6	1.80	102	3.60
1stQuart	20.3	9.4	5.13	5.83	5.93	4.55	8.0	0.448	72.1	6.53	92.3	9.8	3.25	184	6.43
Mean	21.8	10.1	5.48	6.29	6.39	4.91	16.1	0.475	77.5	6.98	92.3	13.4	3.61	197	6.95
Median	21.7	10.1	5.45	6.25	6.35	4.90	10.0	0.460	77.3	6.95	92.9	12.5	3.70	197	6.95
3rdQuart	26.2	12.1	6.55	7.55	7.73	5.93	19.4	0.573	93.2	8.35	94.0	18.2	4.28	237	8.35
Max	26.9	12.4	6.80	7.80	7.90	6.10	43.1	0.600	95.8	8.60	94.2	20.1	4.60	244	8.60

Note: Units for OCPs are µg/kg dwt, and units for metals are mg/kg dwt. Seven samples of surficial sediments from 0 to 8 inches depth were collected along the proposed footprint for dredging. These samples likely consisted of UCF.

Table A-3. Sediment data collected in 2016 in preparation for Newton Park Access Channel dredging, samples dried prior to analysis (Taylor Engineering, Inc. 2017)

Station Name	Cadmium mg/kg		Mercury mg/kg		Percent Moisture %	Selenium mg/kg		Silver mg/kg	
AD2016-01	0.072	U	0.047	IQ	9.7	1.5	I	0.3	U
AD2016-02	0.12	I	0.096	IQ	14.4	3.4		0.31	U
AD2016-03	0.08	I	0.059	IQ	12.4	2.1	I	0.31	U
AD2016-04	0.16	I	0.096	IQ	15.6	2.5		0.31	U
AD2016-05	0.08	I	0.11	IQ	12.9	3.1		0.28	U
AD2016-06	0.41	I	0.17	Q	5	0.93	I	0.29	U
AD2016-07	0.32	I	0.18	Q	13.3	3.5		0.32	U
AD2016-07 (DUP	0.22	I	0.14	IQ	13	3.4		0.31	U

Summary

Analyte Name	Cadmium mg/kg	Mercury mg/kg	Percent Moisture %	Selenium mg/kg	Silver mg/kg
Count	8	8	8	8	8
%ND	13	0	0	0	100
%I	88	75	0	0	0
Min	0.072	0.047	5.0	0.93	0.28
1stQuart	0.080	0.087	11.7	1.95	0.30
Mean	0.183	0.112	12.0	2.55	0.30
Median	0.140	0.103	13.0	2.80	0.31
3rdQuart	0.245	0.148	13.6	3.40	0.31
Max	0.410	0.180	15.6	3.50	0.32

Note: Rerun of same samples summarized in Table A-2 for select metals after drying sediments to lower detection limits.

Table A-4. Sediment data collected in 2017 in preparation for Newton Park Access Channel dredging (Taylor Engineering, Inc. 2017)

SAMPLE NAME	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Arsenic mg/kg	Barium mg/kg	beta-BHC ug/kg	Cadmium mg/kg	Chromium mg/kg	cis-Nonachlor ug/kg	Copper mg/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg
SED 1	18.3 U	19.4 U	8.6 U,J(C2)	9.8 U,J(C2)	8.3 U	9.9 U	18.5 U	58.8	9.7 U	2.3 U	15.4 I	10 U,J(C2)	14.5 U	.1 U,J(C2)	18.7 U	9.4 U,J(C2)	23.8 U,J(C2)	23 U	21.1 U
SED 2	17.6 U	18.7 U	27.6 U	9.4 U,J(C2)	8 U,J(C2)	9.6 U	18 U	48	9.3 U,J(C2)	2.3 U	13.2 I	9.6 U,J(C2)	14.1 U	.8 U,J(C2)	8.1 U,J(C2)	9.1 U,J(C2)	22.9 U,J(C2)	22.2 U,J(C2)	20.3 U
SED 3	16.5 U	17.6 U	5.9 U,J(C2)	8.8 U,J(C2)	7.5 U	9 U	14.9 U	58.1	8.8 U,J(C2)	1.9 U	14.5	9.1 U,J(C2)	11.7 U	.2 U,J(C2)	17 U	8.5 U	21.5 U	20.8 U	19.1 U
SED 4	16.2 U	7.2 U,J(C2)	5.4 U,J(C2)	8.7 U	.4 U,J(C2)	8.8 U,J(C2)	14.9 U	54.7	8.6 U	1.9 U	14.2 I	8.9 U	11.7 U	8.1 U	6.6 U,J(C2)	8.3 U	21.1 U,J(C2)	20.4 U	8.7 U,J(C2)
SED 5	17 U	8.1 U,J(C2)	6.7 U,J(C2)	9.1 U	7.8 U	9.3 U	15.9 U	47.4	9 U,J(C2)	2 U	14 I	9.3 U,J(C2)	12.5 U	8.5 U	7.5 U,J(C2)	8.8 U	22.2 U,J(C2)	21.4 U	19.6 U
SED 6	6.4 U,J(C2)	7.4 U,J(C2)	5.7 U,J(C2)	8.8 U,J(C2)	7.5 U	8.9 U	16.3 U	58.6	8.7 U,J(C2)	2.1 U	22.2	9 U,J(C2)	38.7 I	.2 U,J(C2)	16.8 U	8.4 U,J(C2)	21.3 U,J(C2)	20.6 U	18.9 U
SED 7	19.1 U	22.3 I	30 U	0.2 U,J(C2)	8.7 U	10.4 U	24 I	63.2	0.1 U,J(C2)	2.5 U	22.2	10.5 U	44.7 I	.5 U,J(C2)	19.6 U	9.9 U	24.9 U	24.1 U	22.1 U

Summary

ANALYTE	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Arsenic mg/kg	Barium mg/kg	beta-BHC ug/kg	Cadmium mg/kg	Chromium mg/kg	cis-Nonachlor ug/kg	Copper mg/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg
Count	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
%ND	100	86	100	100	100	100	86	0	100	100	0	100	71	100	100	100	100	100	100
%I	0	14	0	0	0	0	14	0	0	0	0	0	29	0	0	0	0	0	0
Min	16.2	17.2	25.4	8.70	7.40	8.80	14.9	47.4	8.6	1.90	13.2	8.90	11.7	8.10	16.6	8.30	21.1	20.4	18.7
1stQuart	16.5	17.5	25.8	8.80	7.50	8.95	15.4	51.4	8.8	1.95	14.1	9.05	12.1	8.20	16.9	8.45	21.4	20.7	19.0
Mean	17.3	18.7	27.1	9.26	7.89	9.41	17.5	55.5	9.2	2.14	16.5	9.49	21.1	8.63	17.8	8.91	22.5	21.8	20.0
Median	17.0	18.1	26.7	9.10	7.80	9.30	16.3	58.1	9.0	2.10	14.5	9.30	14.1	8.50	17.5	8.80	22.2	21.4	19.6
3rdQuart	18.0	19.1	28.1	9.60	8.15	9.75	18.3	58.7	9.5	2.30	18.8	9.80	26.6	8.95	18.4	9.25	23.4	22.6	20.7
Max	19.1	22.3	30.0	10.20	8.70	10.40	24.0	63.2	10.1	2.50	22.2	10.50	44.7	9.50	19.6	9.90	24.9	24.1	22.1

Note: Samples were analysed at field moisture content (as collected). Note that units for OCPs are µg/kg dwt, and units for metals are mg/kg dwt.
Seven samples were collected along the proposed footprint for dredging at two to three feet below the sediment surface using a scoop.

Table A-4. Sediment data collected in 2017 in preparation for Newton Park Access Channel dredging (Taylor Engineering, Inc. 2017)

SAMPLE NAME	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg	Heptachlor ug/kg	Heptachlor epoxide ug/kg	Lead mg/kg	Mercury mg/kg	Methoxychlor ug/kg	Oxychlordane ug/kg	Percent Solids %	Selenium mg/kg	Silver mg/kg	Toxaphene ug/kg	trans-Nonachlor ug/kg
SED 1	21 U,J(C2)	31.2 U	18.9 U,J(C2)	11.4 U,J(C2)	0.5 U,J(C2)	8.8 U	7.6 U	0.19 U	135 U,J(C2)	23.4 U	5.585	19.6 U	6.1 U	253 U	11.6 U
SED 2	20.3 U,J(C2)	30.1 U	18.2 U,J(C2)	11 U,J(C2)	0.1 U,J(C2)	8.5 U	7.4 U	0.18 U	130 U	22.6 U	5.788	19 U	5.9 U	244 U	11.2 U
SED 3	19 U,J(C2)	28.3 U	17.1 U,J(C2)	10.4 U,J(C2)	9.5 U	8 U	6.2 U	0.17 U	122 U	21.2 U	6.169	15.8 U	4.9 U	229 U	10.5 U
SED 4	18.6 U,J(C2)	27.7 U	16.7 U,J(C2)	10.1 U,J(C2)	9.3 U,J(C2)	7.8 U,J(C2)	6.2 U	0.16 U	119 U,J(C2)	20.8 U	6.298	15.8 U	4.9 U	224 U	10.3 U
SED 5	19.6 U,J(C2)	29.1 U	17.6 U	10.7 U,J(C2)	9.8 U	8.2 U	6.6 U	0.17 U	126 U	21.8 U	5.992	16.8 U	5.2 U	235 U	10.8 U
SED 6	18.8 U	28 U	16.9 U	10.3 U,J(C2)	9.4 U,J(C2)	7.9 U	27.3	0.19 I	121 U	21 U	6.225	17.2 U	5.3 U	227 U	10.4 U
SED 7	22 U,J(C2)	32.7 U,J(C2)	19.8 U,J(C2)	12 U	11 U	9.3 U	47.8	0.19 U	141 U,J(C2)	24.6 U	5.329	20.5 U	6.3 U	265 U	12.2 U

Summary

ANALYTE	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg	Heptachlor ug/kg	Heptachlor epoxide ug/kg	Lead mg/kg	Mercury mg/kg	Methoxychlor ug/kg	Oxychlordane ug/kg	Percent Solids %	Selenium mg/kg	Silver mg/kg	Toxaphene ug/kg	trans-Nonachlor ug/kg
Count	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
%ND	100	100	100	100	100	100	0	86	100	100	0	100	100	100	100
%I	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0
Min	18.6	27.7	16.7	10.1	9.30	7.80	6.2	0.160	119	20.8	5.33	15.8	4.90	224	10.3
1stQuart	18.9	28.2	17.0	10.4	9.45	7.95	6.4	0.170	122	21.1	5.69	16.3	5.05	228	10.5
Mean	19.9	29.6	17.9	10.8	9.94	8.36	15.6	0.179	128	22.2	5.91	17.8	5.51	240	11.0
Median	19.6	29.1	17.6	10.7	9.80	8.20	7.4	0.180	126	21.8	5.99	17.2	5.30	235	10.8
3rdQuart	20.7	30.7	18.6	11.2	10.30	8.65	17.5	0.190	133	23.0	6.20	19.3	6.00	249	11.4
Max	22.0	32.7	19.8	12.0	11.00	9.30	47.8	0.190	141	24.6	6.30	20.5	6.30	265	12.2

Note: Samples were analysed at field moisture content (as collected). Note that units for OCPs are µg/kg dwt, and units for metals are mg/kg dwt.
Seven samples were collected along the proposed footprint for dredging at two to three feet below the sediment surface using a scoop.

Table A-5. Sediment data collected in 2017 in preparation for Newton Park Access Channel dredging, samples dried prior to analysis (Taylor Engineering, Inc. 2017)

SAMPLE NAME	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Arsenic mg/kg	Barium mg/kg	beta-BHC ug/kg
SED 1 DRY	2.6 U,J(C2)	2.7 U	4 U	1.4 U,J(C2)	1.2 U,J(C2)	1.4 U	6.1 I	46.3	1.4 U
SED 2 DRY	2.4 U	2.6 U	3.8 U	1.3 U	1.1 U	1.3 U	6.5	48	1.3 U
SED 3 DRY	3.1 U	3.3 U,J(C2)	4.8 U,J(C2)	1.6 U,J(C2)	1.4 U,J(C2)	1.7 U	6.4 I	44.1	1.6 U
SED 4 DRY	2.5 U,J(C2)	2.7 U	4 U,J(C2)	1.4 U,J(C2)	1.2 U,J(C2)	1.4 U	6.6 I	42.9	1.3 U
SED 5 DRY	3 U,J(C2)	3.2 U	4.7 U,J(C2)	1.6 U,J(C2)	1.4 U,J(C2)	1.6 U	6.7 I	40.6	1.6 U
SED 6 DRY	2.9 U,J(C2)	3.1 U	4.6 U,J(C2)	1.6 U,J(C2)	1.3 U,J(C2)	1.6 U	9.4 I	55.3	1.6 U
SED 7 DRY	2.4 U	12.7	3.7 U,J(C2)	1.3 U,J(C2)	1.1 U,J(C2)	1.3 U	13.6	53.4	1.3 U

SAMPLE NAME	Cadmium mg/kg	Chromium mg/kg	cis-Nonachlor ug/kg	Copper mg/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg
SED 1 DRY	0.19 U	11.3	1.4 U,J(C2)	5.2	1.3 U,J(C2)	2.6 U,J(C2)	1.3 U,J(C2)	3.4 U	3.2 U,J(C2)	3 U
SED 2 DRY	0.16 U	10.1	1.3 U,J(C2)	5.3	1.2 U,J(C2)	2.5 U,J(C2)	1.3 U,J(C2)	3.2 U	3.1 U,J(C2)	2.8 U
SED 3 DRY	0.19 U	11.7	1.7 U,J(C2)	5.3	1.5 U	3.1 U,J(C2)	1.6 U	4 U,J(C2)	3.9 U,J(C2)	3.5 U
SED 4 DRY	0.28 U	11	1.4 U,J(C2)	6.4	1.3 U,J(C2)	2.6 U	1.3 U,J(C2)	3.3 U	3.2 U,J(C2)	2.9 U
SED 5 DRY	0.37 U	11.6	1.6 U,J(C2)	8.7	1.5 U,J(C2)	3.1 U	1.6 U,J(C2)	3.9 U,J(C2)	3.8 U,J(C2)	3.5 U
SED 6 DRY	0.37 U	17.4	1.6 U,J(C2)	28.6	1.5 U	3 U	1.5 U	3.8 U,J(C2)	3.7 U,J(C2)	3.4 U,J(C2)
SED 7 DRY	0.55 I	19.6	1.3 U	40.8	1.2 U	2.4 U	1.2 U	3.1 U	3 U,J(C2)	2.8 U,J(C2)

Summary

ANALYTE	4,4'-DDD ug/kg	4,4'-DDE ug/kg	4,4'-DDT ug/kg	Aldrin ug/kg	alpha-BHC ug/kg	alpha-Chlordane ug/kg	Arsenic mg/kg	Barium mg/kg	beta-BHC ug/kg
Count	7	7	7	7	7	7	7	7	7
%ND	100	0	100	100	100	100	0	0	100
%I	0	0	0	0	0	0	0	0	0
Min	2.40	2.60	3.70	1.30	1.10	1.30	6.10	40.6	1.30
1stQuart	2.45	2.70	3.90	1.35	1.15	1.35	6.45	43.5	1.30
Mean	2.70	4.33	4.23	1.46	1.24	1.47	7.90	47.2	1.44
Median	2.60	3.10	4.00	1.40	1.20	1.40	6.60	46.3	1.40
3rdQuart	2.95	3.25	4.65	1.60	1.35	1.60	8.05	50.7	1.60
Max	3.10	12.70	4.80	1.60	1.40	1.70	13.60	55.3	1.60

ANALYTE	Cadmium mg/kg	Chromium mg/kg	cis-Nonachlor ug/kg	Copper mg/kg	delta-BHC ug/kg	Dieldrin ug/kg	Endosulfan I ug/kg	Endosulfan II ug/kg	Endosulfan sulfate ug/kg	Endrin ug/kg
Count	7	7	7	7	7	7	7	7	7	7
%ND	85.71429	0	100	0	100	100	100	100	100	100
%I	14.28571	0	0	0	0	0	0	0	0	0
Min	0.160	10.1	1.30	5.20	1.20	2.40	1.20	3.10	3.00	2.80
1stQuart	0.190	11.2	1.35	5.30	1.25	2.55	1.30	3.25	3.15	2.85
Mean	0.301	13.2	1.47	14.33	1.36	2.76	1.40	3.53	3.41	3.13
Median	0.280	11.6	1.40	6.40	1.30	2.60	1.30	3.40	3.20	3.00
3rdQuart	0.370	14.6	1.60	18.65	1.50	3.05	1.55	3.85	3.75	3.45
Max	0.550	19.6	1.70	40.80	1.50	3.10	1.60	4.00	3.90	3.50

Note: Samples were dried prior to analyses to lower detection limits but otherwise are same samples summarized in Table A-4. Note that units for OCPs are µg/kg dwt, and units for metals are mg/kg dwt.

Table A-5. Sediment data collected in 2017 in preparation for Newton Park Access Channel dredging, samples dried prior to analysis (Taylor Engineering, Inc. 2017)

SAMPLE NAME	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg	Heptachlor ug/kg	Heptachlor epoxide ug/kg	Lead mg/kg	Mercury mg/kg	Methoxychlor ug/kg	Oxychlordane ug/kg	Percent Solids %	Selenium mg/kg	Silver mg/kg	Toxaphene ug/kg	trans-Nonachlor ug/kg
SED 1 DRY	3 U,J(C2)	4.4 U	2.7 U	1.6 U,J(C2)	1.5 U	1.2 U,J(C2)	4.4	0.071	19 U,J(C2)	3.3 U	65.865	3.1 I	0.5 U	35.7 U	1.6 U
SED 2 DRY	2.8 U,J(C2)	4.2 U	2.5 U,J(C2)	1.5 U,J(C2)	1.4 U,J(C2)	1.2 U	4.5	0.08	18 U,J(C2)	3.1 U	83.565	2.8 I	0.41 U	33.8 U	1.6 U
SED 3 DRY	3.5 U,J(C2)	5.2 U	3.2 U	1.9 U,J(C2)	1.8 U	1.5 U,J(C2)	4.1	0.068	22.6 U,J(C2)	3.9 U	66.592	3.3 I	0.49 U	42.4 U	1.9 U
SED 4 DRY	2.9 U	4.3 U	2.6 U	1.6 U,J(C2)	1.4 U,J(C2)	1.2 U	5.9	0.083	18.6 U,J(C2)	3.2 U	43.234	2.7 I	0.74 U	35 U	1.6 U
SED 5 DRY	3.5 U,J(C2)	5.2 U	3.1 U,J(C2)	1.9 U,J(C2)	1.7 U	1.5 U	8.9	0.11	22.2 U,J(C2)	3.9 U	33.875	3.1 U	0.97 U	41.6 U	1.9 U
SED 6 DRY	3.4 U,J(C2)	5 U	3 U	1.8 U,J(C2)	1.7 U,J(C2)	1.4 U	20.7	0.23	21.6 U,J(C2)	3.8 U	34.755	3.3 I	0.95 U	40.6 U	1.9 U
SED 7 DRY	2.7 U,J(C2)	4.1 U,J(C2)	2.5 U	1.5 U,J(C2)	1.4 U	1.2 U	54.9	0.2	17.6 U,J(C2)	3.1 U	42.747	2.5 U	0.78 U	33 U	1.5 U

Summary

ANALYTE	Endrin aldehyde ug/kg	Endrin ketone ug/kg	gamma-BHC (Lindane) ug/kg	gamma-Chlordane ug/kg	Heptachlor ug/kg	Heptachlor epoxide ug/kg	Lead mg/kg	Mercury mg/kg	Methoxychlor ug/kg	Oxychlordane ug/kg	Percent Solids %	Selenium mg/kg	Silver mg/kg	Toxaphene ug/kg	trans-Nonachlor ug/kg
Count	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
%ND	100	100	100	100	100	100	0	0	100	100	0	28.57143	100	100	100
%I	0	0	0	0	0	0	0	0	0	0	0	71.42857	0	0	0
Min	2.70	4.10	2.50	1.50	1.40	1.20	4.1	0.068	17.6	3.10	33.9	2.50	0.410	33.0	1.50
1stQuart	2.85	4.25	2.55	1.55	1.40	1.20	4.5	0.076	18.3	3.15	38.8	2.75	0.495	34.4	1.60
Mean	3.11	4.63	2.80	1.69	1.56	1.31	14.8	0.120	19.9	3.47	52.9	2.97	0.691	37.4	1.71
Median	3.00	4.40	2.70	1.60	1.50	1.20	5.9	0.083	19.0	3.30	43.2	3.10	0.740	35.7	1.60
3rdQuart	3.45	5.10	3.05	1.85	1.70	1.45	14.8	0.155	21.9	3.85	66.2	3.20	0.865	41.1	1.90
Max	3.50	5.20	3.20	1.90	1.80	1.50	54.9	0.230	22.6	3.90	83.6	3.30	0.970	42.4	1.90

Note: Samples were dried prior to analyses to lower detection limits but otherwise are same samples summarized in Table A-4. Note that units for OCPs are µg/kg dwt, and units for metals are mg/kg dwt.

DEPARTMENT OF THE ARMY PERMIT

Permittee: St. Johns River Water Management District
Attn: Dr. Ann Shortelle
4049 Reid Street
Palatka, Florida 32177

Permit No: SAJ-2019-00608 (SP-JED)

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: You are hereby authorized to complete the following work:

Hydraulically dredge 26,666,598 cubic yards of material from seven areas dispersed throughout Lake Apopka totaling 12,826 acres;

Discharge the dredged material into 12,003 acres of waters of the United States encompassed within fourteen areas of the Lake Apopka North Shore Restoration Area (LANS). Dredged material would be transported from the point of discharge using a standard hydraulic dredge pipeline configuration. The pipeline would utilize a combination of floating on-water segments and land segments along the Apopka-Beauclair canal. Floating and land based booster pumps would be utilized along the pipeline route as necessary;

Discharge 561 cubic yards of fill material consisting of natural organic material such as peat to plant and establish submerged and floating aquatic vegetation communities within 600 acres of the proposed dredge areas.

The work described above is to be completed in accordance with the 46 pages of drawings and 5 attachments affixed at the end of this permit instrument.

Project Location: The project would affect waters of the United States associated with Lake Apopka and the Lake Apopka North Shore Restoration Area located in the following areas of Lake or Orange County, Florida:

Section(s): 26, 27, 33-36 Township: 20 S Range: 26 E
Section(s): 22, 27-29, 31-35 Township: 20 S Range: 27 E
Section(s): 1-4, 22, 35 Township: 21 S Range: 26 E
Section(s): 1-15, 23, 24, 36 Township: 21 S Range: 27 E
Section(s): 7, 18, 19, 30, 31 Township: 21 S Range: 28 E

Directions to site: From the intersection of US-441 and CR-414, travel NW on US-441/Orange Blossom Trail for 3.9 miles and then turn left on to West Jones Avenue. Stay on West Jones Avenue (which becomes Duda Road) for 3.7 miles and proceed to turn left on County Road 448A. Continue on CR-448A for 0.5 miles then turn right on to CR-48. Travel 1.2 miles to the Nutrient Reduction Facility site. Access to the site is then off road or on foot to the south.

Approximate Central Coordinates: Latitude: 28.655299°
Longitude: -81.632399°

Permit Conditions

General Conditions:

1. The time limit for completing the work authorized ends on **March 25, 2030.** 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. 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-2019-00608 (SP-JED), on all submittals.

2. Commencement Notification: Within 10 days from the date of initiating the work authorized by this permit the Permittee shall submit a completed “Commencement Notification” Form (Attachment 3).

3. 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 a completed “As-Built Certification By Professional Engineer” form (Attachment 4) 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.

4. 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 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 **Tampa** Permits Section. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for modification of this permit.

5. Assurance of Navigation and Maintenance: The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structures or work herein authorized, or if in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

6. Posting of Permit: The Permittee shall have available and maintain for review a copy of this permit and approved plans at the construction site.

7. Erosion Control: Prior to the initiation of any work authorized by this permit, the Permittee shall install erosion control measures along the perimeter of all work areas to prevent the displacement of fill material outside the authorized work area. Immediately after completion of the final grading of the land surface, all slopes, land surfaces, and filled areas shall be stabilized using sod, degradable mats, barriers, or a combination of similar stabilizing materials to prevent erosion. The erosion control measures shall remain in place and be maintained until all authorized work is completed and the work areas are stabilized.

8. Removal of structures: On the date of the expiration of the time limit for completing the authorized work, or within 60 days of completion of the authorized work, whichever comes first, the Permittee shall remove the temporary pipeline and booster pumps from Lake Apopka and/or the AB Canal.

9. Turbidity Controls: Prior to the initiation of any of the work authorized by this permit, the Permittee shall implement best management practices to ensure applicable water quality requirements will not be violated. The Permittee shall employ appropriate turbidity controls throughout the dredge and discharge operations to control erosion and siltation and ensure that turbidity levels within the project area do not exceed background conditions required in the Water Quality Certification (Attachment 2). All turbidity controls shall remain in place and be maintained until the source of the discharge and/or turbidity has been corrected and erodible materials have been stabilized.

10. Maximum Discharge Elevation: In order to ensure that the fill discharge authorized herein results in the establishment of shallow marsh wetlands, the Permittee shall cease the discharge of fill material into any authorized discharge areas of the LANS once the target bottom elevation is reached. This permit instrument does not authorize the Permittee to exceed the target elevations provided in the project drawings (Attachment 1) and Attachment 5 of this permit.

11. Dredge Avoidance Areas: The Permittee shall avoid dredging any existing communities of native submerged vegetation within Lake Apopka. These vegetated bottom areas were avoided as part of this permit application review process; and, therefore, the existing vegetated areas will not be disturbed by any dredging activities that would degrade the ecological integrity of these areas. The Corps reserves the right to deny review of any requests for future impacts to these avoided vegetation areas.

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.

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.

Ann B. Shortelle, Ph.D. March 25, 2020

(PERMITTEE) (DATE)

Ann B. Shortelle, Ph.D.
(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

25 March 2020

(DISTRICT ENGINEER) (DATE)
For 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-2019-00608 (SP-JED)

1. PERMIT DRAWINGS: 46 pages, dated March 11, 2020

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. 121 pages.

3. COMMENCEMENT NOTIFICATION FORM: 1 page

4. AS-BUILT CERTIFICATION FORM: 2 pages

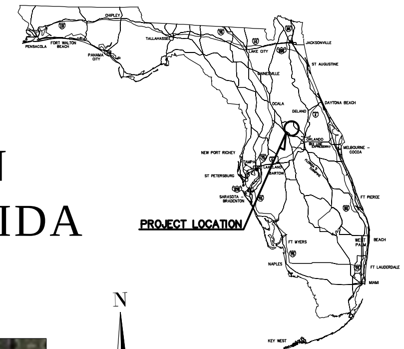
5. LANS Discharge Area Target Elevations: 1 page

ATTACHMENT 1A

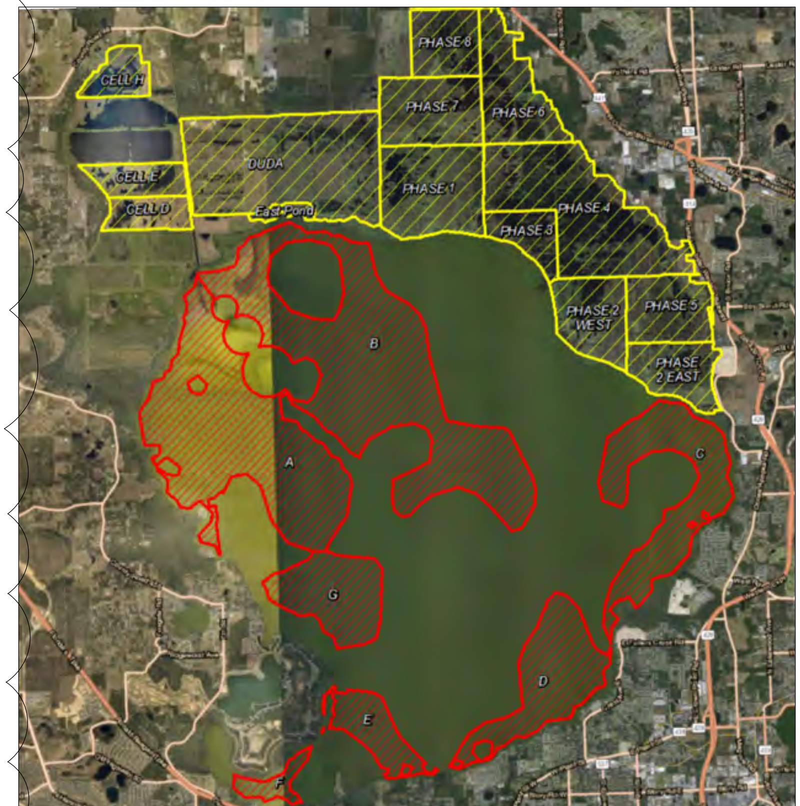
PROJECT: SAJ-2019-00608 (SP-JED) DATE: 11 MAR 2020

Lake Apopka Dredge and Placement Typical Plans (35 PAGES)

LAKE APOPKA DREDGE AND PLACEMENT TYPICAL PLAN ORANGE AND LAKE COUNTY, FLORIDA



INDEX OF DRAWINGS



N

0 7,500' 15,000'

LEGEND

PLACEMENT AREA

DREDGE AREA

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN CHANGED IN SIZE BY REPRODUCTION.
THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.

GOVERNING SPECIFICATIONS:
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (FWC);
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP);
U.S. ARMY CORPS OF ENGINEERS (USACE)
IN THE EVENT OF A CONFLICT, THE MOST RESTRICTIVE APPLIES.

PLAN PREPARED BY:

wood.

WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS, INC.
6256 GREENLAND ROAD,
JACKSONVILLE, FLORIDA 32258
TEL:(904) 396-5173
WEBSITE: WWW.WOODPLC.COM
EMAIL: Joseph.Wagner@woodplc.com
ENGINEER OR RECORD:
ROBERT J. WAGNER, P.E., D.NE. (FL63028)
CERTIFICATE OF AUTHORIZATION: FL 5392

PROJECT OWNER:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
4049 REID STREET, PALATKA, FLORIDA 32177

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No:
6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

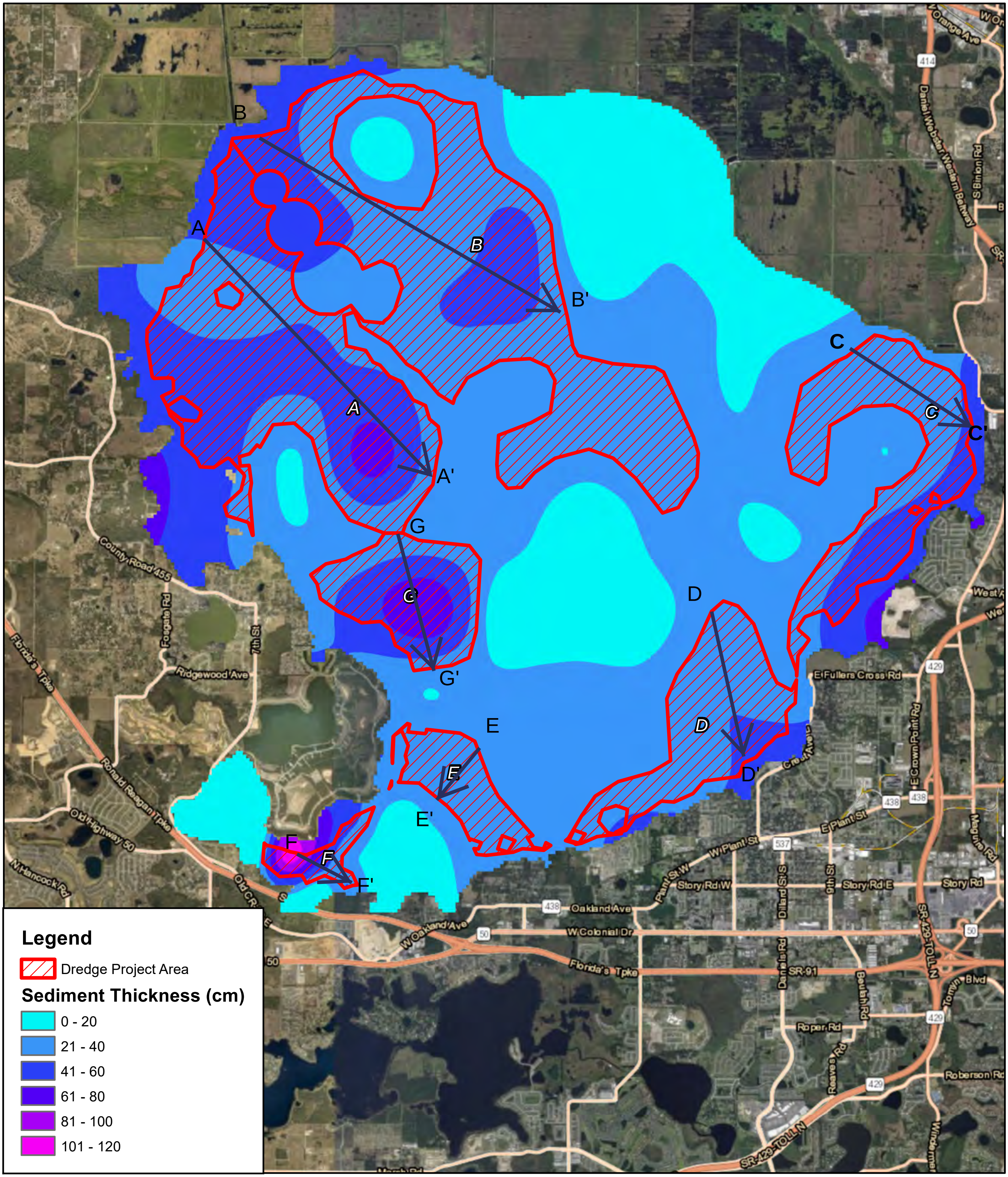
DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:

COVER SHEET

SHEET NUMBER:	REV. 1
1	
SHEET 1 OF 34 SHEETS	


Legend
Sheet 2
Depth Contours (ft)
Index
Minor
N
0
3,500
7,000 Ft
Note: Based on 2008 survey. Lake level 65.6 ft NAVD88
Data Sources: ESRI 2014(Aerial) ; WOOD 2018: SJRWMD 2016
Yothers Rd
Lester Rd
W Orange Blossom Trl
W Orange Ave
Daniel Webster Western Beltway
Schopke Lester Rd
S Binion Rd
Boy S
SR-429 TOLL
Ocoee Apopka Rd
West Rd
County Road 455
Fosgate Rd
7th St
Ridgewood Ave
Florida's Tpke
Ronald Reagan Tpke
Old Highway 50
N Hancock Rd
Old CR-50 E
SR-91
E Fullers Cross Rd
Crest Ave E
E Crown Point Rd
N Lakewood Ave
Maguire Rd
E Plant St
W Plant St
Plant St W
Story Rd W
Story Rd E
Story Rd
Dillard St
9th St
Oakland Ave
W Oakland Ave
W Colonial Dr
State Road 50
Highway 50
Daniels Rd
Beulah Rd
Tomyn Blvd
441
429
414
438
439
537
50
5
10
15



Source: Imagery, ESRI 2017; Wood 2018

N

0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

UCF Thickness Map

Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Sheet 3
DLA	1/15/2019			
Checked	Date			
MFC	1/15/2019			

Path: P:\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\Figure 8 UCF Thickness Map.mxd dustin.atwater Date Saved: 1/15/2019 2:20:01 PM

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

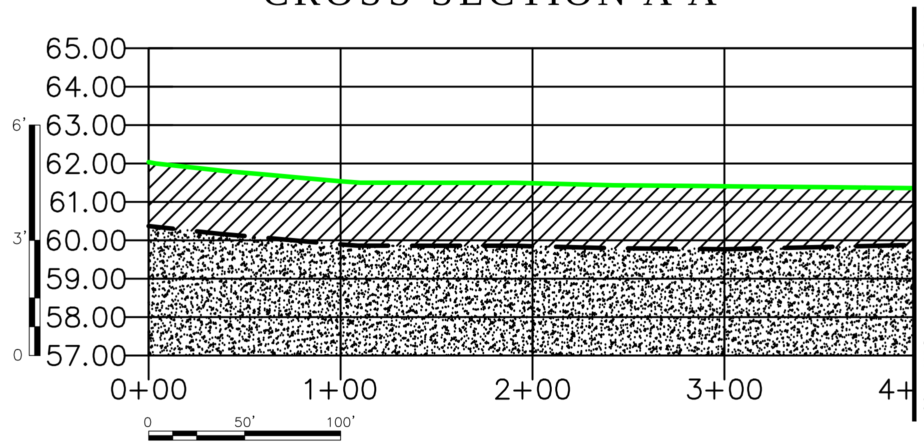
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

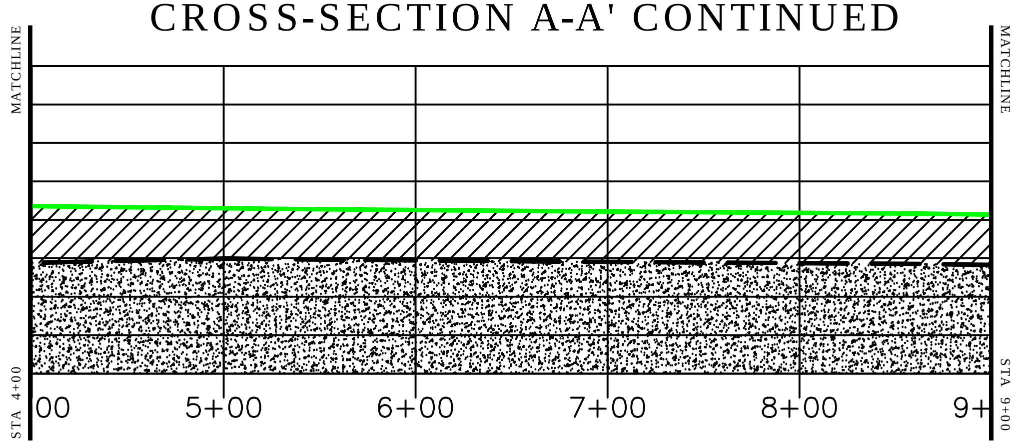
PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

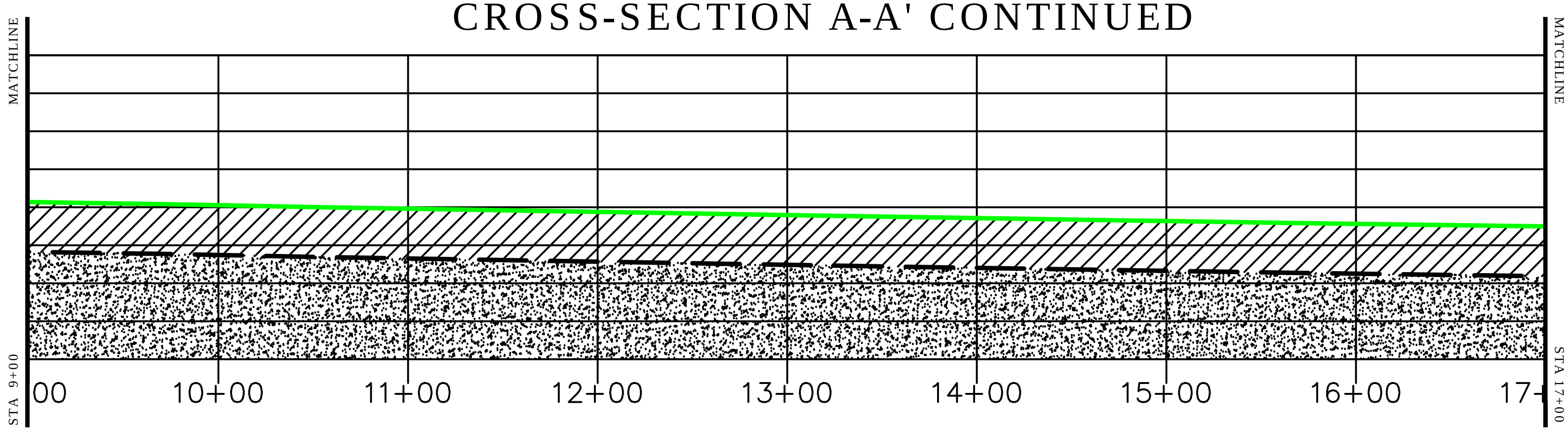
CROSS-SECTION A-A'



CROSS-SECTION A-A' CONTINUED



CROSS-SECTION A-A' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF
AUTHORIZATION LICENSE
NUMBER 5392

PROJECT:

LAKE APOPKA
DREDGING AND
PLACEMENT

APPLICANT:

ST. JOHNS
RIVER WATER
MANAGEMENT
DISTRICT

WOOD PROJECT No:
6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION A (1)

SHEET NUMBER:	REV. 1
4	

SHEET 4 OF 34 SHEETS

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

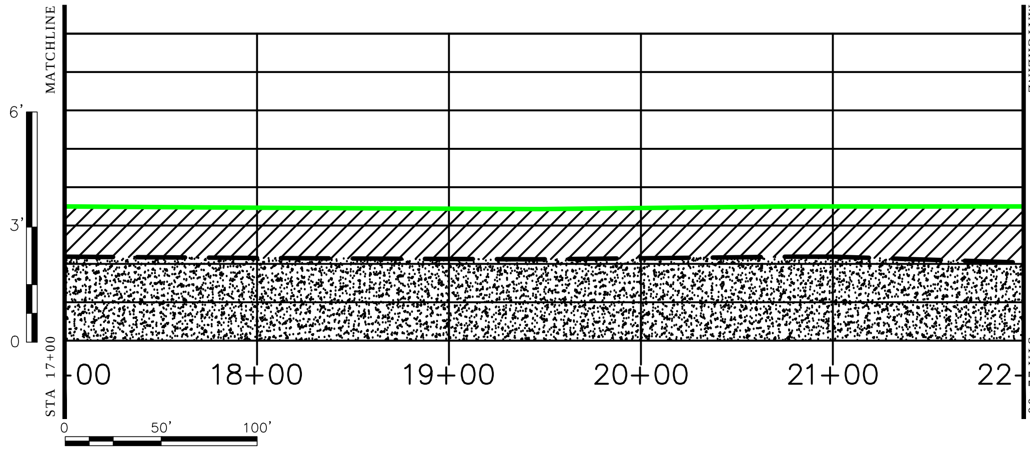
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

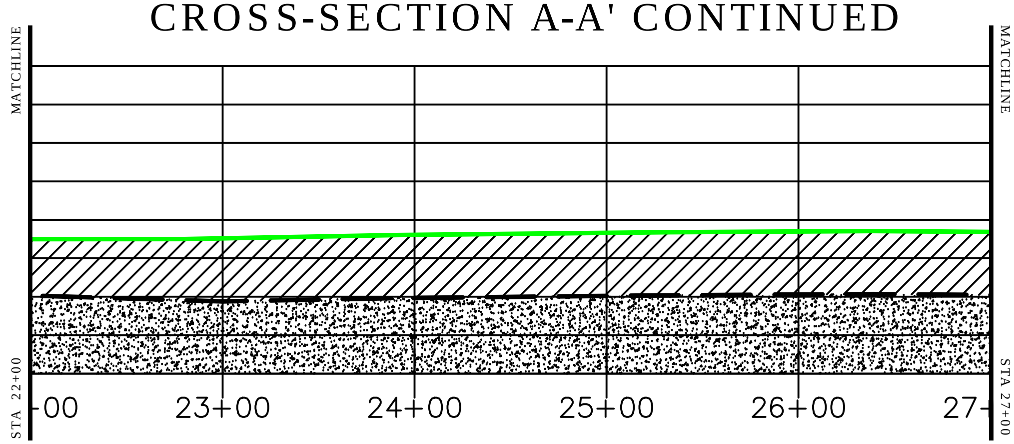
PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

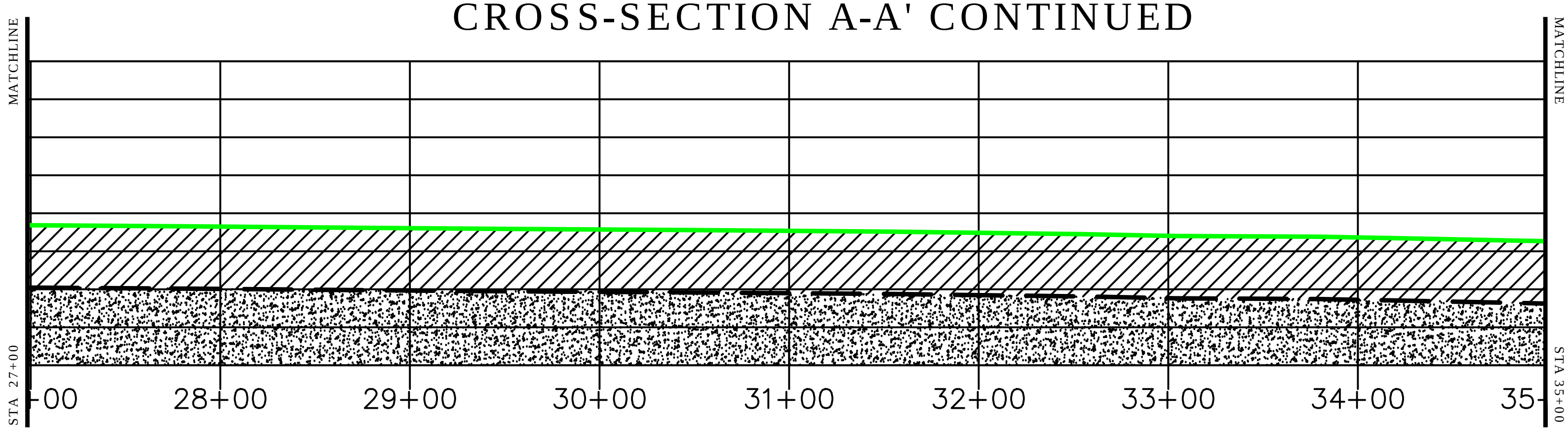
CROSS-SECTION A-A' CONTINUED



CROSS-SECTION A-A' CONTINUED



CROSS-SECTION A-A' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF
AUTHORIZATION LICENSE
NUMBER 5392

PROJECT:

LAKE APOPKA
DREDGING AND
PLACEMENT

APPLICANT:

ST. JOHNS
RIVER WATER
MANAGEMENT
DISTRICT

WOOD PROJECT No:
6735-17-9417

REVISIONS

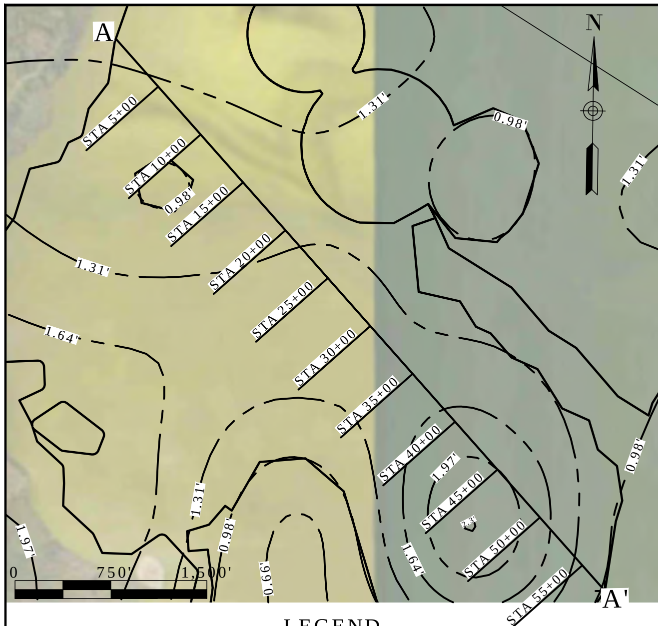
NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION A (2)

SHEET NUMBER:	REV. 1
5	

SHEET 5 OF 34 SHEETS



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

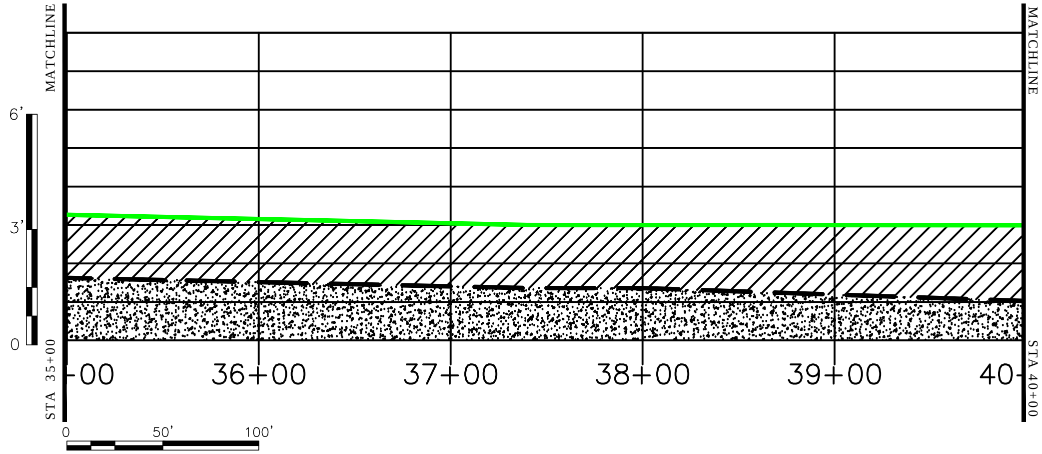
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

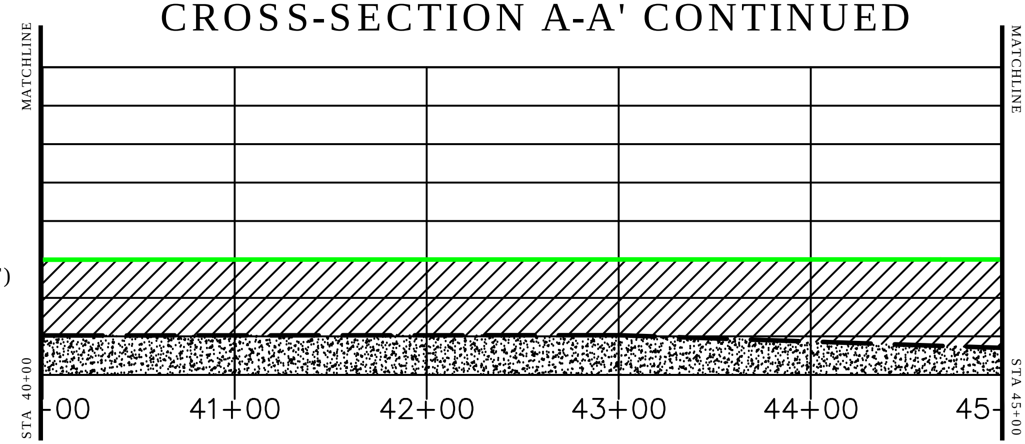
PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

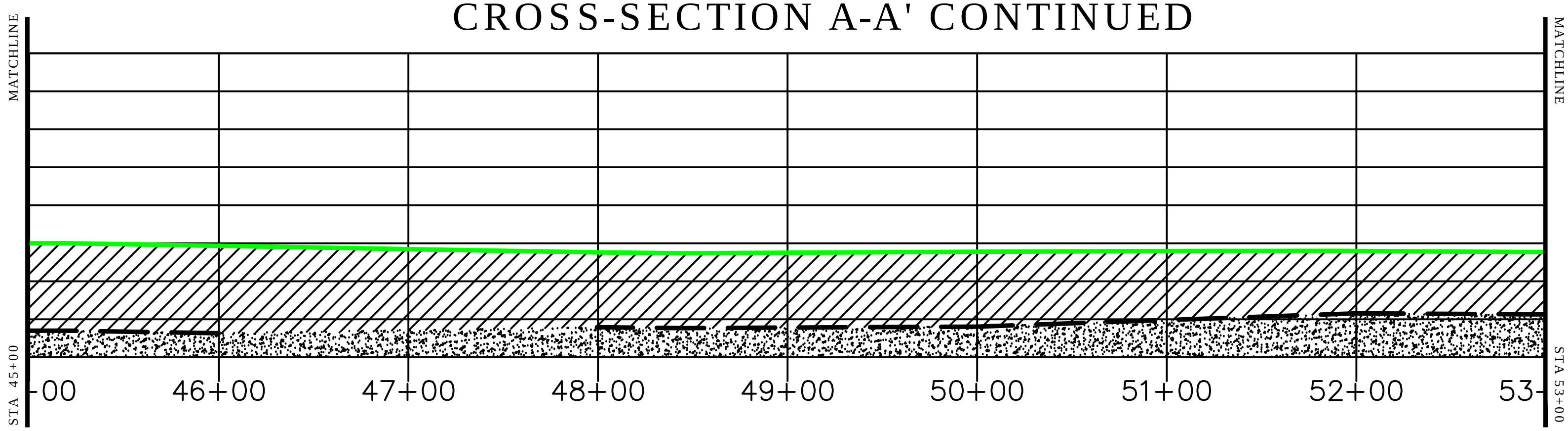
CROSS-SECTION A-A' CONTINUED



CROSS-SECTION A-A' CONTINUED



CROSS-SECTION A-A' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF
AUTHORIZATION LICENSE
NUMBER 5392

PROJECT:

LAKE APOPKA
DREDGING AND
PLACEMENT

APPLICANT:

ST. JOHNS
RIVER WATER
MANAGEMENT
DISTRICT

WOOD PROJECT No:
6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
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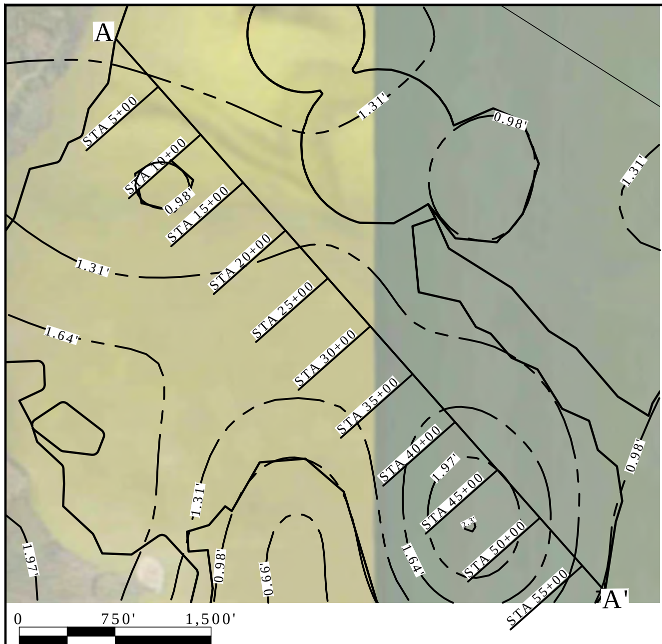
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION A (3)

SHEET NUMBER: 6 REV. 1



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

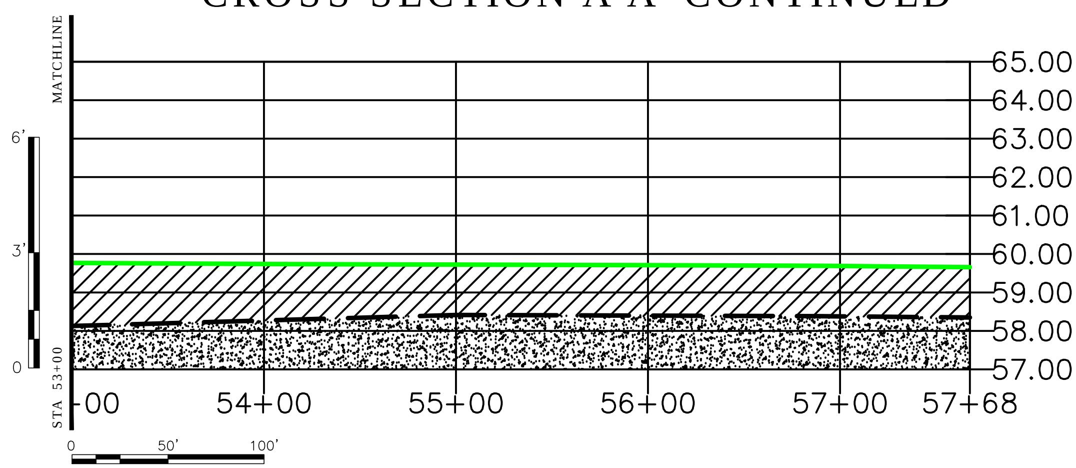
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

CROSS-SECTION A-A' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

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LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No:
6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
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DESIGNED BY:	OTHERS
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APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION A (4)

SHEET NUMBER: 7 REV. 1

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

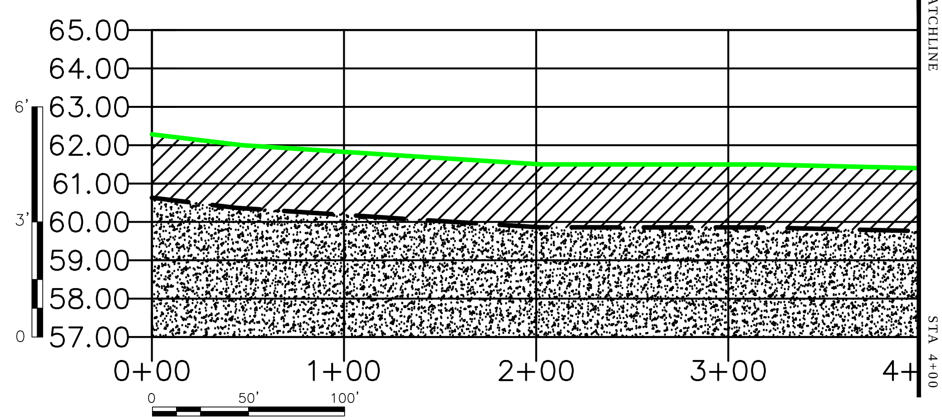
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION B-B'



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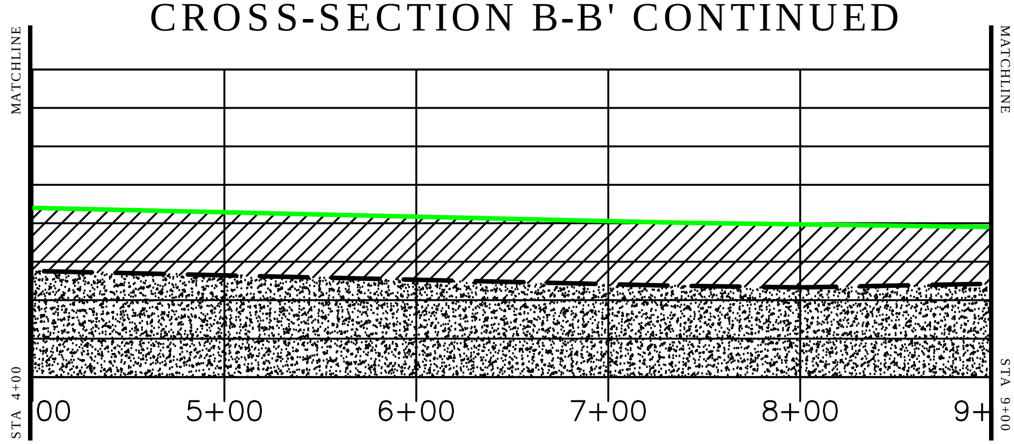

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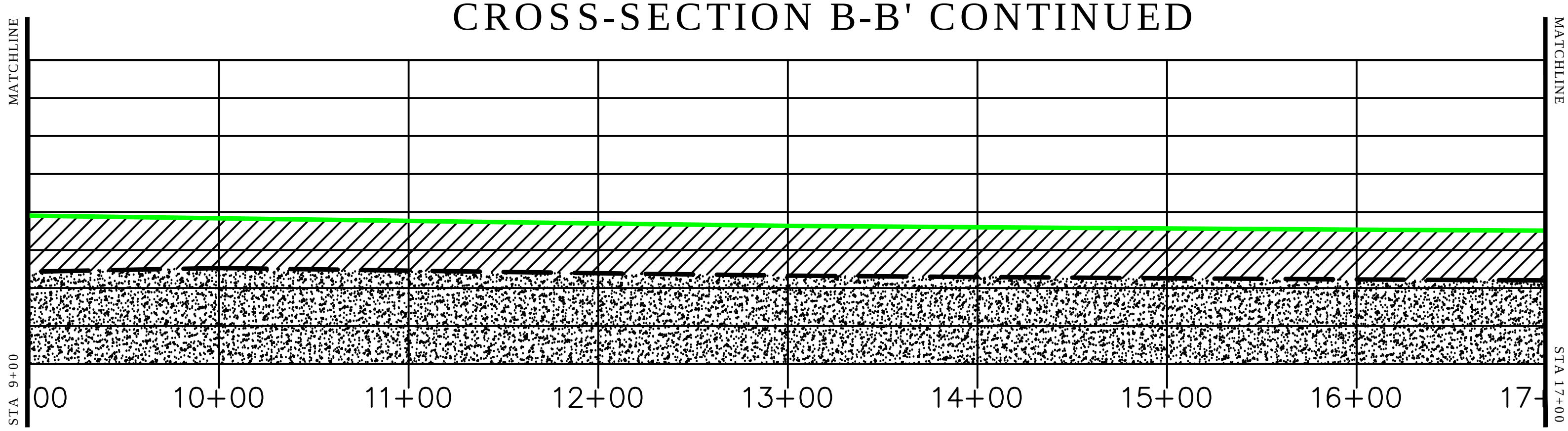

NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
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ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

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APPROVED BY:	RJW
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SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION B (1)

SHEET NUMBER:	REV. 1
8	

SHEET 8 OF 34 SHEETS

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

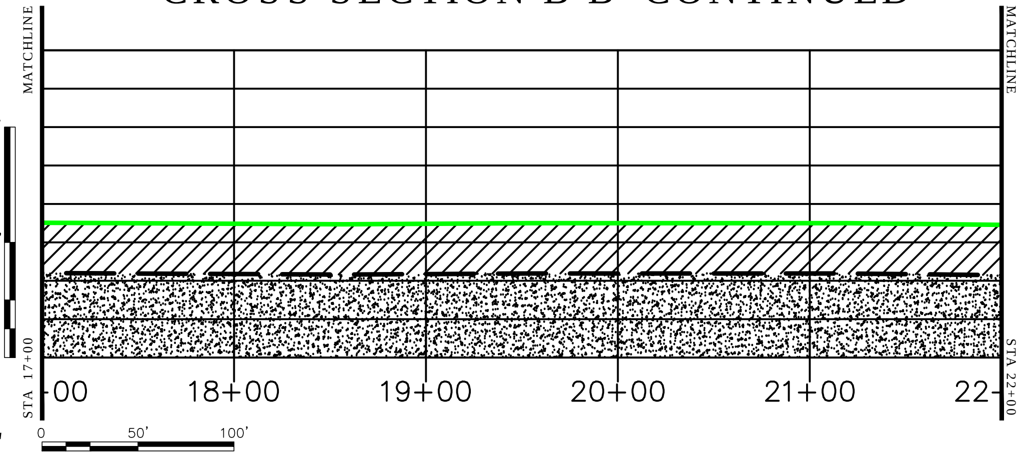
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION B-B' CONTINUED



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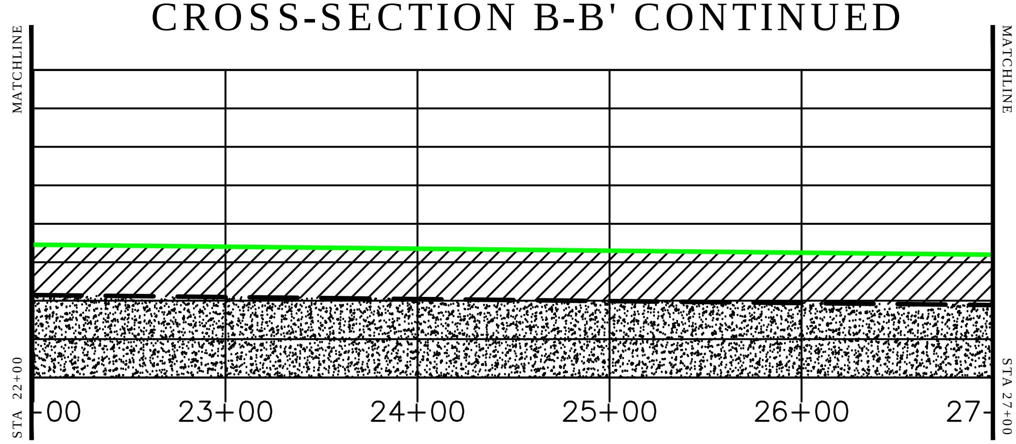

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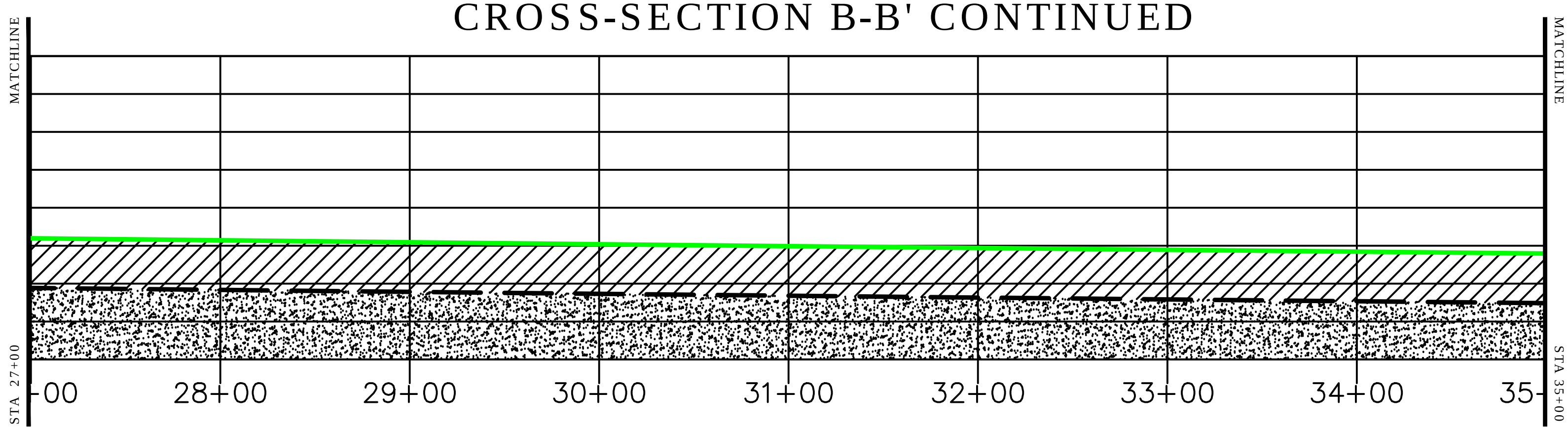

NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
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LAKE APOPKA
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APPLICANT:

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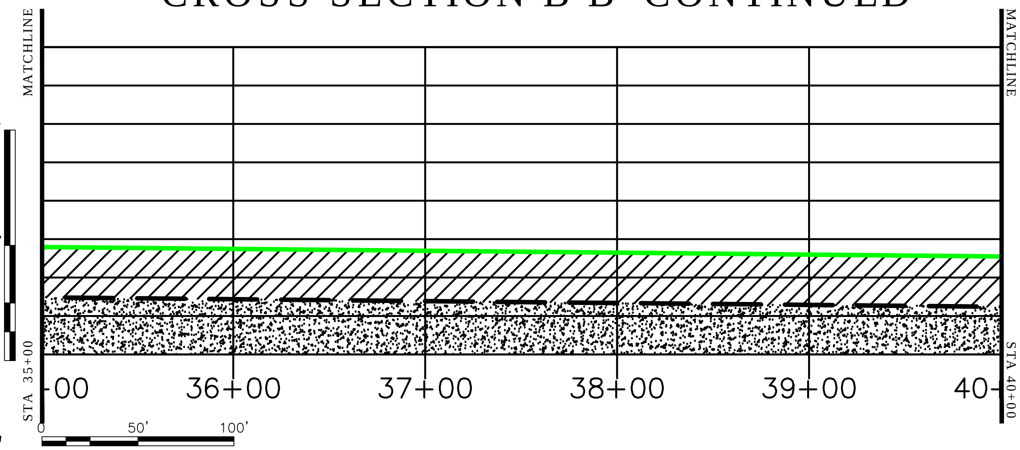
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION B (2)

SHEET NUMBER:	REV. 1
9	

CROSS-SECTION B-B' CONTINUED



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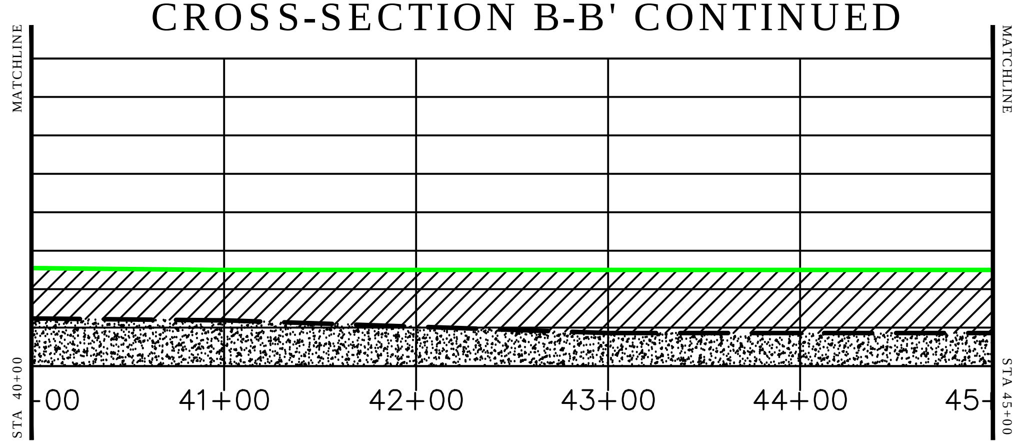


LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

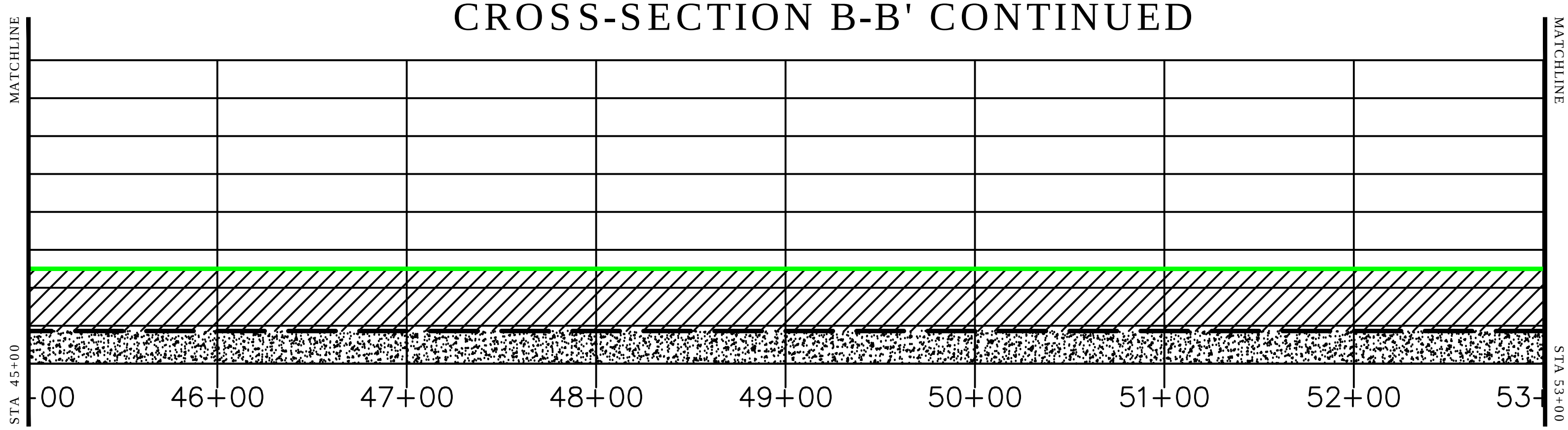
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION B-B' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

wood.

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PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS			
NO.	DATE	BY	APPROVED
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DESIGNED BY:	OTHERS
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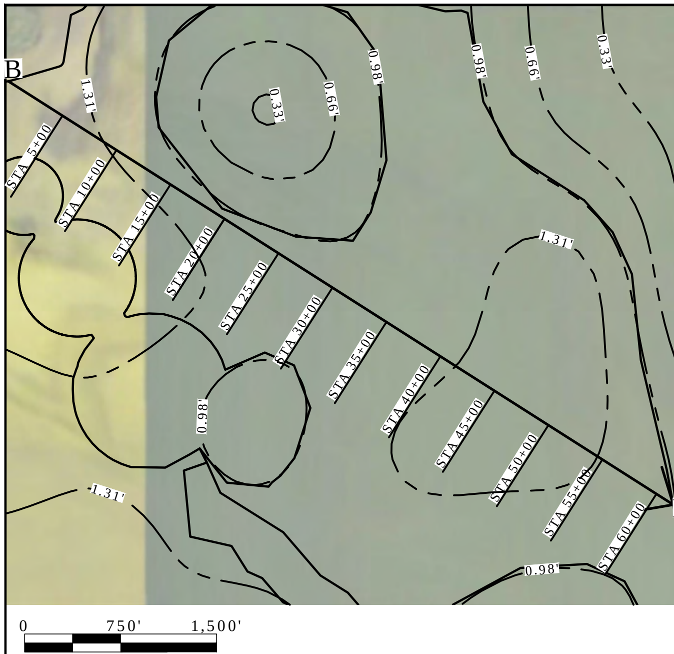
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION B (3)

SHEET NUMBER: 10 — REV. 1

SHEET 10 OF 34 SHEETS



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

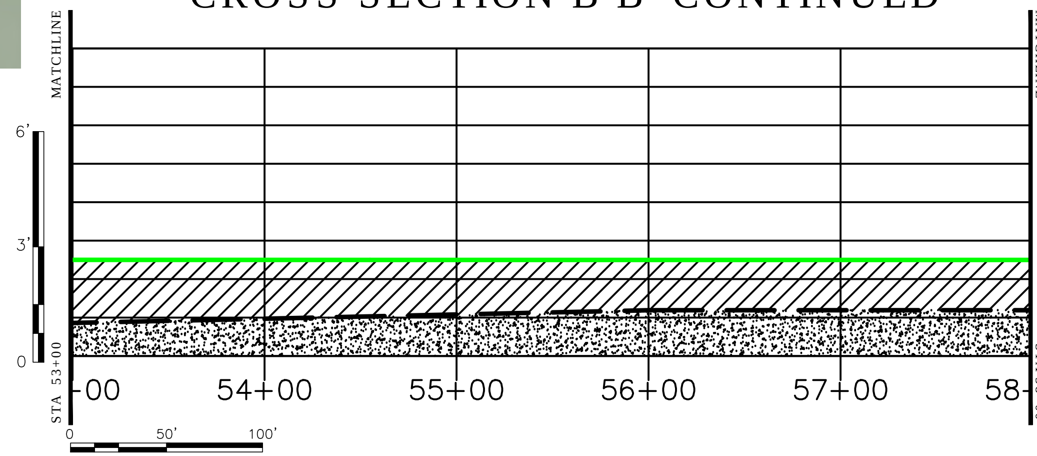
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

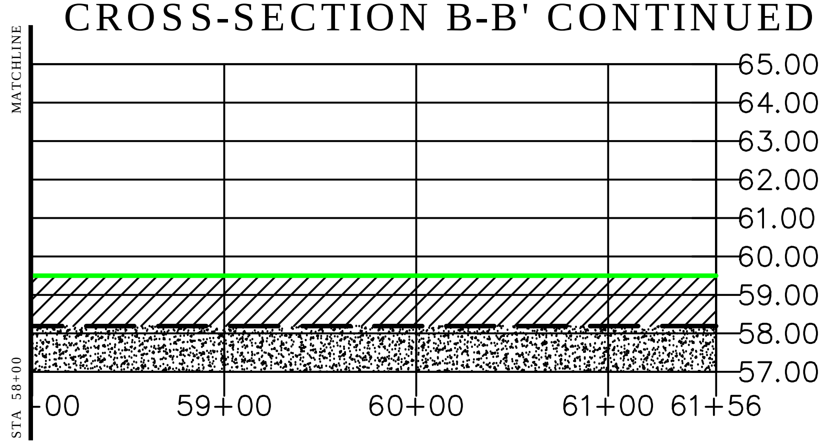
PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

CROSS-SECTION B-B' CONTINUED



CROSS-SECTION B-B' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
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wood.

404 SW 140TH TERRACE
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PROJECT:

LAKE APOPKA
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APPLICANT:

ST. JOHNS
RIVER WATER
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DISTRICT

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6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

DESIGNED BY:	OTHERS
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APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION B (4)

SHEET NUMBER:	REV. 1
11	
SHEET 11 OF 34 SHEETS	

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

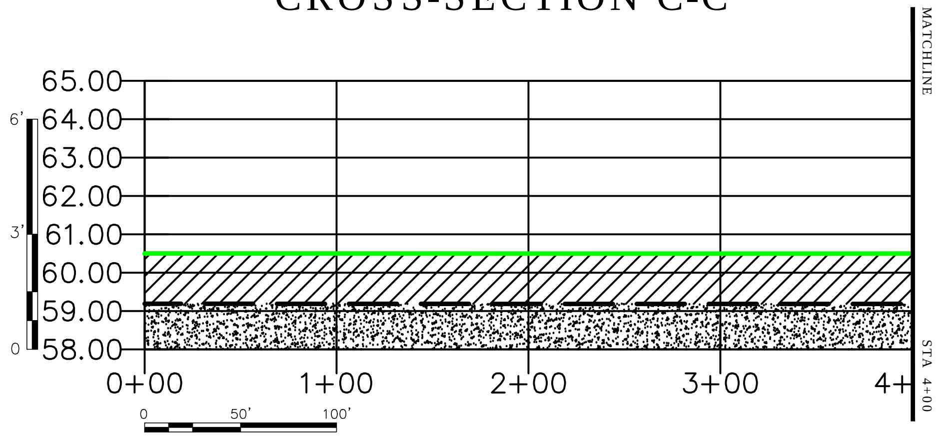
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION C-C'



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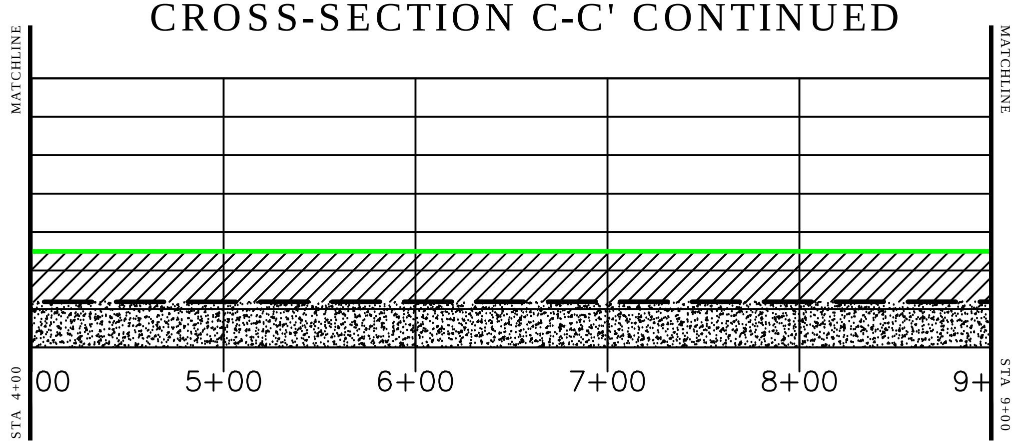
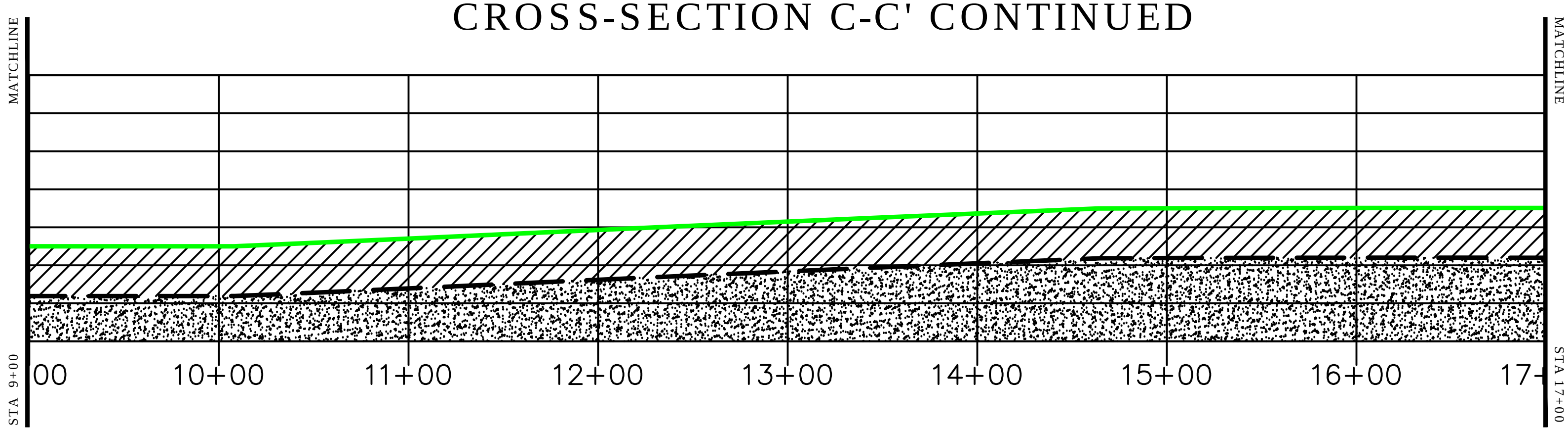


CROSS-SECTION C-C' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
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wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
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CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

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APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:

TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION C (1)

SHEET NUMBER:	REV. 1
12	

SHEET 12 OF 34 SHEETS

0 500' 1,000'

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

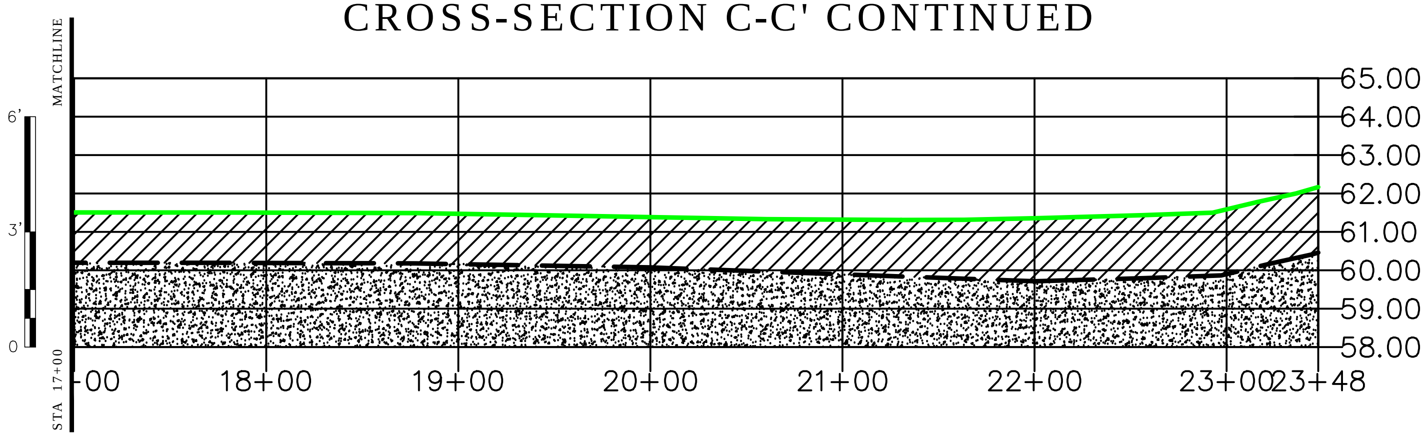
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION C-C' CONTINUED



0 50' 100'

NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD

ELEVATION: NAVD88

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
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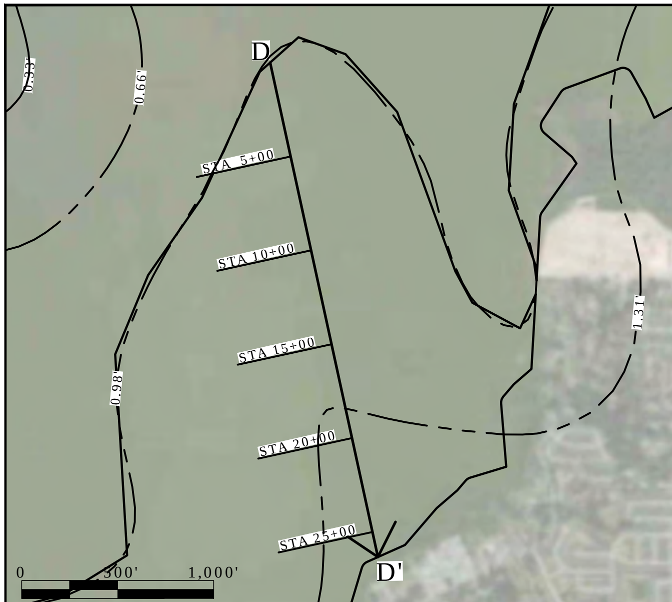
DATE:	1/21/2019

SHEET TITLE:

TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION C (2)

SHEET NUMBER:	REV. 1
13	



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

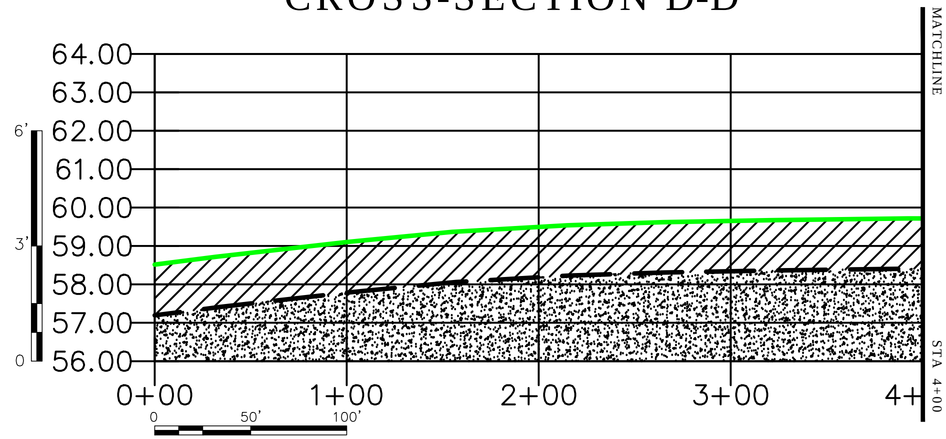
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

CROSS-SECTION D-D'



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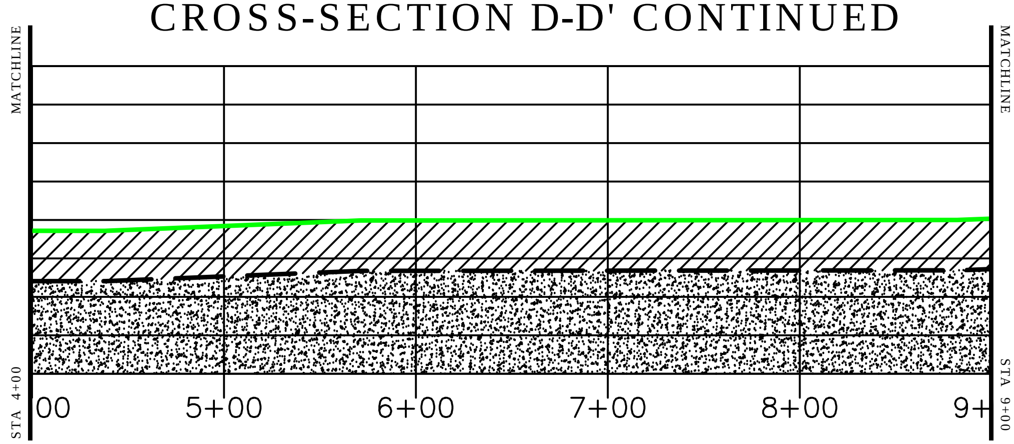

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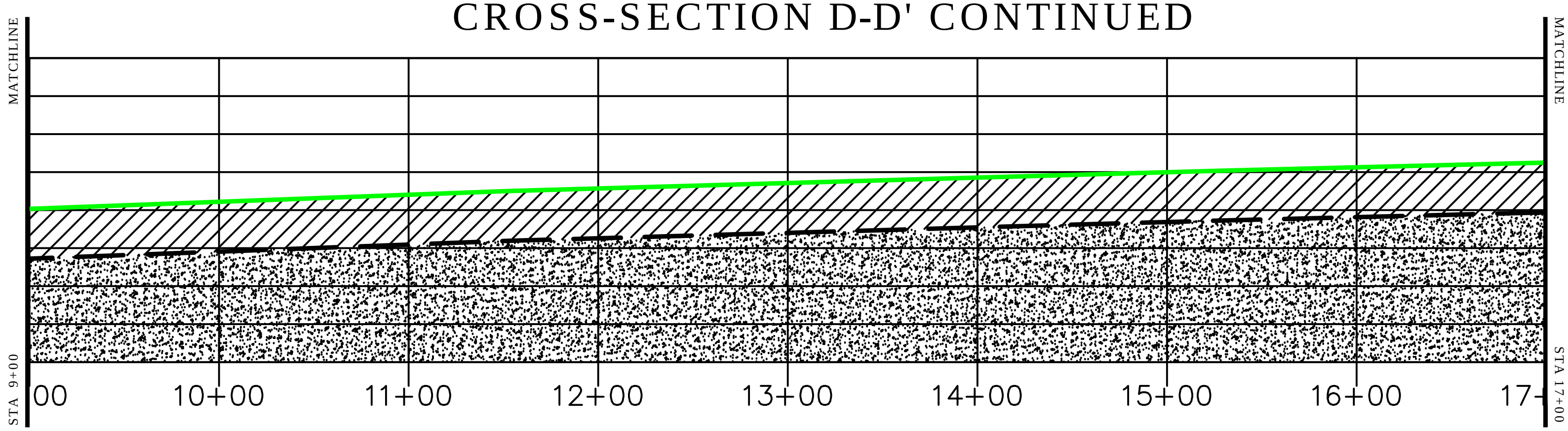

NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
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RIVER WATER
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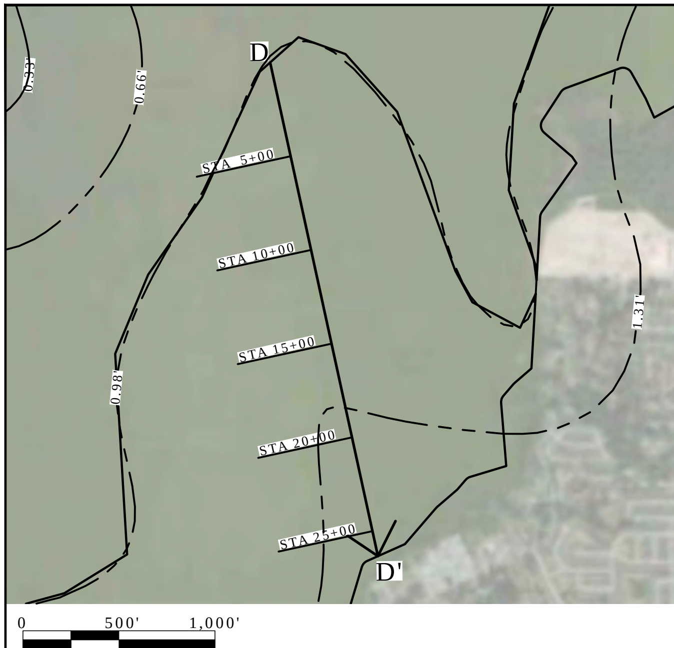
DATE:	1/21/2019

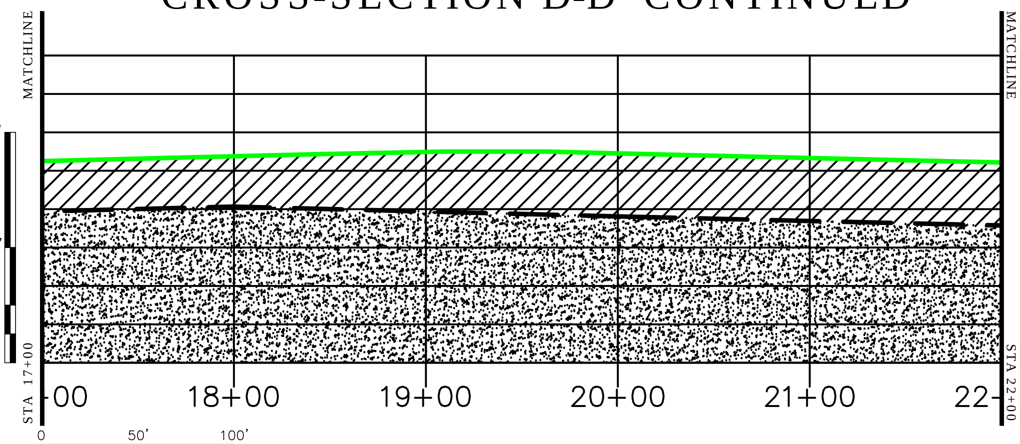
SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION D (1)

SHEET NUMBER:	REV. 1
14	
SHEET 14 OF 34 SHEETS	

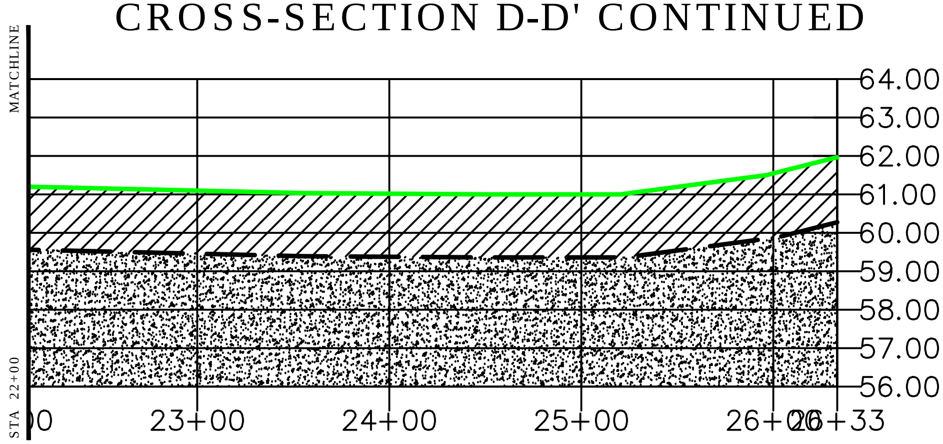


LEGEND
CROSS-SECTIONS
VERTICAL LIMITS OF DREDGING
EXISTING SURFACE
UNCONSOLIDATED FLOCCULENT (UCF)
UNDERLYING SEDIMENT
PROJECT AREA
PROJECT AREA
—1.31'— UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION D-D' CONTINUED



CROSS-SECTION D-D' CONTINUED



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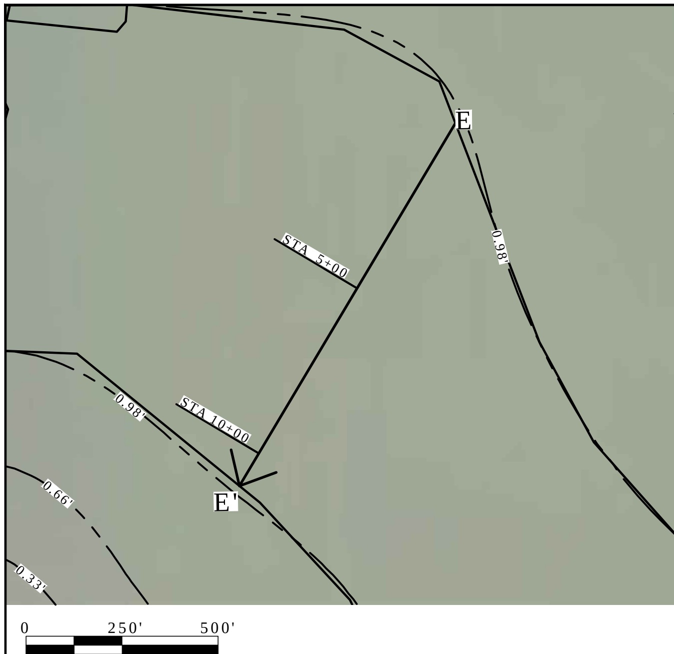
SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION D (2)

SHEET NUMBER:	REV. 1
15	
SHEET 15 OF 34 SHEETS	



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

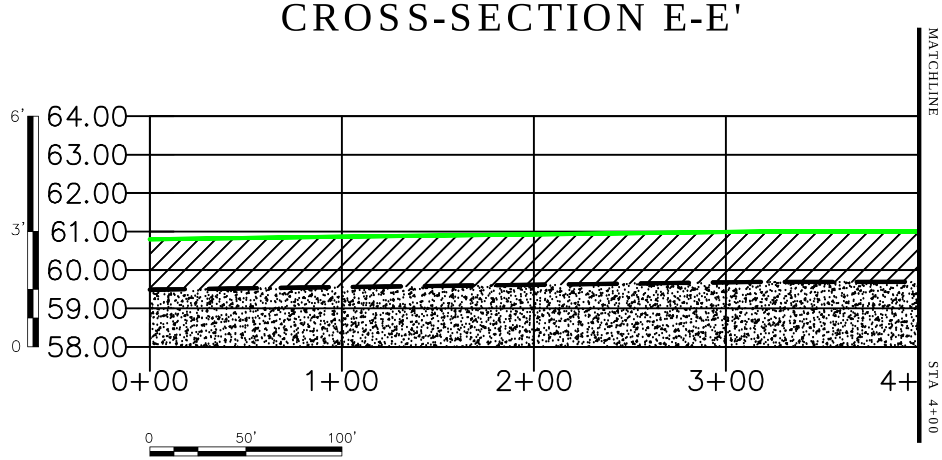
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT PROJECT AREA

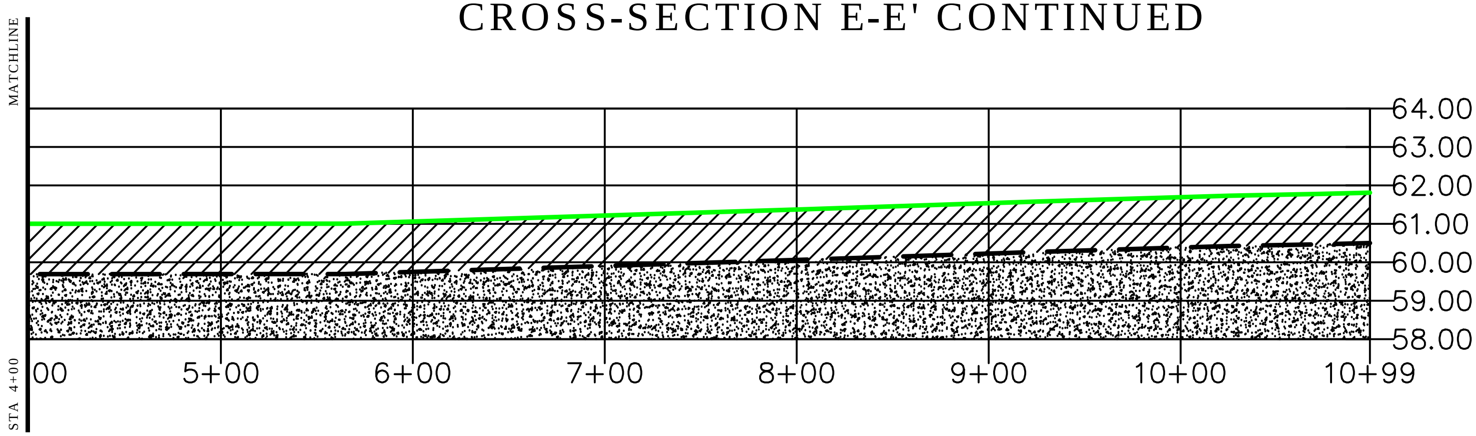
PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION E-E'



CROSS-SECTION E-E' CONTINUED



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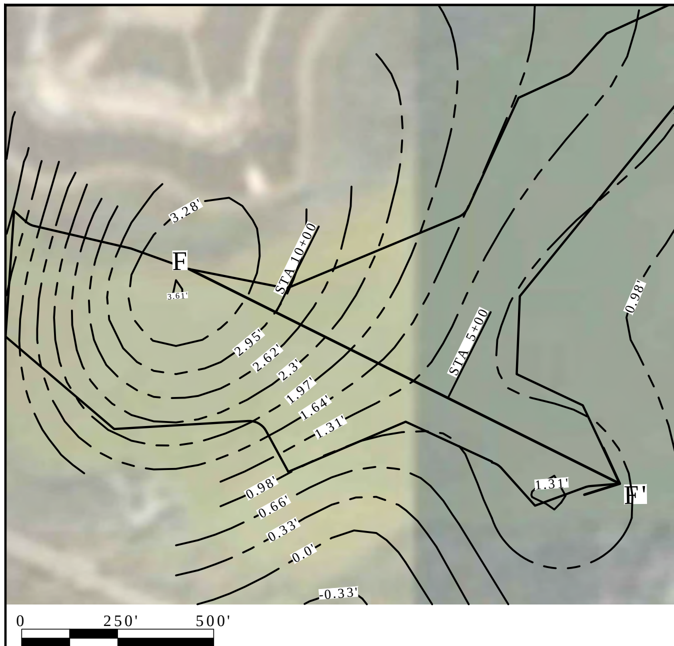
SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION E

SHEET NUMBER:	REV. 1
16	
SHEET 16 OF 34 SHEETS	



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

UNCONSOLIDATED FLOCCULENT (UCF)

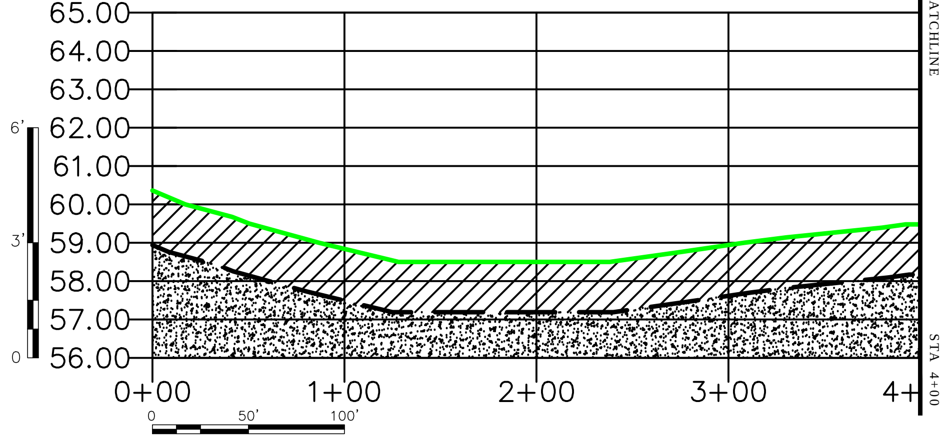
UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

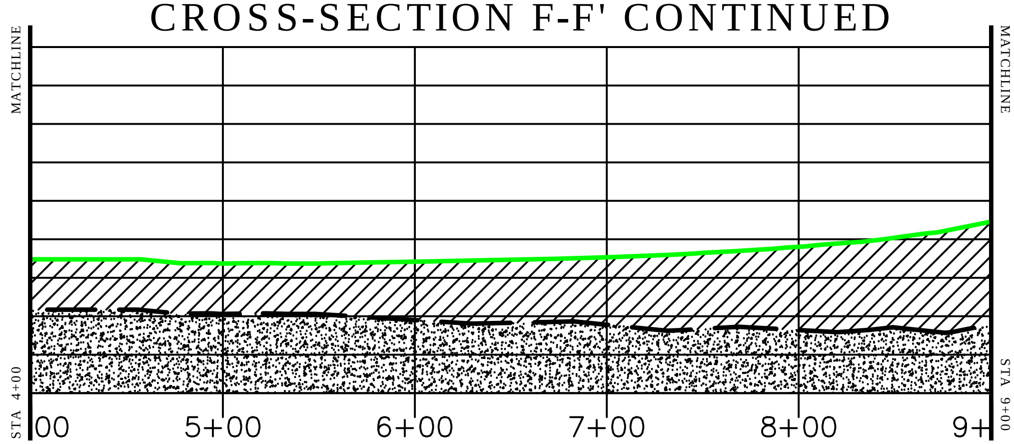
-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

NOTE: FOR PERMIT PURPOSES

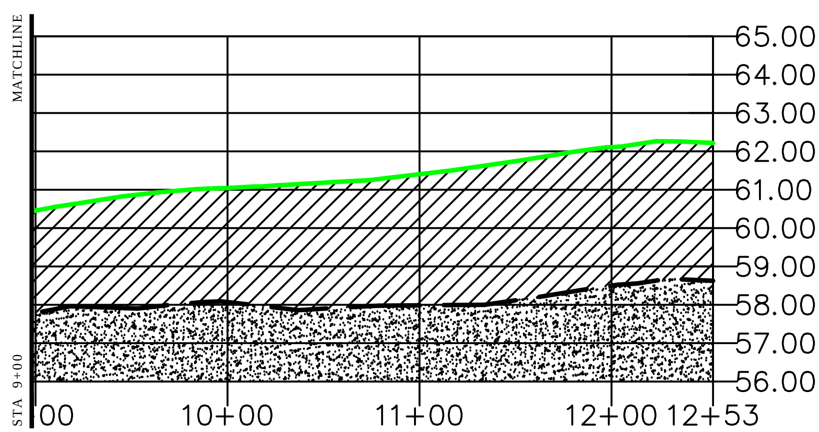
CROSS-SECTION F-F'



CROSS-SECTION F-F' CONTINUED



CROSS-SECTION F-F' CONTINUED



DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF
AUTHORIZATION LICENSE
NUMBER 5392

PROJECT:

LAKE APOPKA
DREDGING AND
PLACEMENT

APPLICANT:

ST. JOHNS
RIVER WATER
MANAGEMENT
DISTRICT

WOOD PROJECT No:
6735-17-9417

REVISIONS

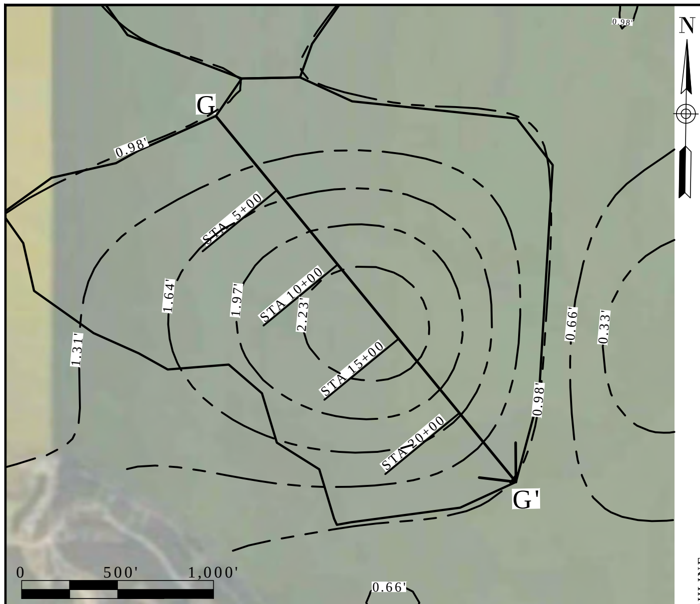
NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

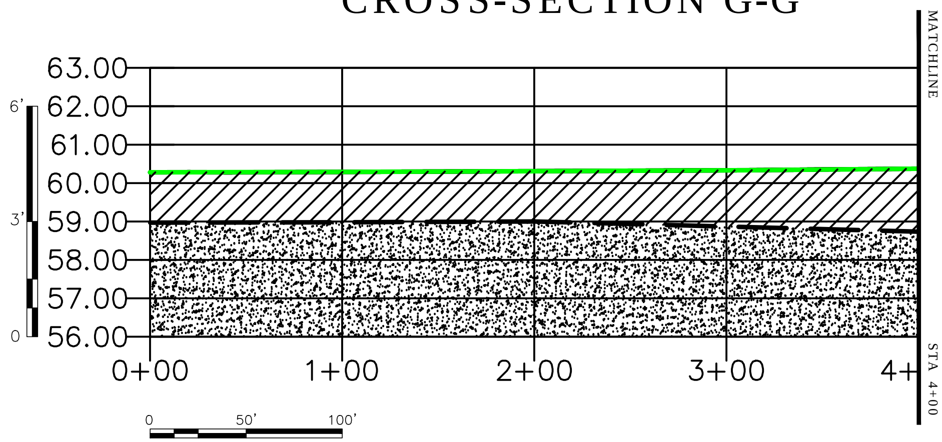
SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION F

SHEET NUMBER: 17 REV. 1

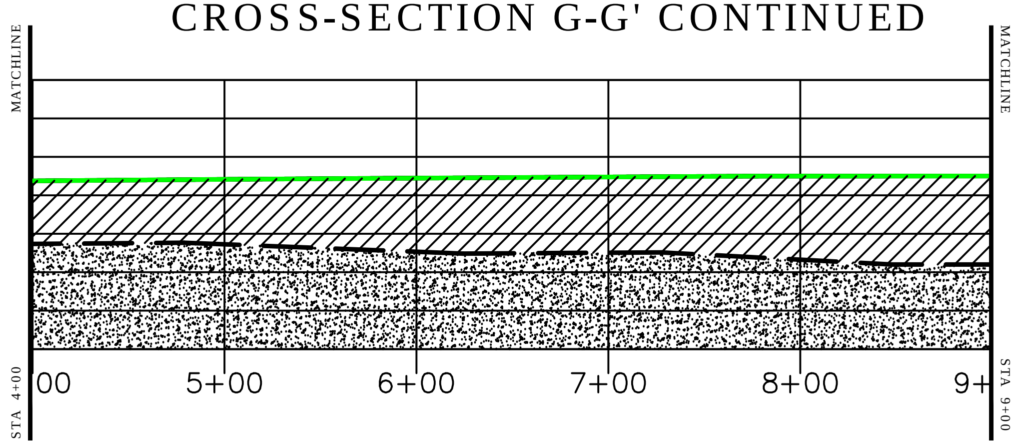
SHEET 17 OF 34 SHEETS



CROSS-SECTION G-G'



CROSS-SECTION G-G' CONTINUED



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

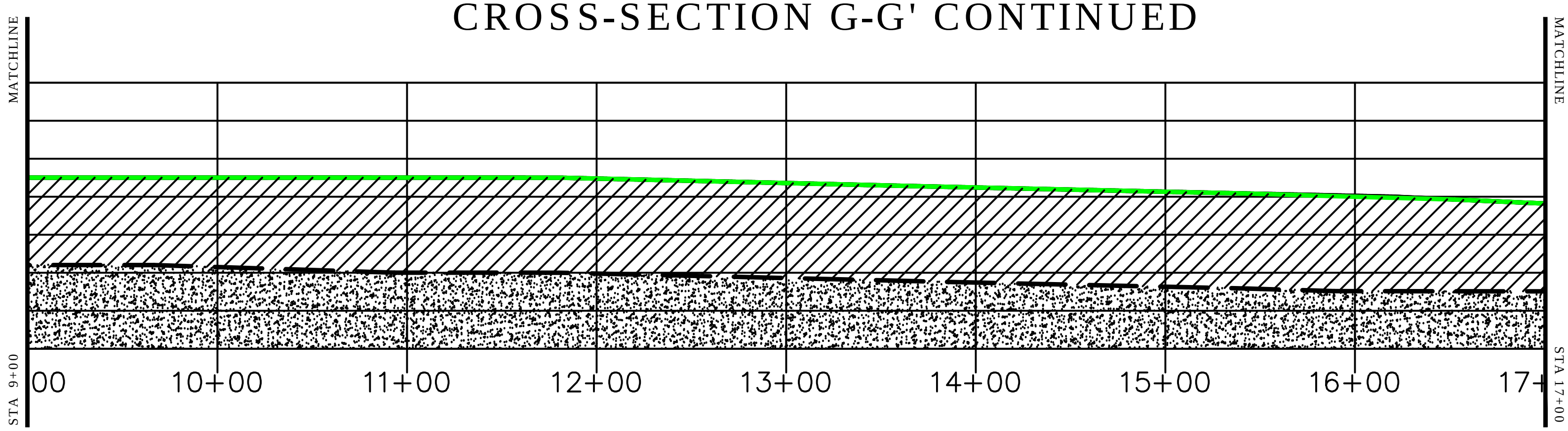
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF)
SEDIMENT THICKNESS

CROSS-SECTION G-G' CONTINUED



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APPLICANT:

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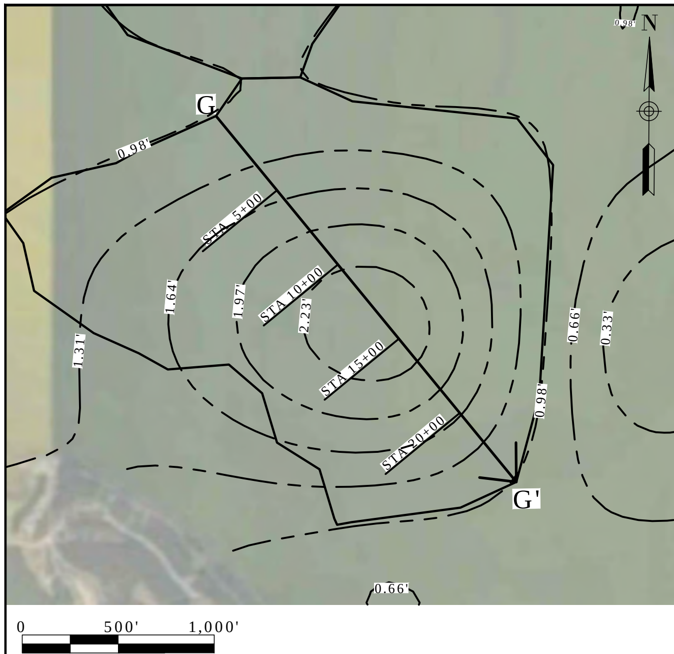
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE
EXISTING & PROPOSED
CROSS SECTION G (1)

SHEET NUMBER:	REV. 1
18	

SHEET 18 OF 34 SHEETS



LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

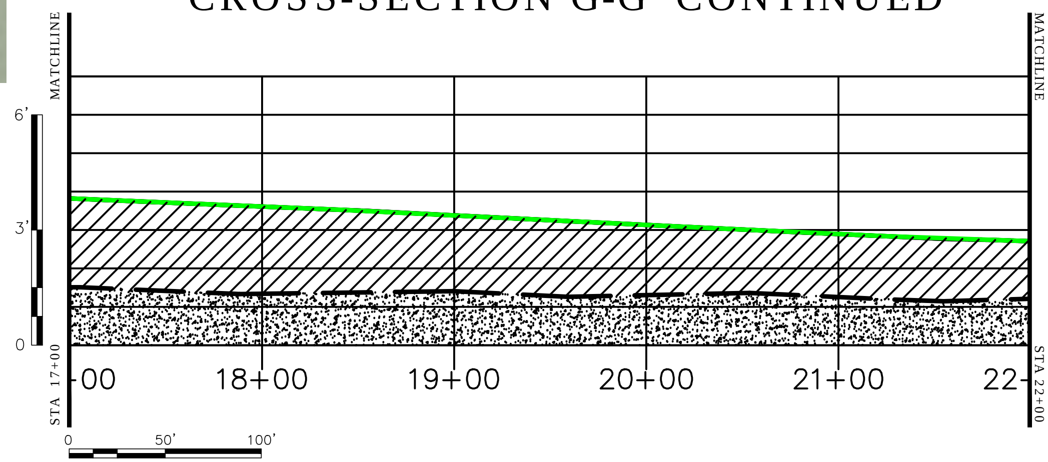
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT
PROJECT AREA

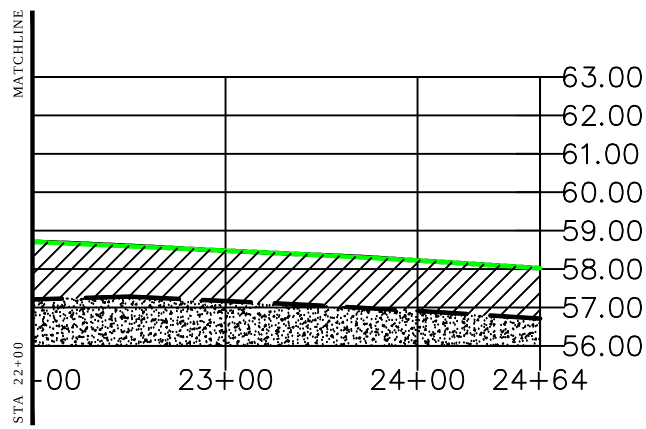
PROJECT AREA

-1.31'- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

CROSS-SECTION G-G' CONTINUED



CROSS-SECTION G-G' CONTINUED



NOTE: FOR PERMIT PURPOSES

DATA SOURCE :ESRI IMAGERY. WOOD
ELEVATION: NAVD88

wood.

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WOOD PROJECT No:
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DESIGNED BY:	OTHERS
DRAWN BY:	RJL
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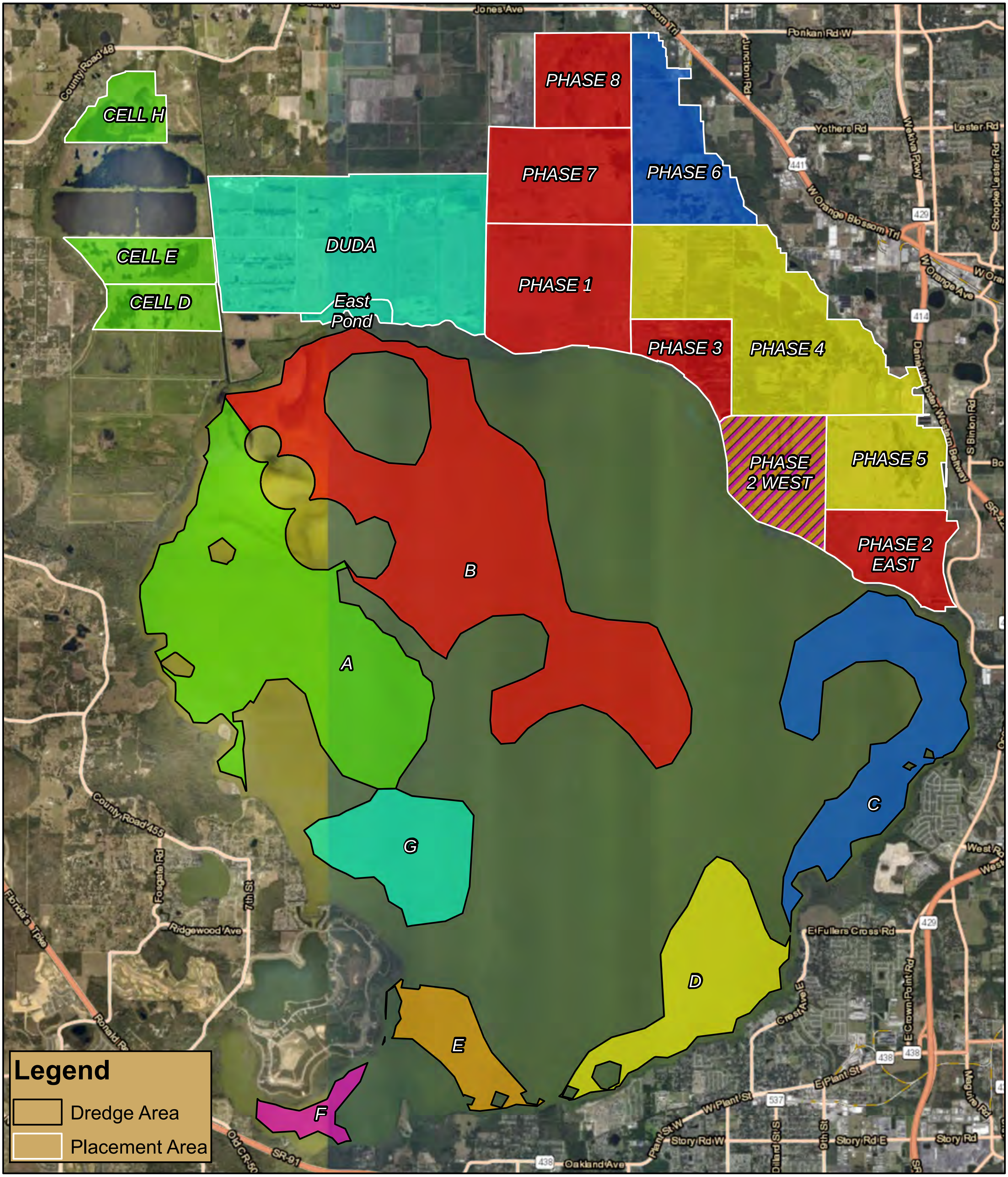
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS SECTION G (2)

SHEET NUMBER: 19 REV. 1



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Dredge Material Placement Map

Drawn	Date
DLA	1/4/2019
Checked	Date
MFC	1/4/2019

Gainesville Florida Project No. 6735179417

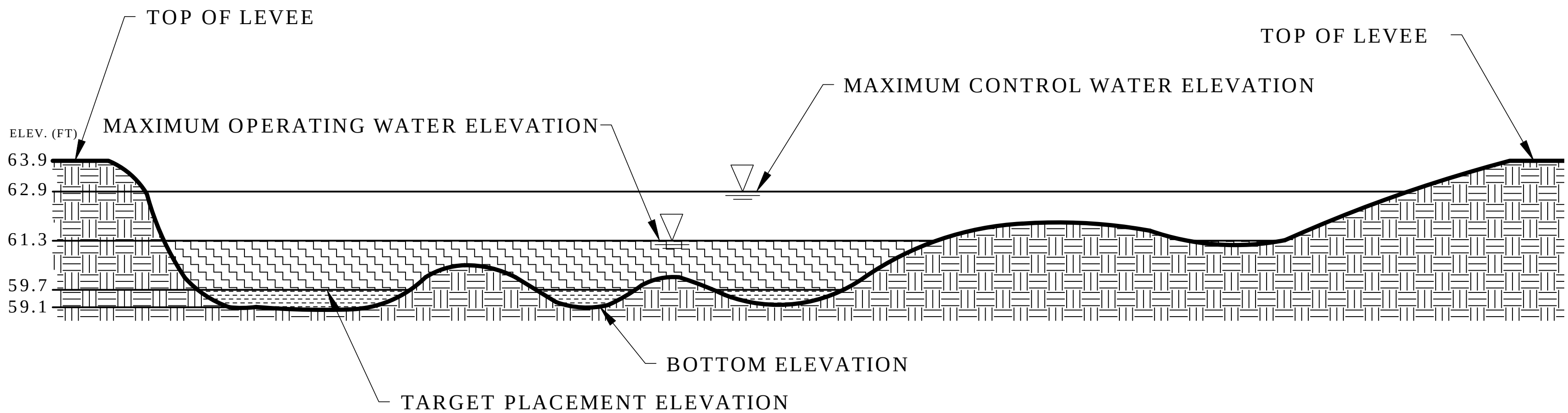
wood.

Sheet 20

Path: P:\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\Figure 1 Dredge Material Placement Map.mxd dustin.atwater Date Saved: 1/4/2019 2:17:02 PM

Lake Area and Dredge Volume cubic yards		Placement Area and Available Volume (cubic yards)													
		Cell D	Cell E	Cell H	Phase 1	Phase 2 East	Phase 3	Phase 7	Phase 8	Phase 6	Phase 4	Phase 5	Phase 2 West	Duda	Duda - E Pond
		5,733,188	7,951,914	6,196,297	7,719,216	1,131,186	1,576,331	2,341,295	4,101,433	7,448,864	4,254,205	1,028,241	2,006,358	6,486,555	387,269
A	8,058,081														
B	8,573,652														
C	3,382,552														
D	2,403,364														
E	952,247														
F	597,654														
G	2,699,031														
Percent of Placement Capacity		41%			51%					45%	45%		77%	39%	

CROSS SECTION - DUDA



NOTE:

CONCEPTUAL FOR PERMITTING PURPOSES.

HORIZONTAL PROFILE IS TYPICAL AND NOT TO SCALE.

ELEVATIONS ARE SCALED FOR EACH PLACEMENT AREA AND DEFINED BELOW:

MAXIMUM CONTROL WATER ELEVATION - THE LEVEL AT WHICH MANAGEMENT INFRASTRUCTURE IS THREATENED. SJRWMD DISCHARGES WATER TO THE INTERNAL WATER MANAGEMENT SYSTEM AS NEEDED TO AVOID EXCEEDING THIS ELEVATION.

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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

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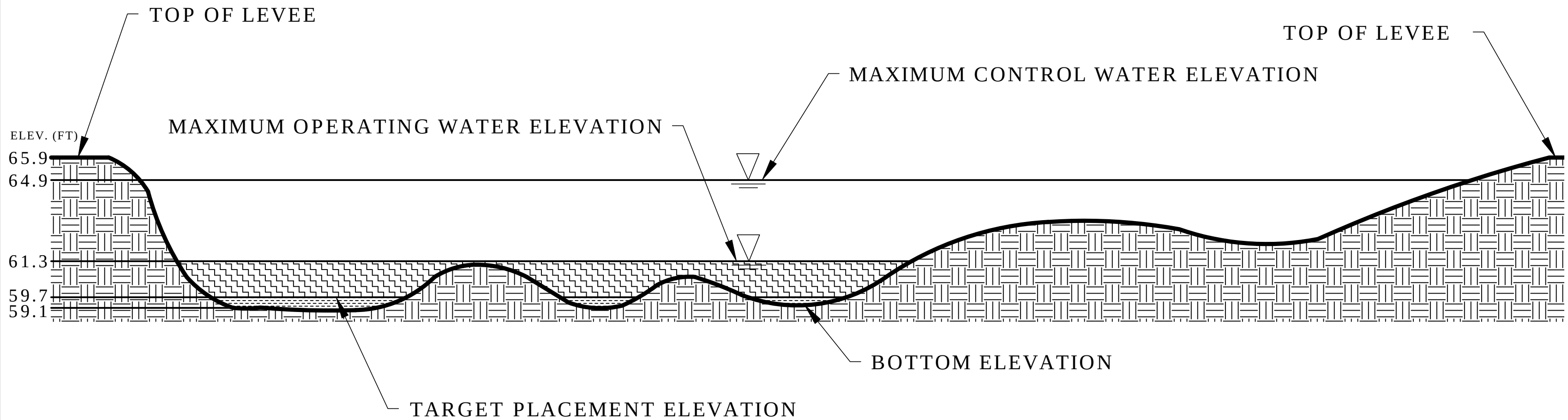
SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION DUDA

SHEET NUMBER:	REV. 1
21	

SHEET 21 OF 34 SHEETS

CROSS SECTION - DUDA EAST POND



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

- EXISTING SURFACE
- GROUND
- SHALLOW PLACEMENT AREA
- DEEP PLACEMENT AREA

wood.

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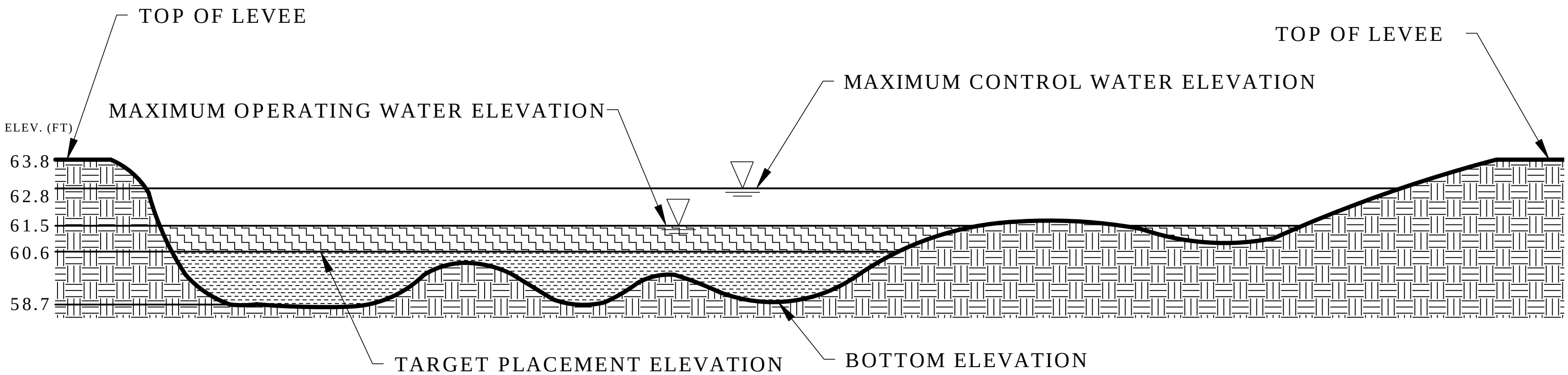
SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION DUDA EAST POND

SHEET NUMBER:	REV. 1
22	

SHEET 22 OF 34 SHEETS

CROSS SECTION - PHASE 1



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

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APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

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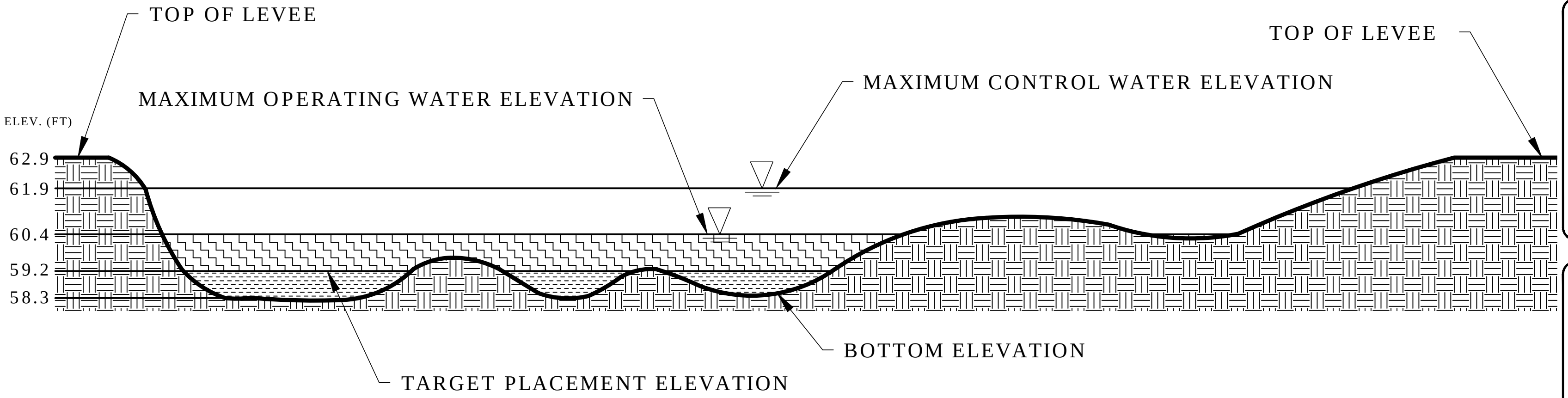
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 1

SHEET NUMBER:	REV. 1
23	
SHEET 23 OF 34 SHEETS	

CROSS SECTION - PHASE 2 EAST



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

- EXISTING SURFACE
- GROUND
- SHALLOW PLACEMENT AREA
- DEEP PLACEMENT AREA

wood.

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APPLICANT:

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WOOD PROJECT No: 6735-17-9417

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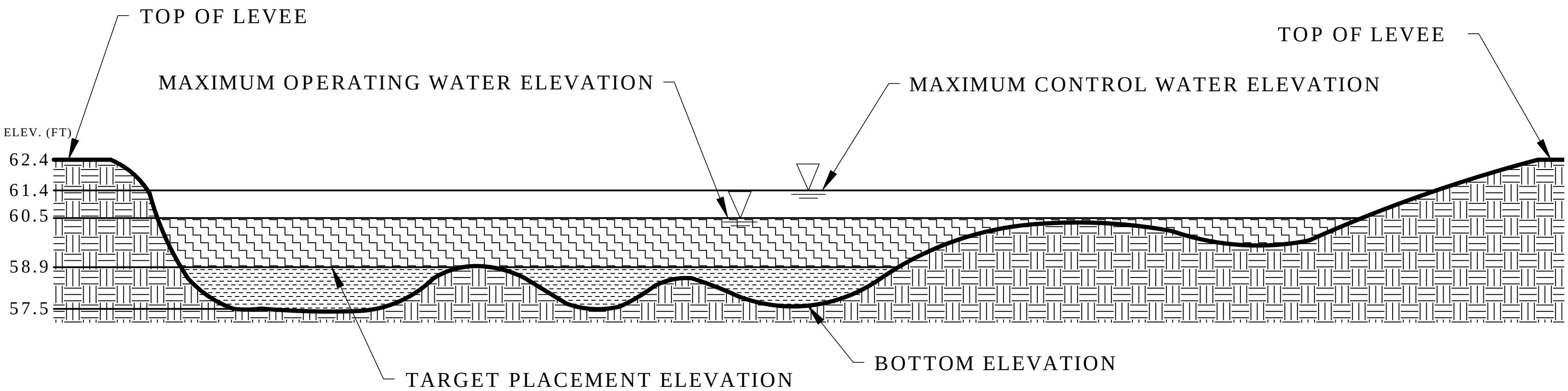
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 2 EAST

SHEET NUMBER:	REV. 1
24	
SHEET 24 OF 34 SHEETS	

CROSS SECTION - PHASE 2 WEST



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

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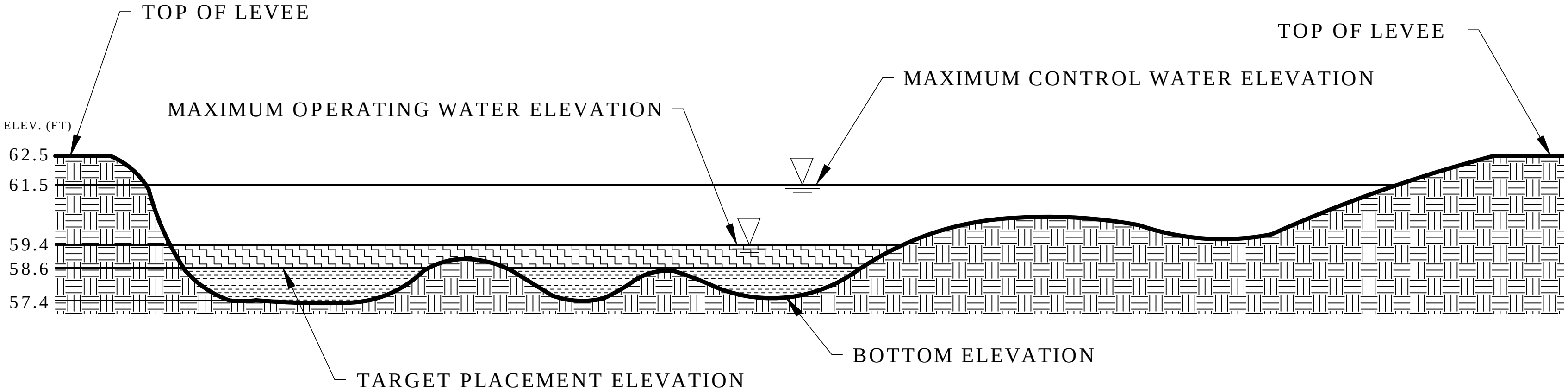
SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 2 WEST

SHEET NUMBER:	REV. 1
25	
SHEET 25 OF 34 SHEETS	

CROSS SECTION - PHASE 3



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

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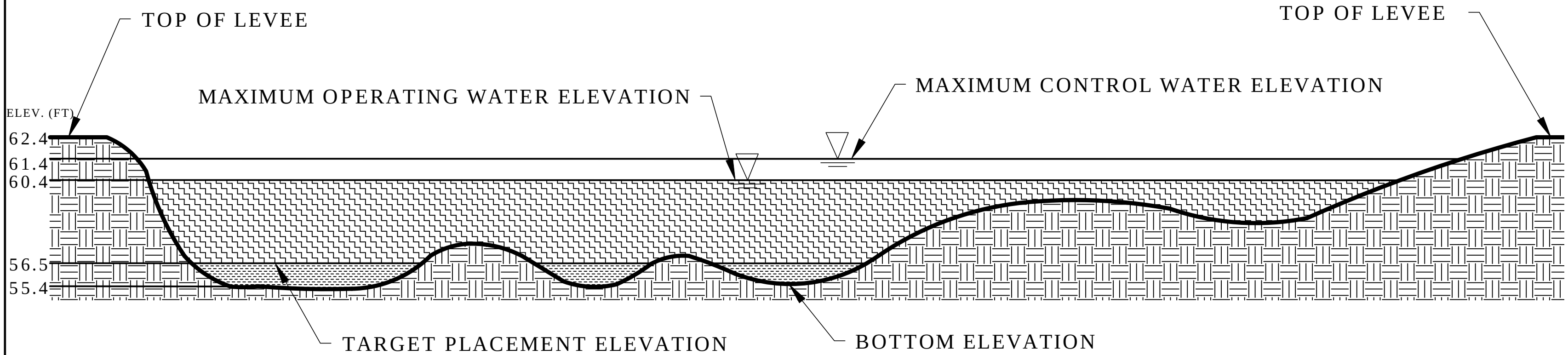
SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 3

SHEET NUMBER:	REV. 1
26	

SHEET 26 OF 34 SHEETS

CROSS SECTION - PHASE 4



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

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APPLICANT:

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WOOD PROJECT No: 6735-17-9417

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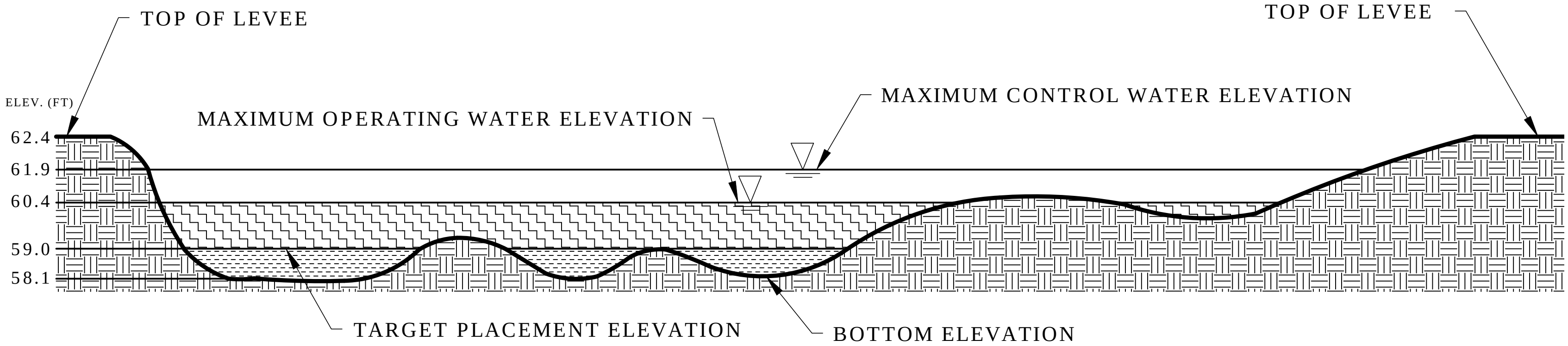
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 4

SHEET NUMBER:	REV. 1
27	

CROSS SECTION - PHASE 5



NOTE:

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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

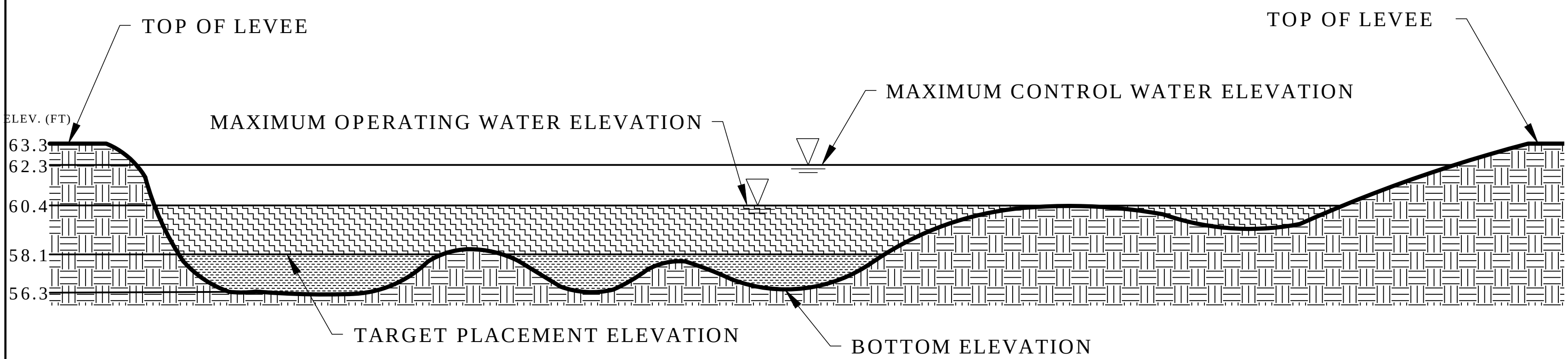
DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 5

SHEET NUMBER:	REV. 1
28	

SHEET 28 OF 34 SHEETS

CROSS SECTION - PHASE 6



NOTE:

CONCEPTUAL FOR PERMITTING PURPOSES.

HORIZONTAL PROFILE IS TYPICAL AND NOT TO SCALE.

ELEVATIONS ARE SCALED FOR EACH PLACEMENT AREA AND DEFINED BELOW:

MAXIMUM CONTROL WATER ELEVATION - THE LEVEL AT WHICH MANAGEMENT INFRASTRUCTURE IS THREATENED. SJRWMD DISCHARGES WATER TO THE INTERNAL WATER MANAGEMENT SYSTEM AS NEEDED TO AVOID EXCEEDING THIS ELEVATION.

MAXIMUM OPERATING WATER ELEVATION - THE MAXIMUM WATER ELEVATION THAT WILL BE ALLOWED DURING PLACEMENT OF SEDIMENT. EXISTING GROUND ELEVATIONS WILL NOT BE AFFECTED ABOVE THIS ELEVATION.

TARGET PLACEMENT ELEVATION - THE MAXIMUM ELEVATION FOR PLACEMENT OF SEDIMENT IF THE ENTIRE PLACEMENT CAPACITY OF THE CELL WERE USED, THIS LEVEL WOULD BE THE NEW BOTTOM ELEVATION.

BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS			
NO.	DATE	BY	APPROVED
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DRAWN BY:	RJL
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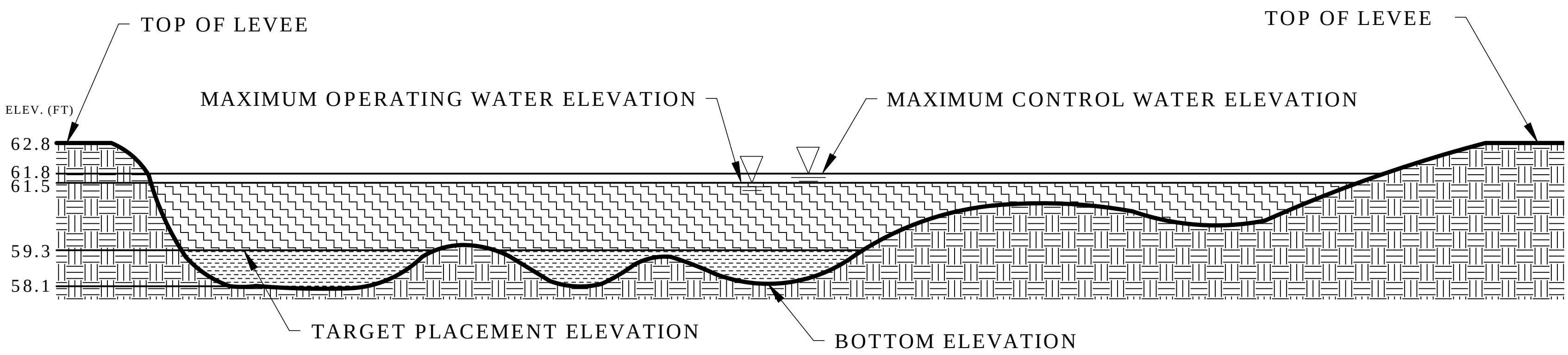
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE: MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 6

SHEET NUMBER:	REV. 1
29	

CROSS SECTION - PHASE 7



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

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DESIGNED BY:	OTHERS
DRAWN BY:	RJL
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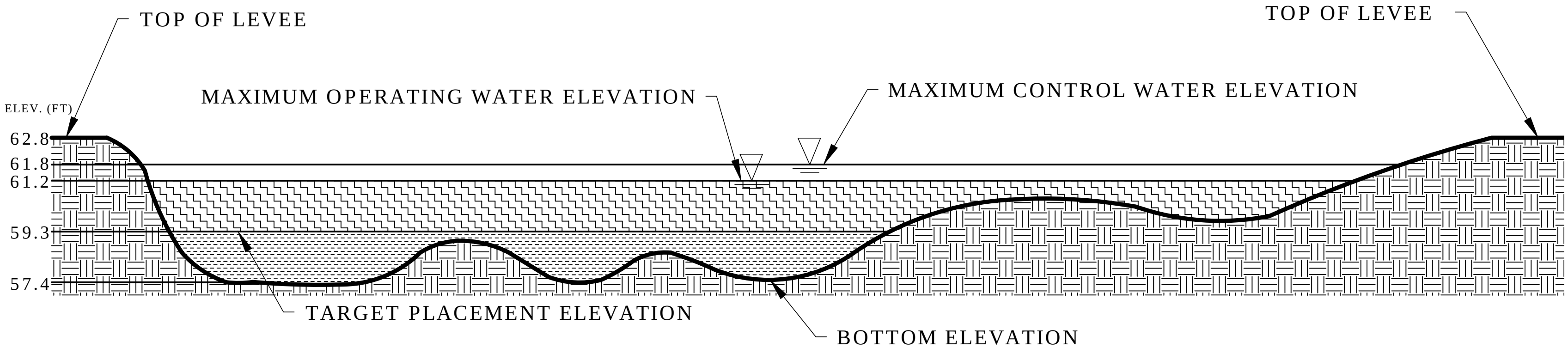
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 7

SHEET NUMBER:	REV. 1
30	
SHEET 30 OF 34 SHEETS	

CROSS SECTION - PHASE 8



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

- EXISTING SURFACE
- GROUND
- SHALLOW PLACEMENT AREA
- DEEP PLACEMENT AREA

wood.

404 SW 140TH TERRACE
NEWBERRY, FL 32669
TEL: (352) 332-3318
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

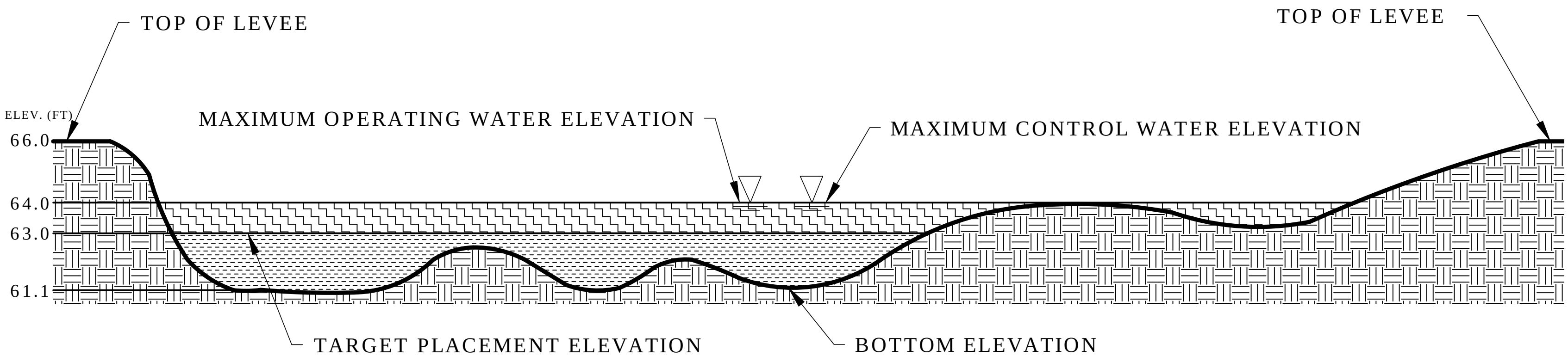
REVISIONS			
NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION PHASE 8

SHEET NUMBER:	REV. 1
31	
SHEET 31 OF 34 SHEETS	

CROSS SECTION - CELL D



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

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NEWBERRY, FL 32669
TEL: (352) 332-3318
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PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED
1	9/6/2019	RJL	RJW

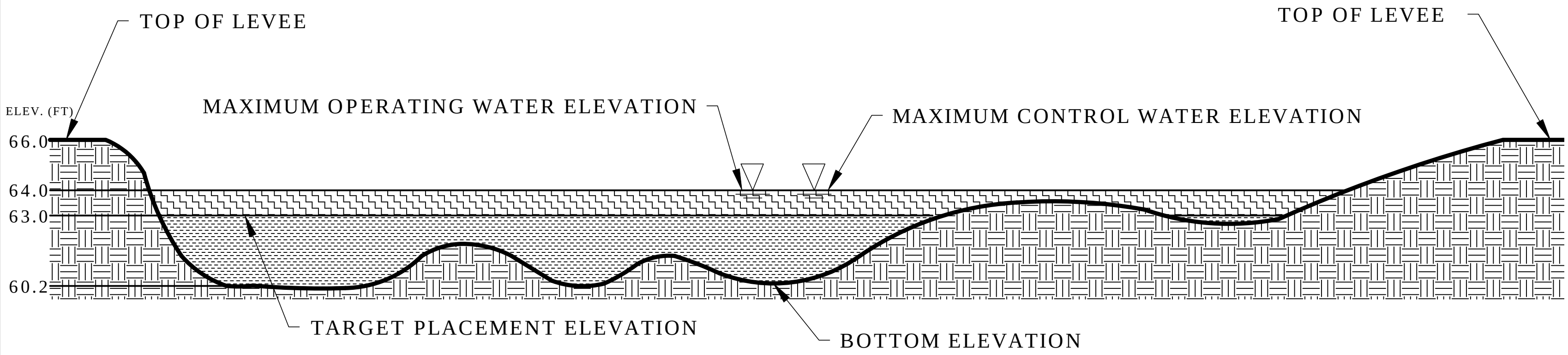
DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION CELL D

SHEET NUMBER:	REV. 1
32	

SHEET 32 OF 34 SHEETS

CROSS SECTION - CELL E&E POND



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BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

- EXISTING SURFACE
- GROUND
- SHALLOW PLACEMENT AREA
- DEEP PLACEMENT AREA

wood.

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NEWBERRY, FL 32669
TEL: (352) 332-3318
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PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

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ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

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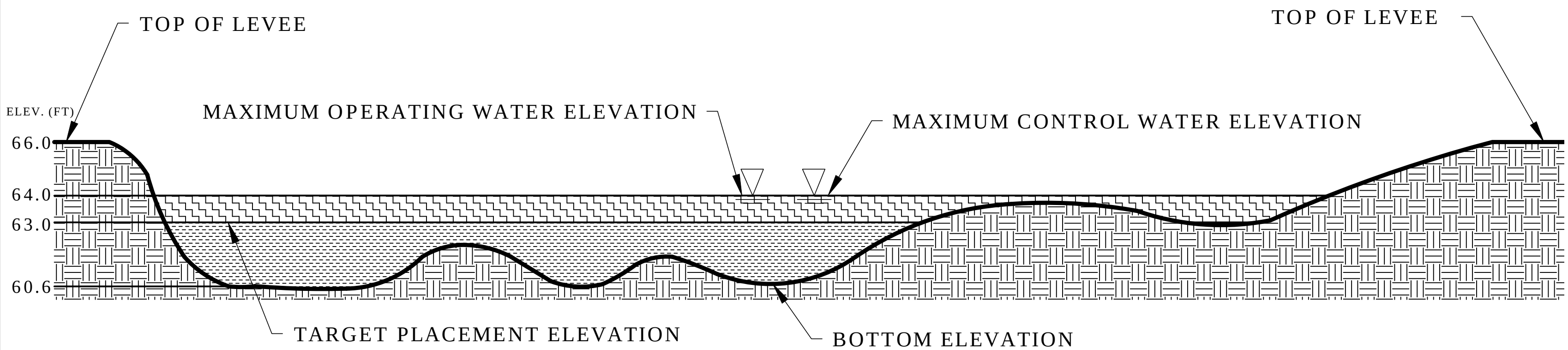
DATE:	1/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION CELL E&E POND

SHEET NUMBER:	REV. 1
33	

SHEET 33 OF 34 SHEETS

CROSS SECTION - CELL H&H POND



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LEGEND

EXISTING SURFACE

GROUND

SHALLOW PLACEMENT AREA

DEEP PLACEMENT AREA

wood.

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PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS			
NO.	DATE	BY	APPROVED
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DATE:	1/21/2019

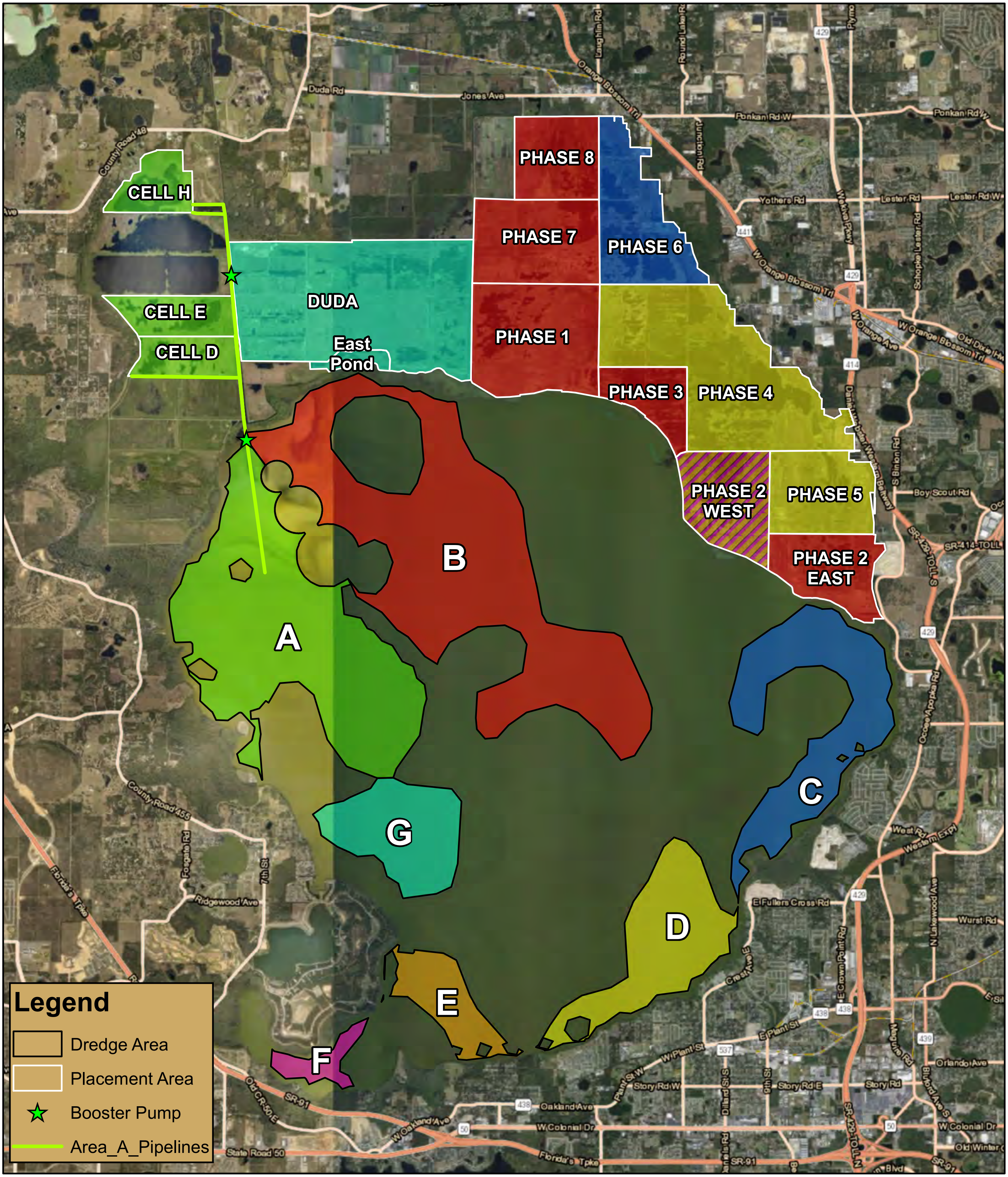
SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS SECTION CELL H&H POND

SHEET NUMBER:	REV. 1
34	
SHEET 34 OF 34 SHEETS	

ATTACHMENT 1B

PROJECT: SAJ-2019-00608 (SP-JED) DATE: 11 MAR 2020

Pipeline and Booster Pump Maps (6 PAGES)



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Proposed Pipeline Route - Dredge Area A

Drawn	Date			
SEM	8/29/2019	*Gainesville Florida Project No. 6735179417*	wood.	**Figure 1**
Checked	Date			
MFC	8/29/2019			

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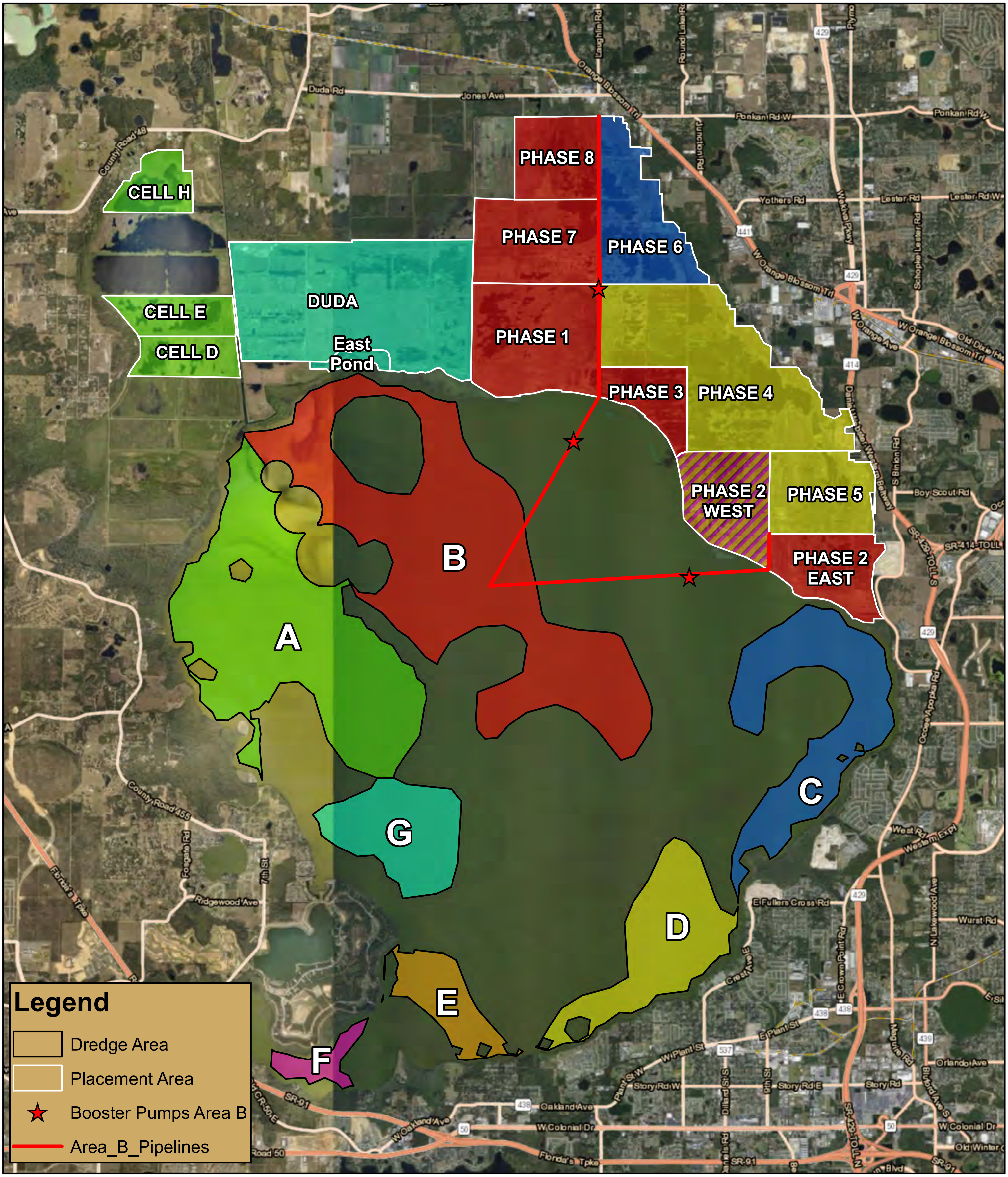


Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

Lake Apopka Dredging Project

Proposed Pipeline Route - Dredge Area B

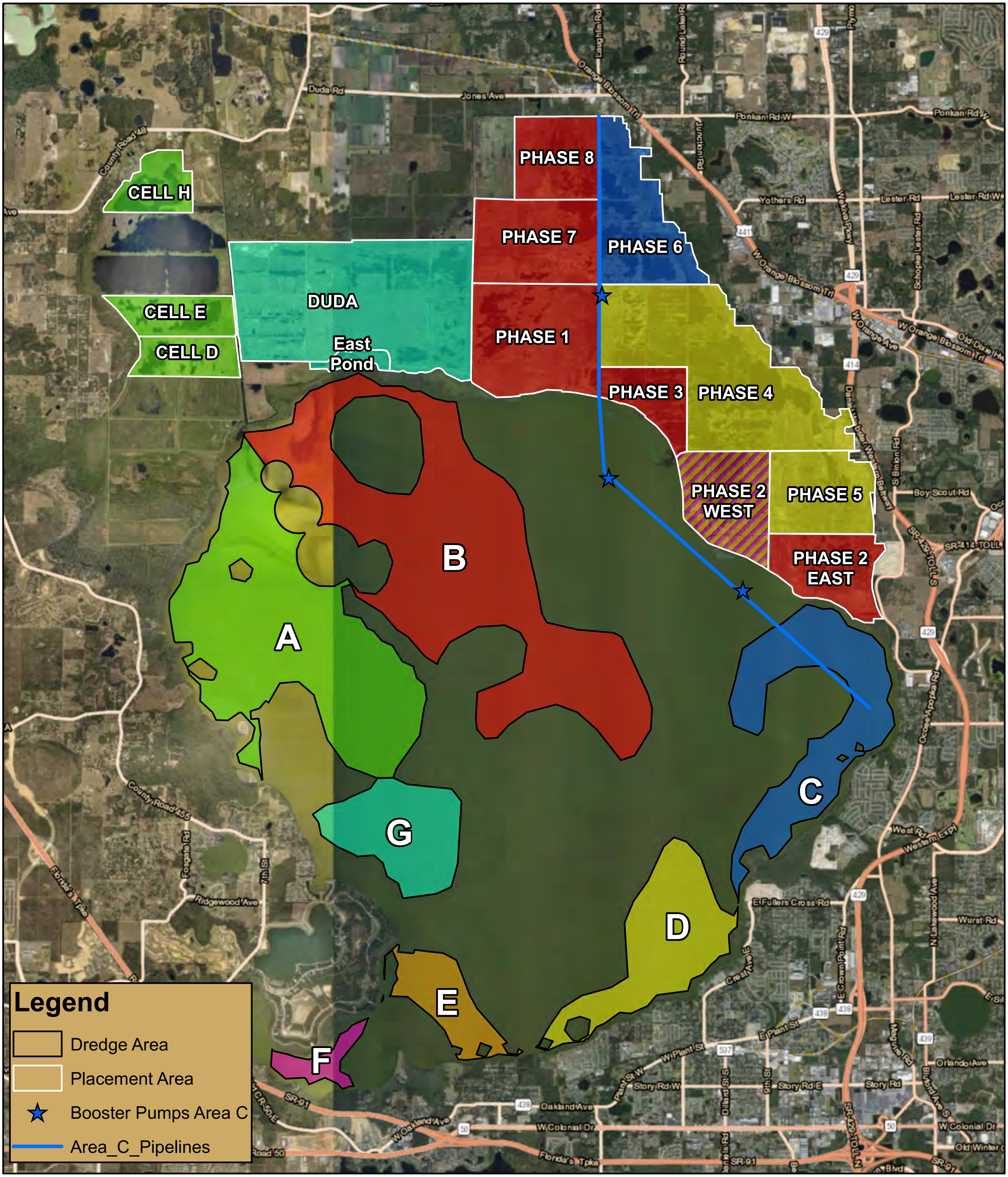
Drawn	Date
SEM	8/29/2019
Checked	Date
MFC	8/29/2019

Gainesville Florida Project No. 6735179417

wood.

Figure 1

Path: \\GNV-FS1\projects\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\USACE RAI\Pipeline Dredge Material Placement Map_Area B.mxd shannon.mcmorrow Date Saved: 8/29/2019 3:06:26 PM



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

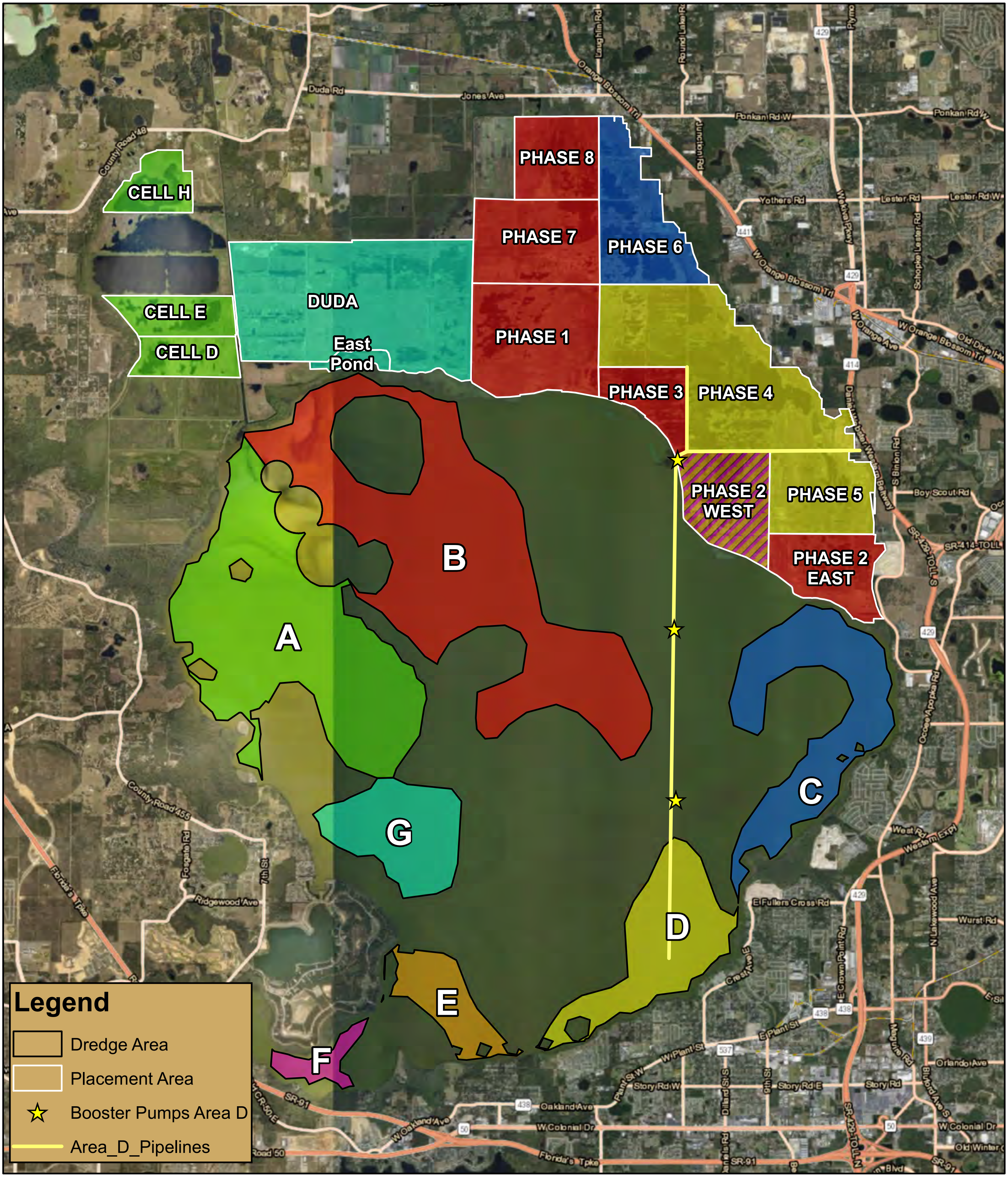
0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Proposed Pipeline Route - Dredge Area C

Drawn	Date	*Gainesville Florida Project No. 6735179417*	wood.	Figure 1
SEM	8/29/2019			
Checked	Date			
MFC	8/29/2019			

Path: \\GNV-FS1\projects\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\USACE RAI\Pipeline Dredge Material Placement Map_Area C.mxd shannon.mcmorrow Date Saved: 8/29/2019 3:09:05 PM



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

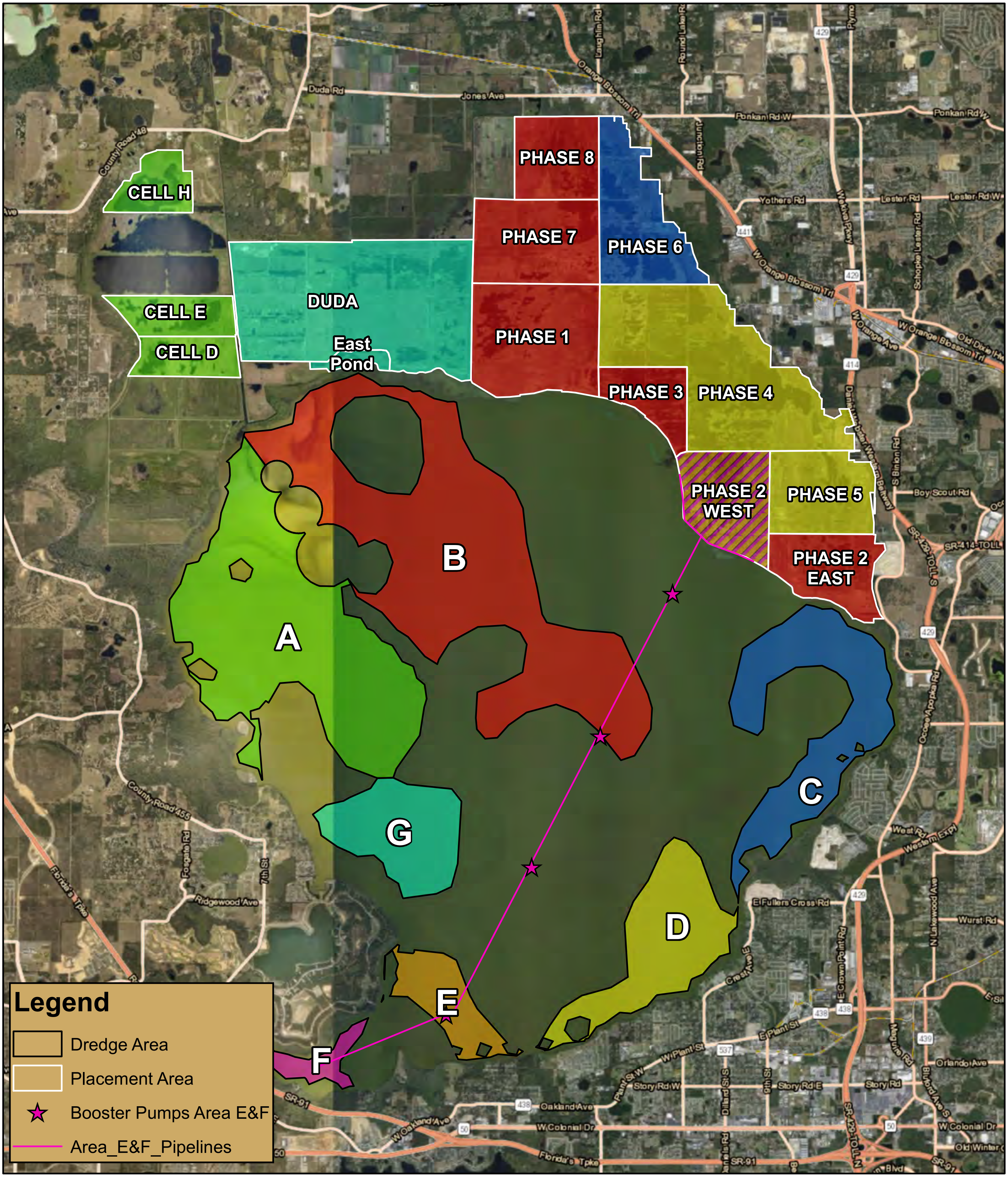
0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Proposed Pipeline Route - Dredge Area D

Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Figure 1
SEM	8/29/2019			
Checked	Date			
MFC	8/29/2019			

Path: \\GNV-FS1\projects\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\USACE RAI\Pipeline Dredge Material Placement Map_Area D.mxd shannon.mcmorrow Date Saved: 8/29/2019 3:11:25 PM



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

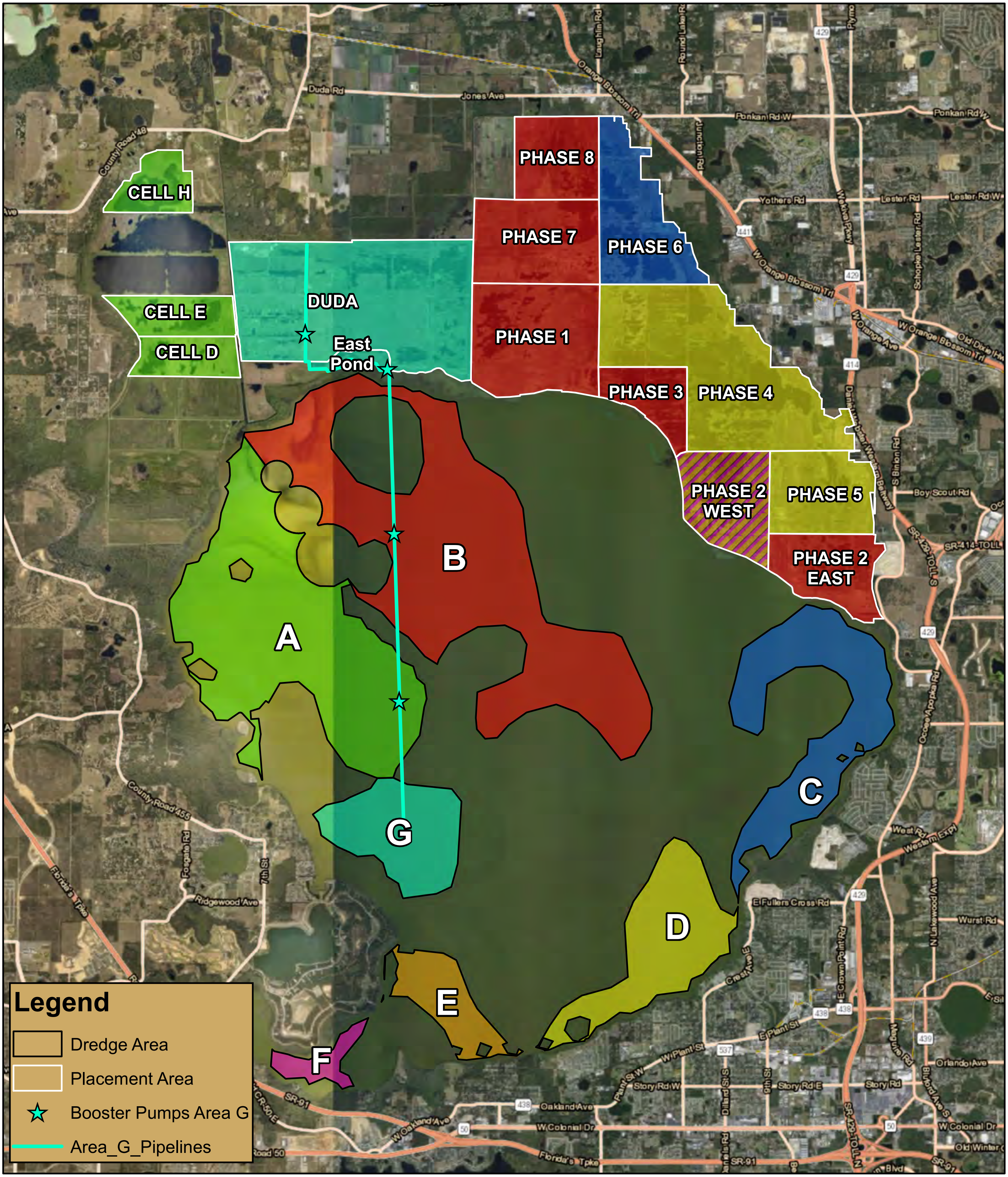
0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Proposed Pipeline Route - Dredge Area E&F

Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Figure 1
SEM	8/29/2019			
Checked	Date			
MFC	8/29/2019			

Path: \\GNV-FS1\projects\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\USACE RAI\Pipeline Dredge Material Placement Map_Area E.mxd shannon.mcmorrow Date Saved: 8/29/2019 1:41:45 PM



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Proposed Pipeline Route - Dredge Area G

Drawn	Date			
SEM	8/29/2019	*Gainesville Florida Project No. 6735179417*	wood.	**Figure 1**
Checked	Date			
MFC	8/29/2019			

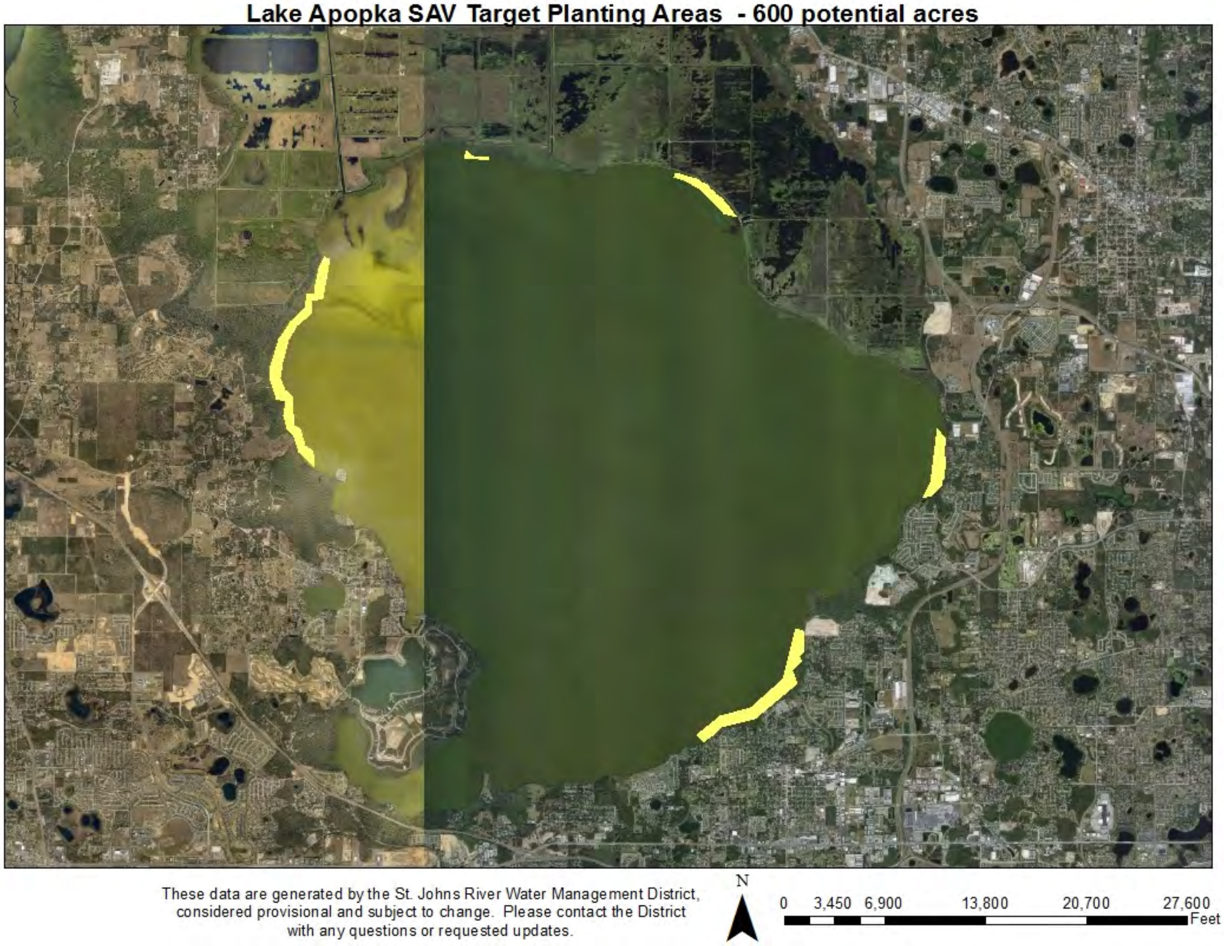
Path: \\GNV-FS1\projects\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\USACE RAI\Pipeline Dredge Material Placement Map_Area G.mxd shannon.mcmorrow Date Saved: 8/29/2019 1:47:06 PM

ATTACHMENT 1C

PROJECT: SAJ-2019-00608 (SP-JED)
DATE: 11 MAR 2020

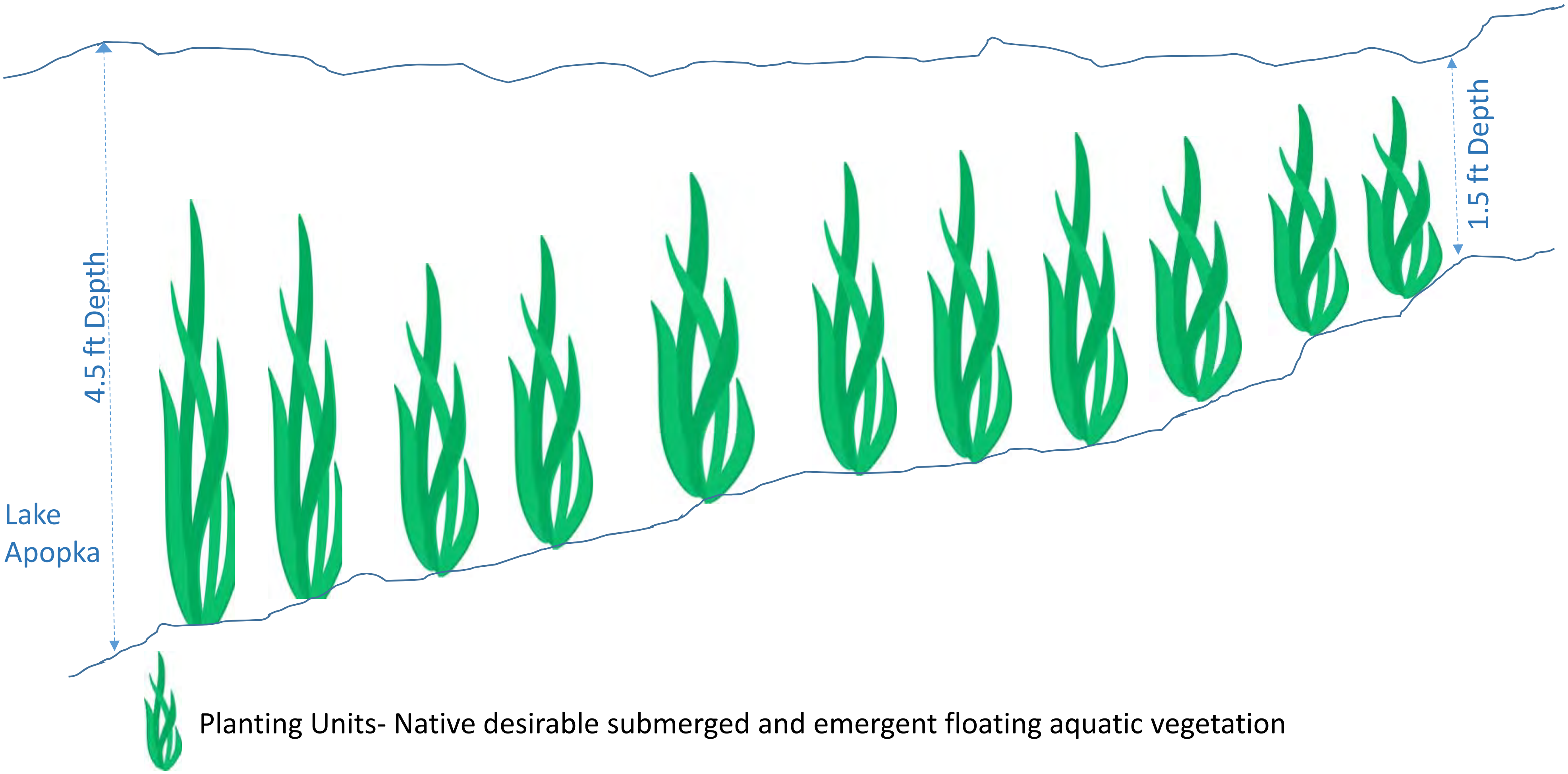
Vegetation Planting Plans (2 PAGES)

Lake Apopka SAV Target Planting Areas - 600 potential acres



These data are generated by the St. Johns River Water Management District, considered provisional and subject to change. Please contact the District with any questions or requested updates.

Water depths at time of planting are expected to be between Maximum (65.1 ft NAVD) and Minimum Desirable Elevations (62.1 ft NAVD). Planting depths will be in 1.5 to 4.5 ft of water.



FLORIDA DEPARTMENT OF Environmental Protection

CENTRAL DISTRICT OFFICE
3319 MAGUIRE BLVD., SUITE 232
ORLANDO, FLORIDA 32803

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

Permittee/Authorized Entity:
St Johns River Water Management District
c/o Dr. Ann Shortelle
4049 Reid Street
Palatka, Florida 32177
AShortelle@SJRWMD.com

Lake Apopka – Unconsolidated Flocculant Removal and Dredge Placement

Authorized Agent:
Wood Environment & Infrastructure Solutions, Inc.
404 SW 140th Terrace
Newberry, Florida 32669
Shannon.McMorrow@woodplc.com

Conceptual Environmental Resource Permit

State-owned Submerged Lands Authorization – Approved

U.S. Army Corps of Engineers Authorization – Separate Corps Authorization Required

Orange County and Lake County
Permit No.: 0374261-001-EC

Permit Issuance Date: September 17, 2019
Permit Construction Phase Expiration Date: September 17, 2039

FLORIDA DEPARTMENT OF
Environmental Protection

CENTRAL DISTRICT OFFICE
3319 MAGUIRE BLVD., SUITE 232
ORLANDO, FLORIDA 32803

Conceptual Environmental Resource Permit

Permittee: St Johns River Water Management District
Permit No: 0374261-001-EC

This Conceptual Approval Permit DOES NOT AUTHORIZE any construction activity. You must apply for and receive an Individual Environmental Resource Permit prior to undertaking any construction activities.

PROJECT LOCATION

The activities authorized by this permit are in Astatula and Mount Dora of Lake County, Florida, and in Apopka of Orange County, Florida in the following Section(s), Township, Range:

Sections: 26, 27, 33-36	Township: 20 S	Range: 26 E
Sections: 22, 27-29, 31-35	Township: 20 S	Range: 27 E
Sections: 1-4, 22, 35	Township: 21 S	Range: 26 E
Sections: 1-15, 23, 24, 36	Township: 21 S	Range: 27 E
Sections: 7, 18, 19, 30, 31	Township: 21 S	Range: 28 E

PROJECT DESCRIPTION

The permittee is conceptually authorized to perform restoration activities of Lake Apopka via dredging of the Unconsolidated Flocculent Sediment (UCF) layer, placement of the sediment in designated areas within the Lake Apopka North Shore (LANS), and planting of native vegetation. This conceptual approval covers a project area of 25,128 acres with three primary components with a goal to restore Lake Apopka to Class III water quality standards, detailed as follows:

1) **Unconsolidated flocculent sediment (UCF) Dredging (12,826 acres) -**

   Hydraulic dredging of approximately 26,666,598 cubic yards of the UCF layer from seven designated areas of Lake Apopka, depicted on the attached plans. Dredge material is approved for transportation via an existing pipe authorized under ERP File No. 0279439-003. Additional transportation pipelines for dredge material will require review and authorization under the future construction Environmental Resource Permit (ERP).

2) **Placement of UCF on former agricultural areas of the Lake Apopka North Shore (LANS) (12,003 acres) -**

   The placement of dredge material within 14 water-controlled cells of the LANS is proposed in order to achieve part of the restoration plan for the LANS to cover organochlorine pesticide (OCP) contaminated sediments. Burial of the OCP is intended to remove the contamination from biological processes, and therefore lower fish tissue concentrations. Secondary benefits include raising the soil elevations to offset oxidation and subsidence, and to restore the cells to elevations which can support marsh vegetation.

The LANS will serve as the DMMA of this project to meet this objective. The runoff from the dredging activities will be attenuated, treated, and controlled within the existing levees and water control structures of the LANS. Existing water control structure elevations are detailed on Table 1 of the attached plans. Up to date elevation data for the berms and levees of the LANS, operating water levels, and water control structures will be required upon submittal of the construction ERP.

Water quality from the cells will be monitored and may be treated with an approved settling agent prior to discharge into adjacent cells.

3) **Aquatic and emergent vegetation plantings within the littoral zones of Lake Apopka (300 acres)**

Authorized activities are depicted on the attached exhibits.

AUTHORIZATIONS
Lake Apopka – Unconsolidated Flocculant Removal and Dredge Placement

Environmental Resource Permit
The Department has determined that the activity qualifies for Conceptual Approval of an Environmental Resource Permit. Therefore, the Conceptual Environmental Resource Permit is hereby granted, pursuant to Part IV of Chapter 373, Florida Statutes (F.S.), and Chapter 62-330, Florida Administrative Code (F.A.C.).

Sovereignty Submerged Lands Authorization
The activity is located on sovereignty submerged lands owned by the State of Florida. It therefore also requires authorization from the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Section 253.77, F.S. As staff to the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees) under Sections 253.002, F.S., the Department has determined that the activity qualifies for and requires a Letter of Consent, as long as the work performed is located within the boundaries as described and is consistent with the terms and conditions herein.

During the term of this Letter of Consent you shall maintain satisfactory evidence of sufficient upland interest as required by paragraph 18-21.004(3)(b), Florida Administrative Code. If such interest is terminated or the Board of Trustees determines that such interest did not exist on the date of issuance of this Letter of Consent, this Letter of Consent may be terminated by the Board of Trustees at its sole option. If the Board of Trustees terminates this Letter of Consent, you agree not to assert a claim or defense against the Board of Trustees arising out of this Letter of Consent.

Federal Authorization
Your proposed activity as outlined on your application and attached drawings **does not qualify** for Federal authorization pursuant to the State Programmatic General Permit and a **SEPARATE**

permit or authorization **shall be required** from the Corps. You must apply separately to the Corps using the federal application form (ENG 4345). More information about Corps permitting may be found online in the Jacksonville District Regulatory Division Sourcebook. **Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.**

Authority for review - an agreement with the USACOE entitled "Coordination Agreement Between the U. S. Army Corps of Engineers (Jacksonville District) and the Florida Department of Environmental Protection, or Duly Authorized Designee, State Programmatic General Permit", Section 10 of the Rivers and Harbor Act of 1899, and Section 404 of the Clean Water Act.

<u>Water Quality Certification</u>
This permit also constitutes a waiver of water quality certification under Section 401 of the Clean Water Act, 33 U.S.C. 1341 because the authorized activity involves "net improvement" of water quality under Section 373.414(1)(b)3, F.S.

<u>Other Authorizations</u>
You are advised that authorizations or permits for this activity may be required by other federal, state, regional, or local entities including but not limited to local governments or municipalities. This permit does not relieve you from the requirements to obtain all other required permits or authorizations.

The activity described may be conducted only in accordance with the terms, conditions and attachments contained in this document. Issuance and granting of the permit and authorizations herein do not infer, nor guarantee, nor imply that future permits, authorizations, or modifications will be granted by the Department.

CONCEPTUAL APPROVAL CONDITIONS

The activities described must be conducted in accordance with:

- **The Specific Conditions**
- **The General Conditions**
- **The limits, conditions and locations of work shown in the attached drawings**
- **The term limits of this authorization**

You are advised to read and understand these conditions and drawings prior to beginning the authorized activities, and to ensure the work is conducted in conformance with all the terms, conditions, and drawings herein. If you are using a contractor, the contractor also should read and understand these conditions and drawings prior to beginning any activity. Failure to comply with these conditions, including any mitigation requirements, shall be grounds for the Department to revoke the permit and authorization and to take appropriate enforcement action. Operation of the facility is not authorized except when determined to be in conformance with all applicable rules and this permit, as described.

SPECIFIC CONDITIONS

CONCEPTUAL CONDITIONS

1. This Conceptual Approval Environmental Resource Permit is issued under Chapter 62-330.056, F.A.C., and **does not authorize** any of the construction or impact to surface waters described herein. Any such authorization shall require submittal of an Individual Environmental Resource Permit (ERP) application and subsequent issuance of the appropriate ERP.

2. The Department herby conceptually approves the work shown on the approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof. This permit is binding on the issuance of future construction permits only to the extent that adequate data has been submitted for review by the applicant during the review process. Any activities that exceed the scope of activities covered herein or any deviations from the proposed design are not conceptually authorized by this permit.

2. The Department's issuance of this conceptual permit provides the conceptual permit holder with assurance that the concepts upon which the engineering and environmental designs are based are capable of providing for systems which meet Department rule criteria within the level of detail provided in the submitted plans and designs. A conceptual permit does not assure that a specific application for a construction permit will be granted. The issuance of this conceptual permit does not prevent the Department from requesting additional information during subsequent processing of construction applications. Future approval shall be authorized only to the extent they are consistent with the information and conditions of this conceptual approval permit.

3. Future applications for subsequent phases to construct, alter, operate, maintain, remove, or abandon the system conceptually approved must be consistent with this conceptual approval and shall provide reasonable assurance that the proposed activity will meet the conditions for issuance.

4. If an application for any subsequent phase activity is made that is not consistent with the terms and conditions of the conceptual approval and the conceptual approval is not modified to conform to the proposed activity, the conceptual approval will no longer be valid and the applicant can no longer rely on the conceptual approval as a basis, in part or whole, for issuance of permits for any future phase activities.

5. Prior to submittal of an Individual ERP application for the construction phase of the proposed project, the Applicant is encouraged to conduct a pre-application meeting with a representative of the Environmental Resource Permitting staff to review the application submittal.

6. This permit does not provide conceptual approval of activities, which may occur in, on, or over wetlands or other surface water not specifically described in the attached application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof.

GENERAL CONDITIONS FOR INDIVIDUAL PERMITS

The following general conditions are binding on all Individual Permits issued under this chapter, except where the conditions are not applicable to the authorized activity, or where the conditions must be modified to accommodate project-specific conditions.

1. All activities shall be implemented following the plans, specifications and performance criteria approved by this permit. Any deviations must be authorized in a permit modification in accordance with rule 62-330.315, F.A.C. Any deviations that are not so authorized may subject the permittee to enforcement action and revocation of the permit under chapter 373, F.S.

2. A complete copy of this permit shall be kept at the work site of the permitted activity during the construction phase, and shall be available for review at the work site upon request by the Agency staff. The permittee shall require the contractor to review the complete permit prior to beginning construction.

3. Activities shall be conducted in a manner that does not cause or contribute to violations of state water quality standards. Performance-based erosion and sediment control best management practices shall be installed immediately prior to, and be maintained during and after construction as needed, to prevent adverse impacts to the water resources and adjacent lands. Such practices shall be in accordance with the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (Florida Department of Environmental Protection and Florida Department of Transportation, June 2007), and the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual (Florida Department of Environmental Protection, Nonpoint Source Management Section, Tallahassee, Florida, July 2008), which are both incorporated by reference in subparagraph 62-330.050(9)(b)5., F.A.C., unless a project-specific erosion and sediment control plan is approved or other water quality control measures are required as part of the permit.

4. Unless the permit is transferred under rule 62-330.340, F.A.C., or transferred to an operating entity under rule 62-330.310, F.A.C., the permittee is liable to comply with the plans, terms, and conditions of the permit for the life of the project or activity.

5. If the final operation and maintenance entity is a third party:
   a. Prior to sales of any lot or unit served by the activity and within one year of permit issuance, or within 30 days of as-built certification, whichever comes first, the permittee shall submit, as applicable, a copy of the operation and maintenance documents (see sections 12.3 thru 12.3.4 of Volume I) as filed with the Florida Department of State, Division of Corporations, and a copy of any easement, plat, or deed restriction needed to operate or maintain the project, as recorded with the Clerk of the Court in the County in which the activity is located.
   b. Within 30 days of submittal of the as-built certification, the permittee shall submit "Request for Transfer of Environmental Resource Permit to the Perpetual Operation and Maintenance Entity" [Form 62-330.310(2)] to transfer the permit to the operation and maintenance entity, along with the documentation requested in the form. If available, an Agency website that fulfills this transfer requirement may be used in lieu of the form.

8. The permittee shall notify the Agency in writing of changes required by any other regulatory agency that require changes to the permitted activity, and any required modification of this permit must be obtained prior to implementing the changes.

9. This permit does not:
   a. Convey to the permittee any property rights or privileges, or any other rights or privileges other than those specified herein or in chapter 62-330, F.A.C.;
   b. Convey to the permittee or create in the permittee any interest in real property;

c. Relieve the permittee from the need to obtain and comply with any other required federal, state, and local authorization, law, rule, or ordinance; or
d. Authorize any entrance upon or work on property that is not owned, held in easement, or controlled by the permittee.

10. Prior to conducting any activities on state-owned submerged lands or other lands of the state, title to which is vested in the Board of Trustees of the Internal Improvement Trust Fund, 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 of the Internal Improvement Trust Fund shall not be considered received until it has been fully executed.

11. The permittee shall hold and save the Agency harmless from any and all damages, claims, or liabilities that may arise by reason of the construction, alteration, operation, maintenance, removal, abandonment or use of any project authorized by the permit.

12. The permittee shall notify the Agency in writing:
a. Immediately if any previously submitted information is discovered to be inaccurate; and
b. Within 30 days of any conveyance or division of ownership or control of the property or the system, other than conveyance via a long-term lease, and the new owner shall request transfer of the permit in accordance with rule 62-330.340, F.A.C. This does not apply to the sale of lots or units in residential or commercial subdivisions or condominiums where the stormwater management system has been completed and converted to the operation phase.

13. Upon reasonable notice to the permittee, Agency staff with proper identification shall have permission to enter, inspect, sample and test the project or activities to ensure conformity with the plans and specifications authorized in the permit.

14. If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, stone tools, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, 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 vicinity of the discovery. The permittee or other designee shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section (DHR), at (850)245-6333, as well as the appropriate permitting agency office. Project activities shall not resume without verbal or written authorization from the Division of Historical Resources. If unmarked human remains are encountered, all work shall stop immediately and the proper authorities notified in accordance with section 872.05, F.S. For project activities subject to prior consultation with the DHR and as an alternative to the above requirements, the permittee may follow procedures for unanticipated discoveries as set forth within a cultural resources assessment survey determined complete and sufficient by DHR and included as a specific permit condition herein.

15. 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 binding unless a specific condition of this permit or a formal determination under rule 62-330.201, F.A.C., provides otherwise.

16. The permittee shall provide routine maintenance of all components of the stormwater management system to remove trapped sediments and debris. Removed materials shall be disposed of in a landfill or other uplands in a manner that does not require a permit under chapter 62-330, F.A.C., or cause violations of state water quality standards.

17. This permit is issued based on the applicant's submitted information that reasonably demonstrates that adverse water resource-related impacts will not be caused by the completed permit activity. If any adverse impacts result, the Agency will require the permittee to eliminate the cause, obtain any necessary permit modification, and take any necessary corrective actions to resolve the adverse impacts.

18. A Recorded Notice of Environmental Resource Permit may be recorded in the county public records in accordance with subsection 62-330.090(7), F.A.C. Such notice is not an encumbrance upon the property.

19. In addition to those general conditions in subsection (1), above, the Agency shall impose any additional project-specific special conditions necessary to assure the permitted activities will not be harmful to the water resources, as set forth in rules 62-330.301 and 62-330.302, F.A.C., Volumes I and II, as applicable, and the rules incorporated by reference in this chapter.

NOTICE OF RIGHTS

FLAWAC Review

The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review

Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

EXECUTION AND CLERKING

Executed in Orlando, Florida.

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Nathan Hess
Permitting Program Administrator

Attachment(s):

1. Exhibit 1, Conceptual Project Plan & Drawings (Location, Dredge and Placement Plan, Biological Assessment), 113 pages

CERTIFICATE OF SERVICE

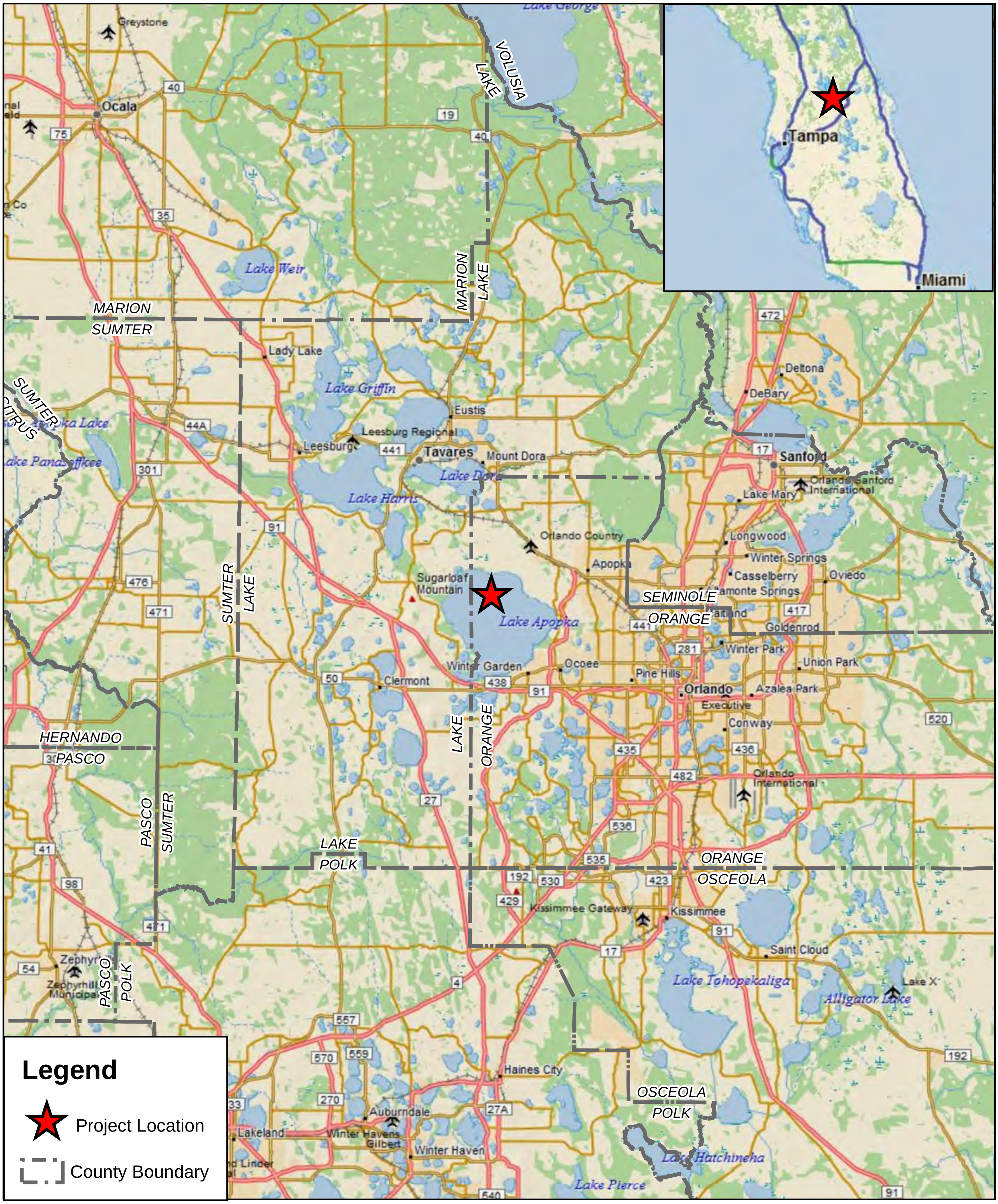
The undersigned duly designated deputy clerk hereby certifies that this document and all attachments were sent on the filing date below to the following listed persons:

Megan Warr, FDEP, Megan.Warr@dep.state.fl.us
Leo Anglero, FDEP, Leo.Anglero@dep.state.fl.us
Robert Wagner, Joseph.Wagner@woodplc.com
Shannon McMorrow, Shannon.McMorrow@woodplc.com
Christine Daniel, FDEP, Christine.Daniel@dep.state.fl.us

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.

Clerk September 17, 2019
Date



Source: DeLorme 2018; Wood 2018

N

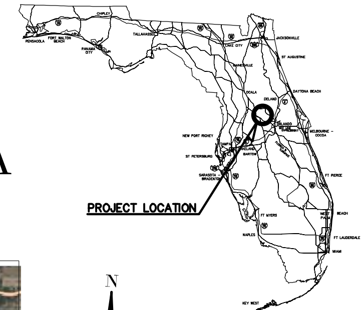
0 5 10 20 Miles

Lake Apopka Dredging Project

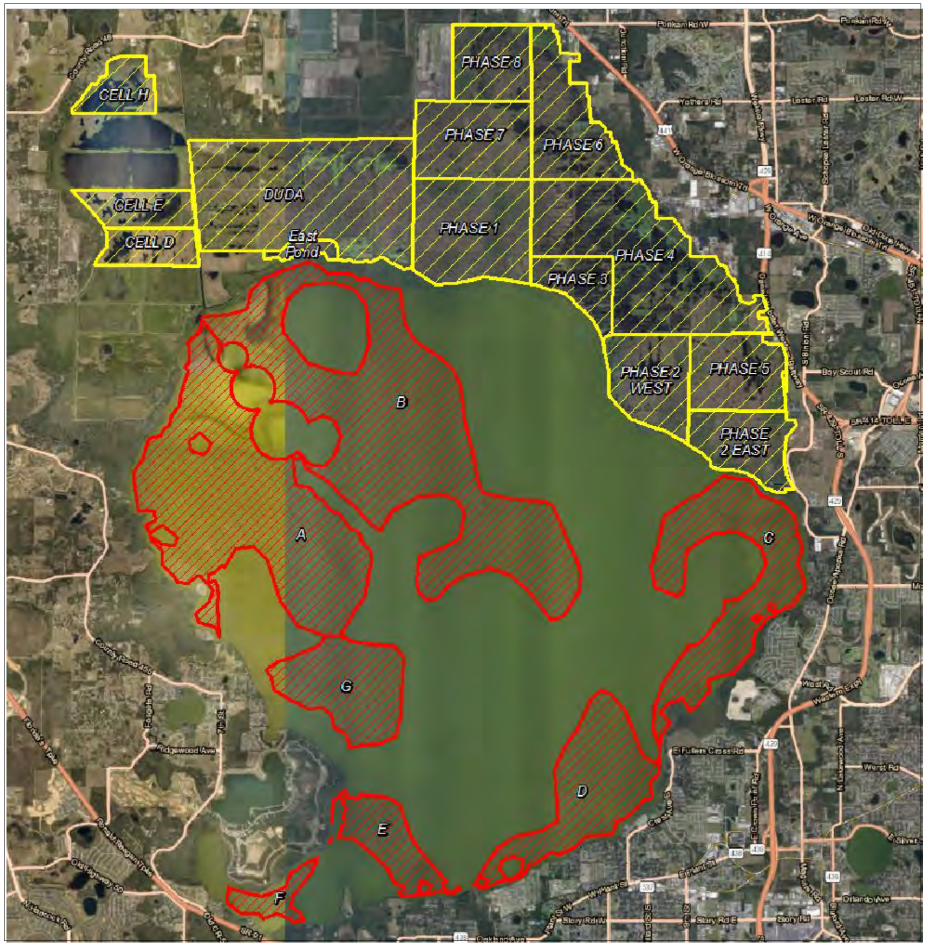
Location Map

Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Figure 1
RJL	1/11/2019			
Checked	Date			
MFC	1/11/2019			

LAKE APOPKA DREDGE AND PLACEMENT TYPICAL PLAN ORANGE AND LAKE COUNTY, FLORIDA



INDEX OF DRAWINGS	
SHEET NO.	SHEET TITLE
1	COVER SHEET/PROJECT LOCATION
2	LAKE APOPKA BATHYMETRY MAP
3	LAKE APOPKA UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS MAP
4	TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (1)
5	TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (2)
6	DREDGE PLACEMENT AREA MAP
7	MATERIAL PLACEMENT SITE TYPICAL CROSS-SECTIONS



NOTE: CONCEPTUAL FOR PERMITTING PURPOSES

N

0 4000' 8000'

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN CHANGED IN SIZE BY REPRODUCTION. THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.

GOVERNING SPECIFICATIONS:
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (FWC);
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP);
U.S. ARMY CORPS OF ENGINEERS (USACE)
IN THE EVENT OF A CONFLICT, THE MOST RESTRICTIVE APPLIES.

PLANS PREPARED BY:

WOOD ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS, INC.
6256 GREENLAND ROAD, JACKSONVILLE, FLORIDA 32258
TEL: (904) 396-5173
WEBSITE: WWW.WOODPLC.COM
EMAIL: Joseph.Wagner@woodplc.com
ENGINEER OR RECORD: ROBERT J. WAGNER, P.E., D.NE. (FL63028)
CERTIFICATE OF AUTHORIZATION: FL 5392

PROJECT OWNER:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
4049 REID STREET, PALATKA, FLORIDA 32177

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
(904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

ROBERT J. WAGNER, P.E.
FLORIDA P.E. #63028
ENGINEER OF RECORD

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

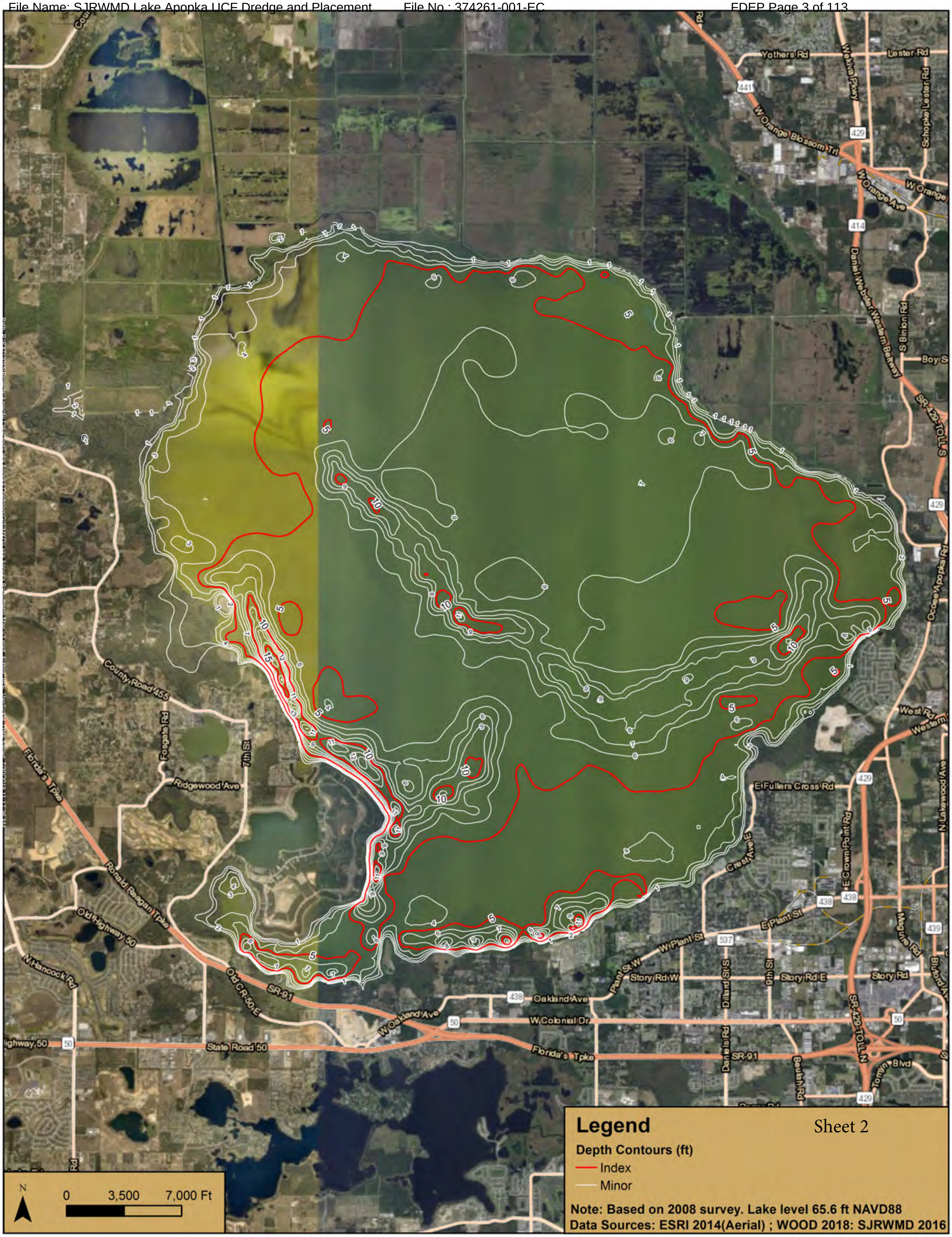
REVISIONS			
NO.	DATE	BY	APPROVED

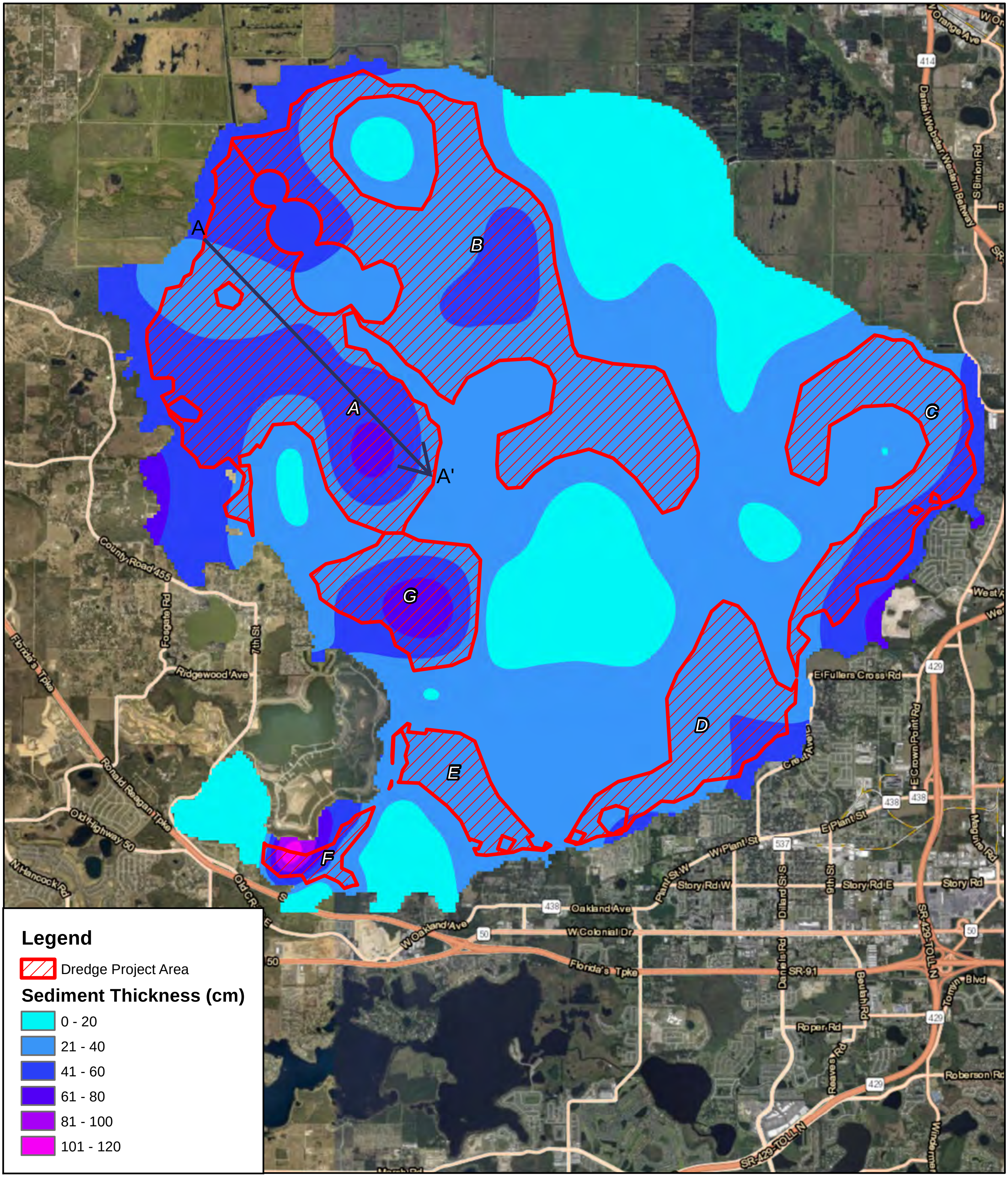
DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	TGD
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
COVER SHEET

SHEET NUMBER:	REV. #
1	

SHEET 1 OF 7 SHEETS


Legend
Sheet 2
Depth Contours (ft)
Index
Minor
Note: Based on 2008 survey. Lake level 65.6 ft NAVD88
Data Sources: ESRI 2014(Aerial) ; WOOD 2018: SJRWMD 2016
0
3,500
7,000 Ft
N
Yothers Rd
Lester Rd
W Orange Blossom Trl
W Orange Ave
Danial Webster Western Beltway
County Road 455
Florida's Tpke
Ronald Reagan Tpke
Old Highway 50
N Hancock Rd
Old CR-50 E
SR-91
Oakland Ave
W Colonial Dr
State Road 50
E Fullers Cross Rd
E Plant St
W Plant St
Story Rd W
Story Rd E
Story Rd
Ridgewood Ave
West Rd
Ocoee Apopka Rd
SR-429 TOLL N
Tomyn Blvd



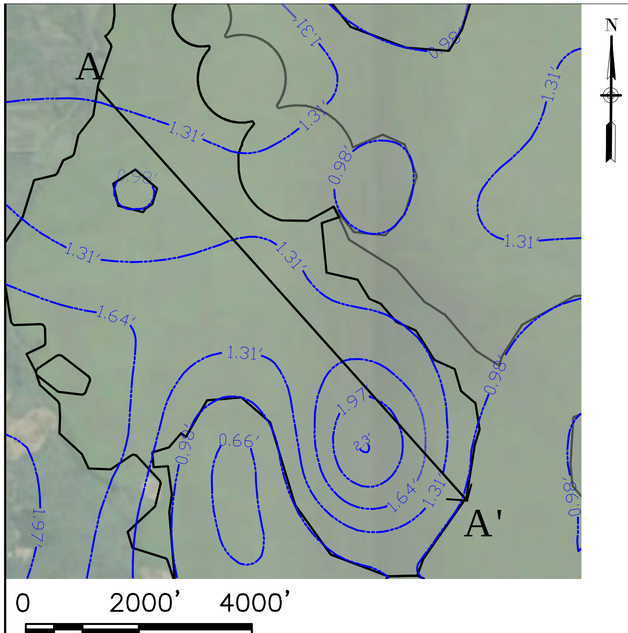
Source: Imagery, ESRI 2017; Wood 2018

0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

UCF Thickness Map

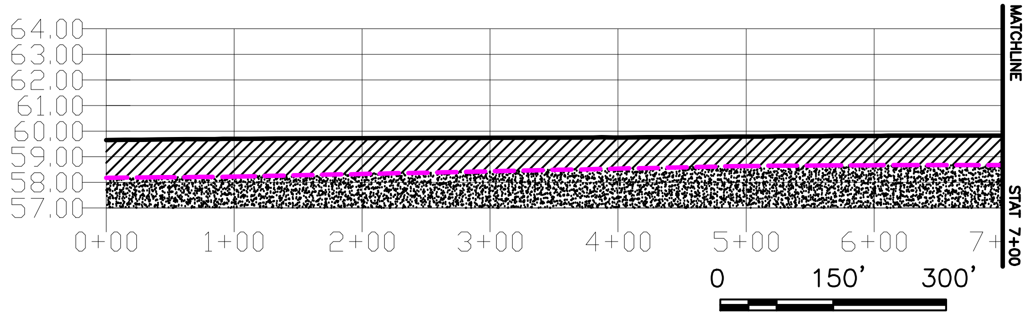
Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Sheet 3
DLA	1/15/2019			
Checked	Date			
MFC	1/15/2019			



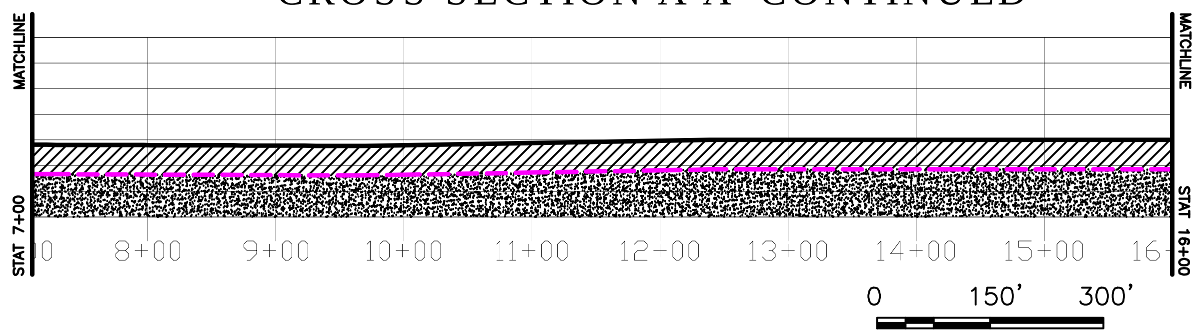
LEGEND

- CROSS-SECTIONS
- VERTICAL LIMITS OF DREDGING
- EXISTING SURFACE
- UNCONSOLIDATED FLOCCULENT (UCF)
- UNDERLYING SEDIMENT
- PROJECT AREA
- 1.31' UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

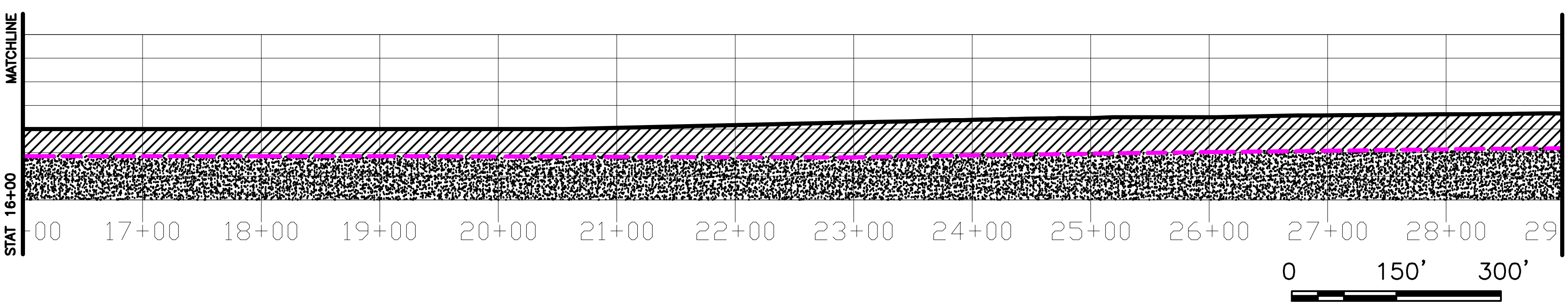
CROSS-SECTION A-A'



CROSS-SECTION A-A' CONTINUED



CROSS-SECTION A-A' CONTINUED



NOTE: CONCEPTUAL FOR PERMITTING PURPOSES

DATA SOURCE: ESRI IMAGERY, WOOD
ELEVATION: NAVD88

wood.
ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
(904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	TGD
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (1)

SHEET NUMBER:	REV. #
4	

SHEET 4 OF 7 SHEETS

0 2000' 4000'

LEGEND

CROSS-SECTIONS

VERTICAL LIMITS OF DREDGING

EXISTING SURFACE

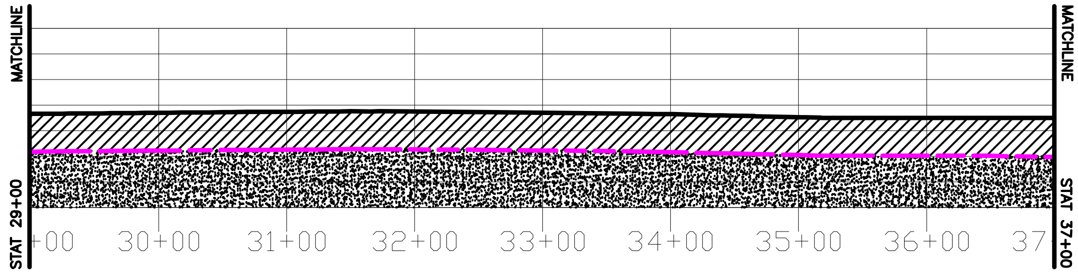
UNCONSOLIDATED FLOCCULENT (UCF)

UNDERLYING SEDIMENT

PROJECT AREA

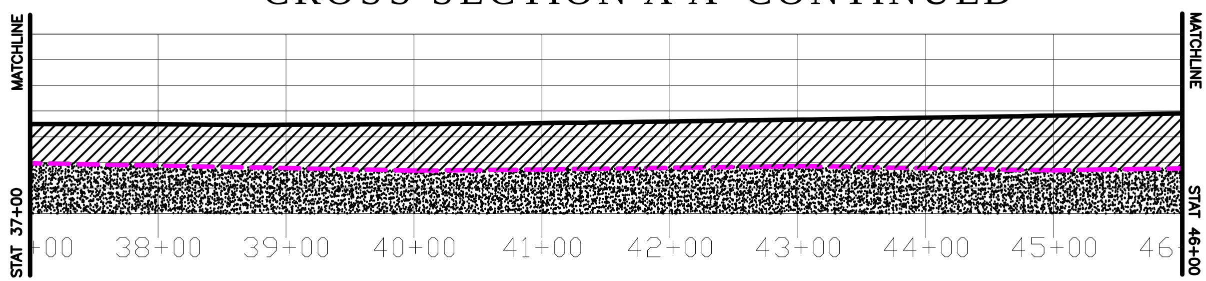
UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS (1.31')

CROSS-SECTION A-A' CONTINUED



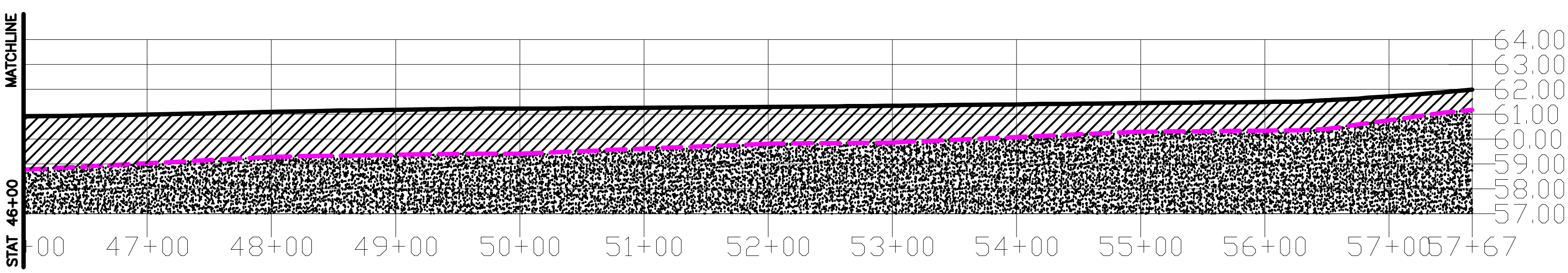
0 150' 300'

CROSS-SECTION A-A' CONTINUED



0 150' 300'

CROSS-SECTION A-A' CONTINUED



0 150' 300'

NOTE: CONCEPTUAL FOR PERMITTING PURPOSES

DATA SOURCE: ESRI IMAGERY, WOOD
ELEVATION: NAVD88

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
(904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:

LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

NO.	DATE	BY	APPROVED

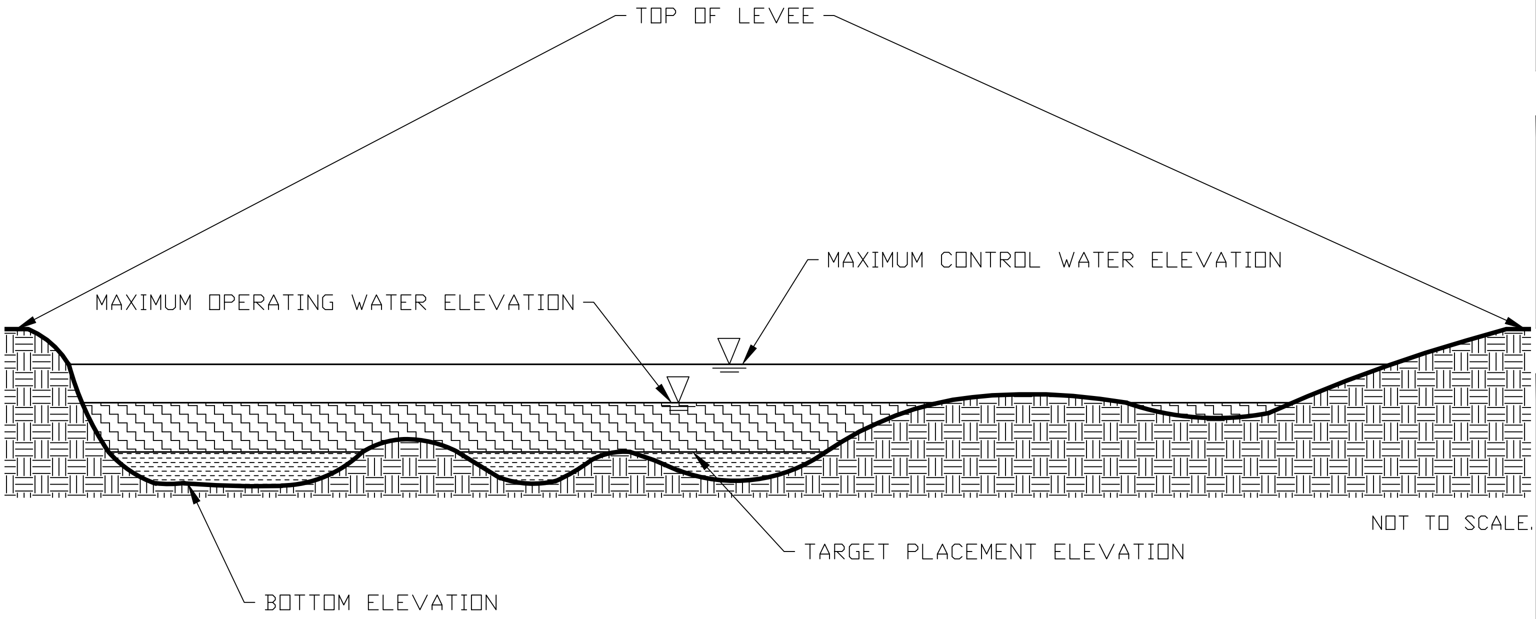
DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	TGD
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:

TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (2)

SHEET NUMBER:	REV. #
5	

SHEET 5 OF 7 SHEETS



NOT TO SCALE.

NOTE:
CONCEPTUAL FOR PERMITTING PURPOSES.

MAXIMUM CONTROL WATER ELEVATION - THE LEVEL AT WHICH MANAGEMENT INFRASTRUCTURE IS THREATENED. SJRWMD DISCHARGES WATER TO THE INTERNAL WATER MANAGEMENT SYSTEM AS NEEDED TO AVOID EXCEEDING THIS ELEVATION.

MAXIMUM OPERATING WATER ELEVATION - THE MAXIMUM WATER ELEVATION THAT WILL BE ALLOWED DURING PLACEMENT OF SEDIMENT. EXISTING GROUND ELEVATIONS WILL NOT BE AFFECTED ABOVE THIS ELEVATION.

TARGET PLACEMENT ELEVATION - THE MAXIMUM ELEVATION FOR PLACEMENT OF SEDIMENT IF THE ENTER PLACEMENT CAPACITY OF THE CELL WERE USED, THIS LEVEL WOULD BE THE NEW BOTTOM ELEVATION.

BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

- EXISTING SURFACE
- GROUND
- SHALLOW PLACEMENT AREA
- DEEP PLACEMENT AREA

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
TEL: (904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

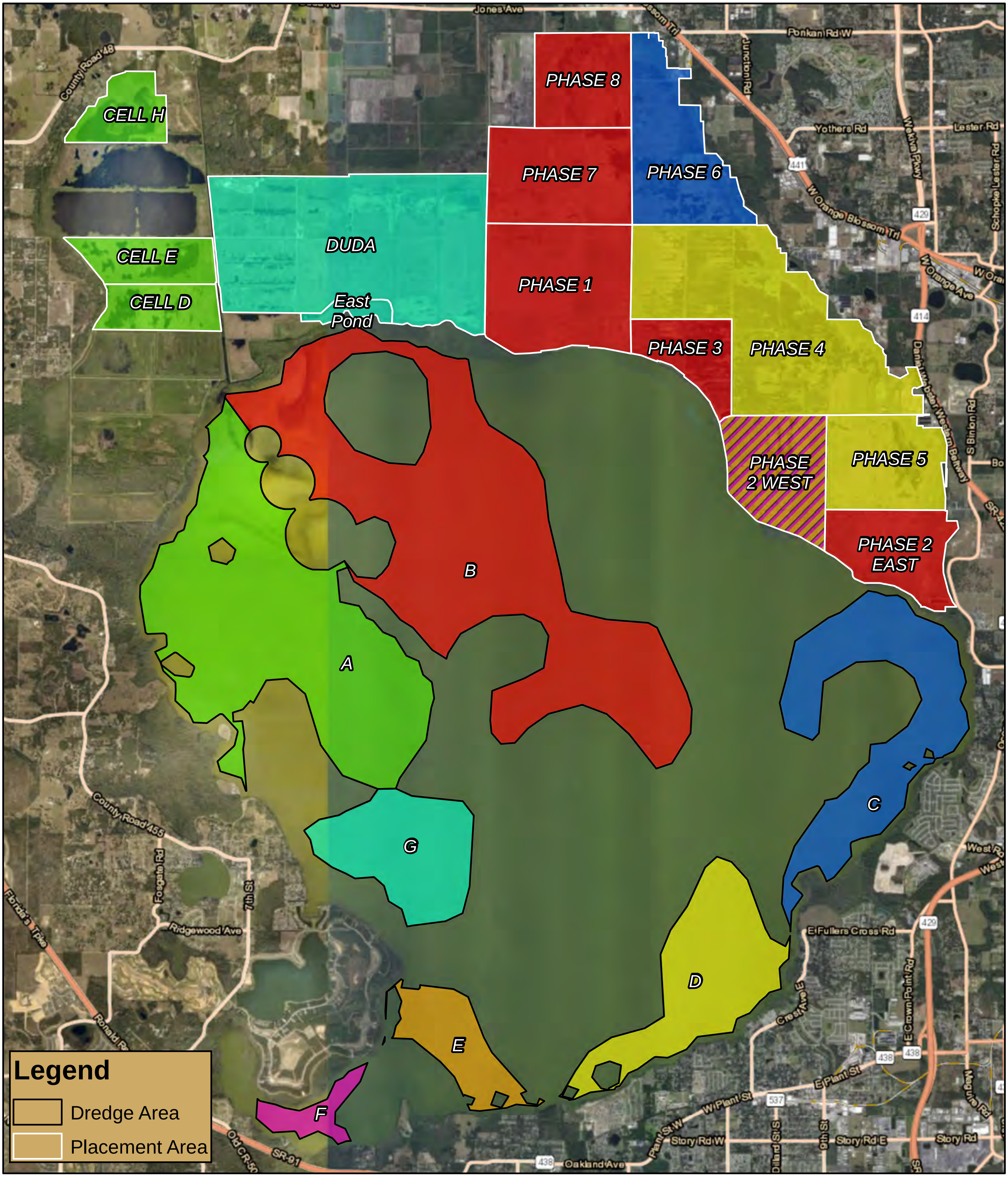
REVISIONS

NO.	DATE	BY	APPROVED

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	01/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS-SECTIONS

SHEET NUMBER: 6 REV. #
SHEET 6 OF 7 SHEETS



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

N

0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Dredge Material Placement Map

Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Sheet 7
DLA	1/4/2019			
Checked	Date			
MFC	1/4/2019			

Lake Apopka North Shore
Biological Assessment for Lake Apopka North Shore
Dredge Material Placement

Prepared by

St Johns River Water Management District
Bureau of Water Resources
Division of Land and Water Resources

January 2019

Executive Summary

Lake Apopka is in the Ocklawaha Chain of Lakes and is the fourth largest lake in Florida (31,000 acres). Prior to the 1940s, the lake had abundant submersed vegetation and was famous for its sport fishery Large-scale conversion to agriculture at the north end of the lake occurred in the 1940s, and farming of the peat soils increased nutrient loading to the lake, causing a shift from submersed vegetation to large-scale algal blooms. In addition, once drained, the peat soils north of the lake oxidized and surface elevations in the farm areas subsided approximately 1 ft every 10 years, or 5-6 feet in total.

Legislation was passed in 1985 (Lake Apopka Restoration Act) and 1987 (Surface Water Improvement and Management [SWIM] Act,) which directed the St. Johns River Water Management District (SJRWMD; District) to restore the lake to Class III water quality. A Total Maximum Daily Load (TMDL) (FDEP 2003) was adopted in August 1996 for Total Phosphorus at 15.9 MT/year, with a lake target concentration of 0.055 mg/L. In addition, the Lake Apopka Improvement and Management Act provided funding to the District to purchase the floodplain muck farms on the north shore of the lake.

While significant phosphorus declines have been observed coincident with reduced external loading, additional phosphorus reductions must occur before meeting the TMDL target. With existing improvements to the lake, patches of submersed vegetation (SAV) have begun to grow in the lake after an absence of several decades. Although encouraging, total coverage is still less than 1% of available habitat within the lake. Submersed vegetation provides spawning, nursery and feeding habitat for native fish and other wildlife and is critical to successful restoration of the lake.

Recent analyses have suggested poor light availability has limited SAV expansion in the lake, and that non-algal suspended solids are responsible for more than 50% of the light attenuation (Wood 2018). To reduce internal phosphorus loading within the lake, and improve navigation access for recreation, the District is pursuing a 10-year maintenance dredging permit for Lake Apopka and intends to place material on the Lake Apopka North Shore, in order to bury existing organochlorine pesticide-contaminated sediments and work toward amelioration of historic subsidence.

Table of Contents

Figures

Tables

List of Acronyms

BSAF	Biota sediment accumulation factor
CFA	Core Foraging Area
DDTx	Sum of 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT
dw	Dry weight
ESA	Environmental site assessment
ESCA	Endangered Species Conservation Act
FDEP	Florida Department of Environmental Protection
HI	Hazard index
HQ	Hazard quotient
LANS	Lake Apopka North Shore
OCP	Organochlorine pesticide
P	Phosphorus
SAV	Submersed Aquatic Vegetation
SJRWMD	St. Johns River Water Management District
SWIM	Surface Water Improvement and Management Act
TLP	Thin Layer Placement
TMDL	Total Maximum Daily Load
TRV	Toxicity reference value
UCF	Unconsolidated flocculant sediment
USFWS	United States Fish and Wildlife Service
ww	Wet weight

Introduction

Lake Apopka is in the Ocklawaha Chain of Lakes, is the fourth largest lake in Florida (31,000 acres) and lies within Orange and Lake Counties (Figure 1). Prior to the 1940s, Lake Apopka had abundant submerged aquatic vegetation (SAV) and was famous for its sports fishery (Clugston 1963). Large-scale conversion for agriculture of about 20,000 acres of mostly floodplain marshes at the north end of the lake began in the 1940s, which precipitated a shift from an SAV-dominated lake to a system dominated by algal blooms. In addition, oxidation of the drained muck soils caused surface elevations in the farm areas to subside below lake level, up to 5-6 feet in some areas.

Legislation in 1985 (Lake Apopka Restoration Act) and 1987 (Surface Water Improvement and Management [SWIM] Act) directed the St. Johns River Water Management District (SJRWMD) to restore Lake Apopka to Class III water quality. The 1996 Lake Apopka Improvement and Management Act provided funding to initiate the purchase of the floodplain muck farms on the north shore of the lake.

Key water quality indicators in Lake Apopka improved along with reductions in phosphorus (P) loading after phasing out the agricultural land use adjacent to the lake. SAV began to grow in the littoral zone after it had been absent several decades. This resurgence in SAV was an important milestone, as SAV provides spawning, nursery, and feeding habitat for native fish and other wildlife. However, the total SAV area remains insufficient for a healthy littoral zone and thriving fisheries at less than 1% of potential SAV habitat.

Recent analyses indicate that poor light availability has limited colonization of SAV into deeper areas of Lake Apopka and may have slowed lateral infilling of plants. Suspended solids other than algae are responsible for more than 50% of light attenuation within the lake (Wood 2018). A surficial layer of unconsolidated flocculant sediment (UCF) has been documented to cover the lake bed (Mehta et al. 2009, Pollman 2016). This sediment has high water and low solids contents and contains high nutrient levels. Wind-driven resuspension of floc sediments in Lake Apopka often contributes to suspended solids in the water column. Proposed dredging projects will target bottom areas in Lake Apopka where resuspension of sediments is most intense, with the long-term goal of reducing suspended sediments in the water column and improving the light climate for SAV. UCF material removed will be placed and contained on reflooded farm fields in the Lake Apopka North Shore (LANS). In addition, native submerged or emergent aquatic vegetation will be planted to further stabilize flocculant sediments, improve water clarity within the lake, and provide beneficial aquatic habitat within the lake.

Sediment placement may occur via conventional open pipe flow of dredged material or high pressure thin-layer placement (TLP). In general, TLP has been used in the context of subaqueous sediment placement and marsh nourishment with sediment to describe placement of sediment in an environmentally acceptable manner to achieve a target elevation or thickness. Thin layer placement projects include efforts to support infrastructure and/or create, enhance, maintain, or restore ecological function. In the case of this project, ecological restoration will be accelerated by burying existing contaminated sediment on the LANS and offsetting historical subsidence. The Lake Apopka North Shore is an actively managed system of contiguous marsh areas used for management of phosphorus load to the lake, residual pesticides within the former agricultural fields, improved lake level fluctuation, flood water storage, recreation and habitat restoration. The LANS provides important habitat for wildlife including numerous species of migratory and resident birds. Most of the managed marsh area can be described as some variant of treeless wetland on former agricultural fields. Water levels have been actively managed since their initial flooding to promote dense, luxuriant vegetation as a precaution for foraging birds. In January 2018, the District was authorized to transition to active management of these areas (SJRWMD 2018), allowing areas to progress to a more desirable mixed marsh habitat, as identified in the District's Land Management Plan (SJRWMD 2013).

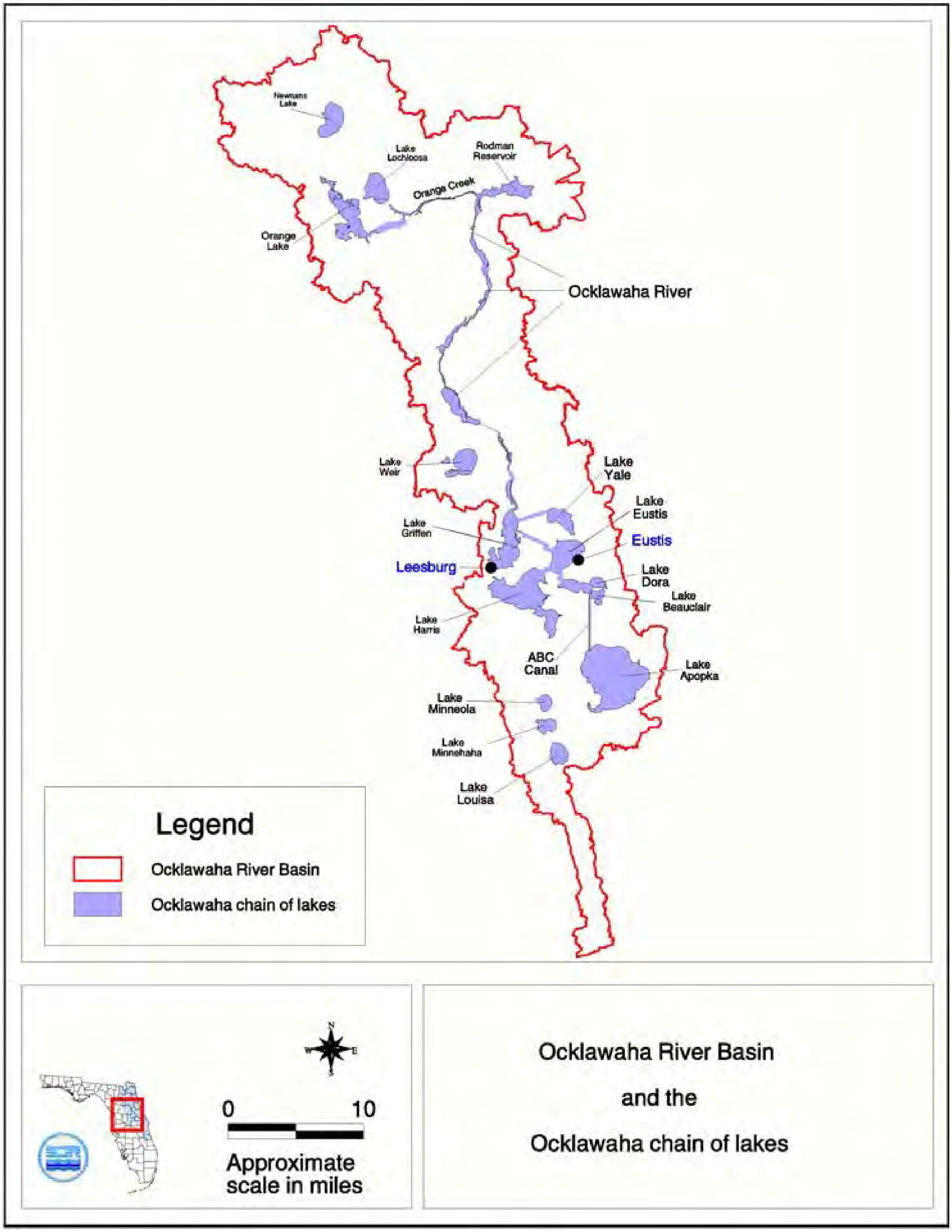


Figure 1. Overview of Lake Apopka and the Ocklawaha Basin

Placement of sediment material in the LANS provides two benefits: First, existing soils will be covered by sediments with lower levels of organochlorine pesticide (OCP) residues to help reduce OCP concentrations in fish tissue. Small herbivorous fish feeding on algae in the sediments ingest sediment as well as sediment-bound OCPs. Organochlorine pesticides are lipophilic and stored in fat and brain tissue, which then propagates up the food chain through prey-predator pathways. Adding external lake sediment to areas within the LANS will cover existing OCP sediments and provide separation of those sediments from foraging wildlife. LANS soils were remediated to achieve contaminant levels in fish that do not pose unacceptable risk for fish-eating birds; however, the long-term goal is to reach lower contaminant levels in soils and fish that are safe for human health and recreation. Placement of dredged lake sediments, which are cleaner than existing soils, on areas of the LANS will help to achieve that goal. The second benefit from strategic placement of dredged sediments on the LANS is to raise soil elevations to help support healthy wetland and marsh habitat by adding material to the deepest areas and bring them closer to an elevation that supports mixed marsh. Surface elevations of portions of the LANS decreased as much as 6 feet (ft) below lake levels during the farming period, and offsetting that subsidence can help transition those areas from open water areas back toward elevations that support marsh or wetlands.

Project Plan

Project Purpose

The project purpose is lake restoration through maintenance dredging of Lake Apopka to include: 1) removal of unconsolidated flocculent sediment (UCF) to improve water clarity, 2) placement of UCF on former agricultural areas at the Lake Apopka North Shore (LANS) to accelerate restoration of wetlands by covering pesticide contaminated sediments and raising soil elevations to offset oxidation and subsidence, and 3) planting of suitable aquatic and emergent vegetation throughout the littoral zones of the lake.

Project Description

Dredging projects proposed for Lake Apopka will consist of removal of surficial UCF sediments through hydraulic dredging. Areas containing the thickest deposits of UCF and that are most prone to resuspension through wave action will be targeted for dredging (Figure 2). Design of individual dredging projects will be developed as funding is procured. Site-specific information that may be needed for final design includes hydrographic surveys of the proposed dredging site, sediment mapping by probing and coring to confirm the spatial distribution of UCF sediments, and sediment sampling and contaminant analyses. Lake bottom areas will be selected for sediment removal based on several factors including the thickness of UCF sediments, the potential for wind-driven resuspension of sediments, proximity to the LANS, and lack of existing SAV. A cultural resource assessment concluded that no further surveys of cultural resources are needed if removal of sediment is limited to the UCF (SEARCH 2018). The dredging equipment will be modified as needed to optimize removal of the low-solids UCF material while minimizing any disturbance to the underlying consolidated sediments. Booster pumps will be used as appropriate to transport sediments over longer distances.

Dredging is expected to occur during daylight hours, 5 days per week. No vegetation clearing is anticipated as part of this project, except for minor impacts that may be required to set up initial pipelines and equipment. Water levels in the sediment placement areas will be managed such that a minimum average water depth of 12” will be maintained within the project placement phase, and maximum operational water depths have been set to prevent material placement in areas above the 25th percentile for inundation frequency of the phase, minimizing placement of material into areas not typically inundated. Lake sediments are expected to be highly organic and rich in phosphorus, so flocculent and/or coagulant may be added to the dredge material in the pipeline, to promote settling and reduce phosphorus concentrations in the receiving areas. Placement will target deeper areas of a phase, to offset subsidence, working toward returning those areas to an elevation that can support marsh as well as bury OCP contaminated sediment. We anticipate most of the material will preferentially settle into the deep placement areas, which have maximum placement elevations set to maintain inundation during spring dry periods to prevent willow germination (Table 1). Some percentage of material will settle outside of the deep placement area, but below the maximum water level established for the cell. Those areas are likely to receive shallow material placement, and the volume of material placed in those areas will be much less. Although still incrementally offsetting subsidence, the primary project goal for these areas is to bury OCP contaminated sediment. In the event water is discharged from a receiving phase, water will be released to other phases on the LANS and incorporated into standard District management (continued storage on the LANS, or release to the lake after alum injection). Water quality exiting the receiving phase will be monitored on a weekly basis and will be equal to or better than adjacent phases; specific parameters of interest include total and dissolved phosphorus, orthophosphate, total suspended solids and turbidity. If fish kills occur in the sediment placement area during the project, actions outlined in the fish kill contingency plan will be followed (Appendix D). The final project will likely shift habitat currently supporting open water toward a shallower environment capable of supporting mixed marsh, an overall management goal for the District in managing the LANS. In addition, OCP-laden sediment will be buried and further removed from biological processes, enhancing remediation efforts and making progress toward an eventual District goal of habitat that supports recreational fishing. We anticipate that this project may affect, but is not likely to adversely affect threatened and/or endangered listed species.

Table 1: Proposed Operational Criteria for each Potential Dredge Material Recipient Phase on the Lake Apopka North Shore.

Site	Area (acres)	Bottom Elev ft	Target Placement Elev ft	Maximal Operating Water Elev ft	Maximal Control Water Elev ft
Cell D	374	61.1	63.0	64.0	64.0
Cell E & E Pond	385	60.2	63.0	64.0	64.0
Cell H & H Pond	320	60.6	63.0	64.0	64.0
Duda	2,500	59.1	59.7	61.3	62.9
Duda East Pond	80	59.1	59.7	61.3	64.9
Phase 1	1,210	58.7	60.6	61.5	62.8
Phase 2 East	630	58.3	59.2	60.4	61.9
Phase 2 West	780	57.5	58.9	60.5	61.4
Phase 3	410	57.4	58.6	59.4	61.5
Phase 4	2,130	55.4	56.5	60.4	61.4
Phase 5	740	58.1	59.0	60.4	61.4
Phase 6	930	56.3	58.1	60.4	62.3
Phase 7	920	58.1	59.3	61.5	61.8
Phase 8 (excl. Lake Jem Sod Farm)	594	57.4	59.3	61.2	61.8
Total	**12,003**				

Map and Discussion of Phased Project Approach

Given the large scale of the overall proposed dredging project, smaller individual projects will be undertaken as funding allows. The preliminary approach is shown in Figure 2. Each project area has a letter designation for reference, however no priority is implied in the designation system. Project areas will be selected and undertaken based on available funding, project logistics and cost-effectiveness. Estimated volumes of UCF available for removal are in Table 2, along with final placement volumes, using an estimated 5-fold consolidation after coagulants and flocculants are added. Potential placement areas on the LANS are shown in Figure 3, and final placement will be determined based on estimated volume of a given project and location within the lake. Pipelines will be routed along existed roadways and will placed to avoid impacts to desirable aquatic vegetation, both in the lake and on the LANS.

Prior to commencement of any project, sediment samples will be collected within the dredge footprint area if no recent data are available (within last five years). A minimum of ten sites will be sampled for projects up to 800 acres; projects larger than that will have one sample collected for every 80 acres. Samples will extend from the top of the sediment surface to 6-12" below the bottom elevation proposed for dredging. Sediments will be analyzed for organochlorine pesticides, metals, and nutrients and compared to Florida Department of Environmental Protections (FDEP) Soil Clean Up Target Levels (SCTLs), as well as historical data from identified placement sites, to evaluate suitability for placement. Suitability will be determined on mean concentration of contaminants in the sediment volume to be removed, which should fall below the FDEP Residential SCTL, with the exception of arsenic. Median arsenic samples historically collected from the lake suggest concentrations ranging from 6.2 mg/kg dwt (Sump Dredging Project, AMEC 2016) to 9.6 mg/kg dwt (Segal and Pollman, 1992). This range is within natural background levels for Florida histosols (Chen et al. 2002), however exceeds the FDEP Residential SCTL for arsenic; therefore, we propose to compare mean arsenic concentration for the volume of dredged sediment to the FDEP Industrial SCTL for arsenic.

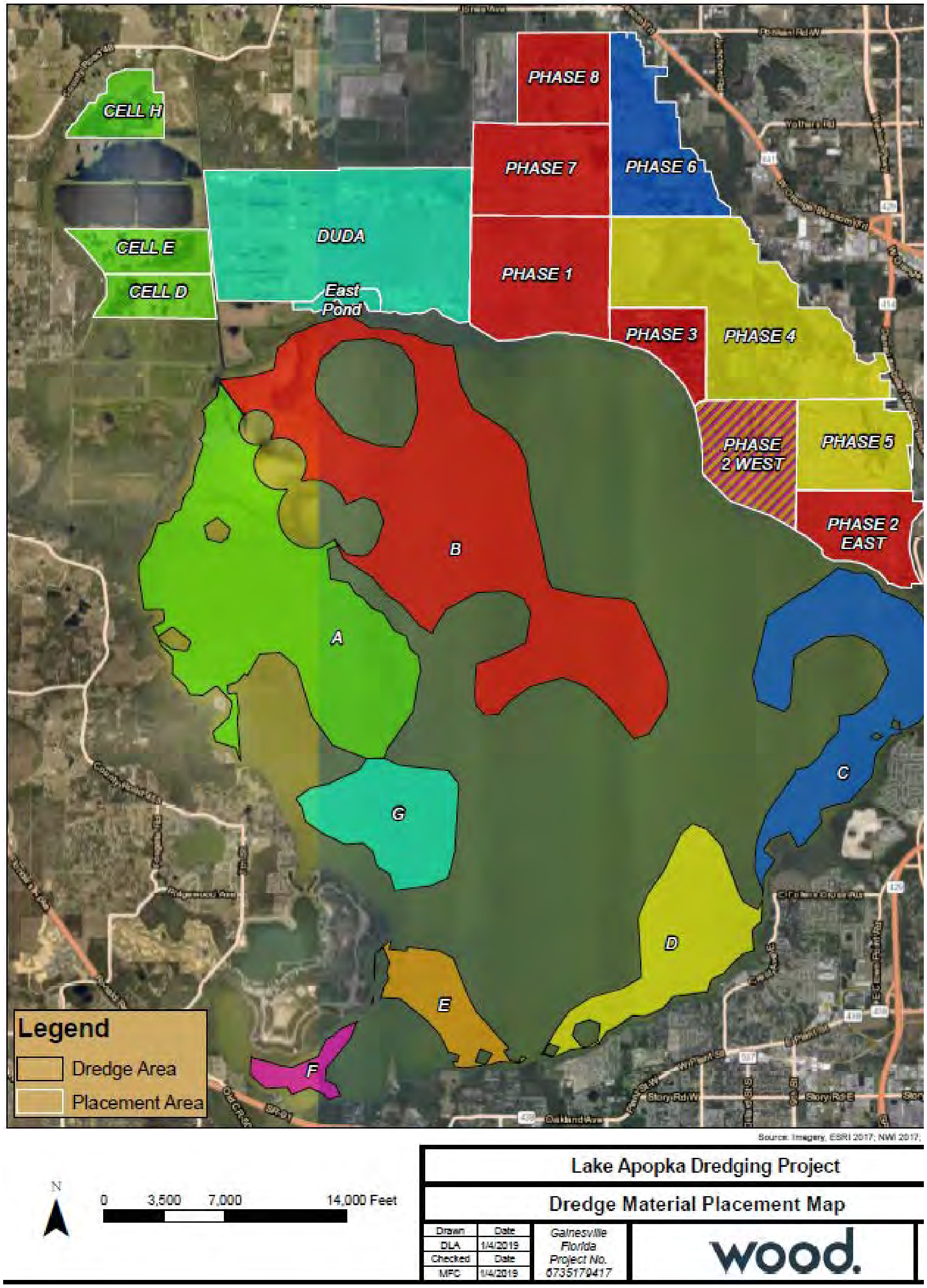


Figure 2: Areas targeted for UCF removal and potential placement sites on the Lake Apopka North Shore. Project area designations do not imply an order of implementation but are simply labeled for reference purposes.

Table 2. Estimated volume of UCF (ac-ft) to remove from each project area within lake. Project area designations do not imply an order of implementation but are simply labeled for reference purposes.

Lake Area and Dredge Volume Acre-Feet		Placement Area and Available Volume (Acre-Feet)													
		Cell D	Cell E	Cell H	Phase 1	Phase 2 East	Phase 3	Phase 7	Phase 8	Phase 6	Phase 4	Phase 5	Phase 2 West	Duda	Duda E-Pond
		3,554	4,929	3,841	4,785	701	977	1,451	2,542	4,617	2,637	637	1,244	4,021	240
A	4,995														
B	5,314														
C	2,097														
D	1,490														
E	590														
F	370														
G	1,673														
Percent of Placement Capacity		41%			51%					45%	45%		77%	39%	

Placement Areas

History of the LANS

For a detailed history of agricultural practices, phase flood dates, and results from the management period where the LANS was required to be maintained as dense, luxuriant vegetation as a protective measure for fish-eating birds, please see the existing Biological Assessment authorizing the transition to active management across the property (SJRWMD 2018). The approval of the active management plan provides for selective plantings, drawdowns, deep inundation, prescribed fire, habitat restoration, beneficial soil/sediment placement, and control of invasive vegetation across the LANS.

Since receiving concurrence of this plan in 2018, water levels have typically been held higher across the LANS to reduce release of high-nutrient water to the lake and will be allowed to follow a more natural fluctuation with prevailing climatological conditions. This Biological Assessment specifically addresses sediment placement on the LANS, and details specific plans for strategic placement to benefit the recipient sites.

Project Purpose - Placement Sites

The intended beneficial use of dredged material is placement on the Lake Apopka North Shore, on former farm fields. This will provide two benefits to recipient areas: first, existing soils will be covered by sediment with lower OCP concentrations to assist in lowering OCP exposure to biota, and ultimately, lowering fish tissue concentrations, which aligns with long-term management goals for recreational fishing on the property. In addition, soil elevations will increase to help convert existing open water areas to areas that can support mixed marsh herbaceous wetlands.

Placement Sites

Most phases across the LANS have had some level of sediment and fish tissue analysis since District-ownership was initiated. Because of the bird mortality event occurring in 1998 and OCP contaminants in soils and fish, the District implemented a phased approach to flooding individual phases, tied with fish-tissue monitoring and maintenance of dense, luxuriant vegetation to limit foraging by fish-eating birds. Given this phased flooding approach, sampling has been more extensive in some phases than others and has occurred at different time periods since ownership. Sediment sampling results provided in this report represent samples collected post-remediation, with limited sampling occurring since that time. Fish samples have been collected periodically within a phase since initial flooding, with timing dictated by previous results within that phase. All fish samples were weighed, measured and shipped (frozen) to Pace Analytical Inc. for analysis, and incorporate whole fish. Reported OCP concentrations have been rounded to the nearest integer for reporting, with means rounded to the tenth place and standard error to the hundredths; values reported at MDL (below instrument detection limit) were analyzed using the MDL value, to provide a conservative estimate of concentration. Raw data are available upon request.

West Marsh Cell D

Cell D in West Marsh is west of the Apopka-Beauclair Canal and includes 374 acres of mostly shallow marsh and open water with mixed aquatic beds (Figure 3; Table 3). The District acquired the property in a flooded state, which has continued since ownership. Vegetation mapping was conducted in early 2017 across the LANS, however Hurricane Irma impacted this area in August of 2017, and combined with approval of active management across the LANS, water levels have remained much higher since that time. Figure 4 shows a Google Earth image of the cell from January 2018, where a larger percentage of the cell exists as open water. Cells within West Marsh are no longer isolated from each other, as internal dividing levees have eroded below the water surface, so hydrologic exchange occurs across West Marsh cells. Water is typically discharged from the entire area either through the southwest corner of Cell D into the Marsh Flow-Way, or through a pump and culvert system in Cell F to the North, which discharges to the Apopka-Beauclair Canal. Water levels tend to fluctuate with the lake and rainfall.

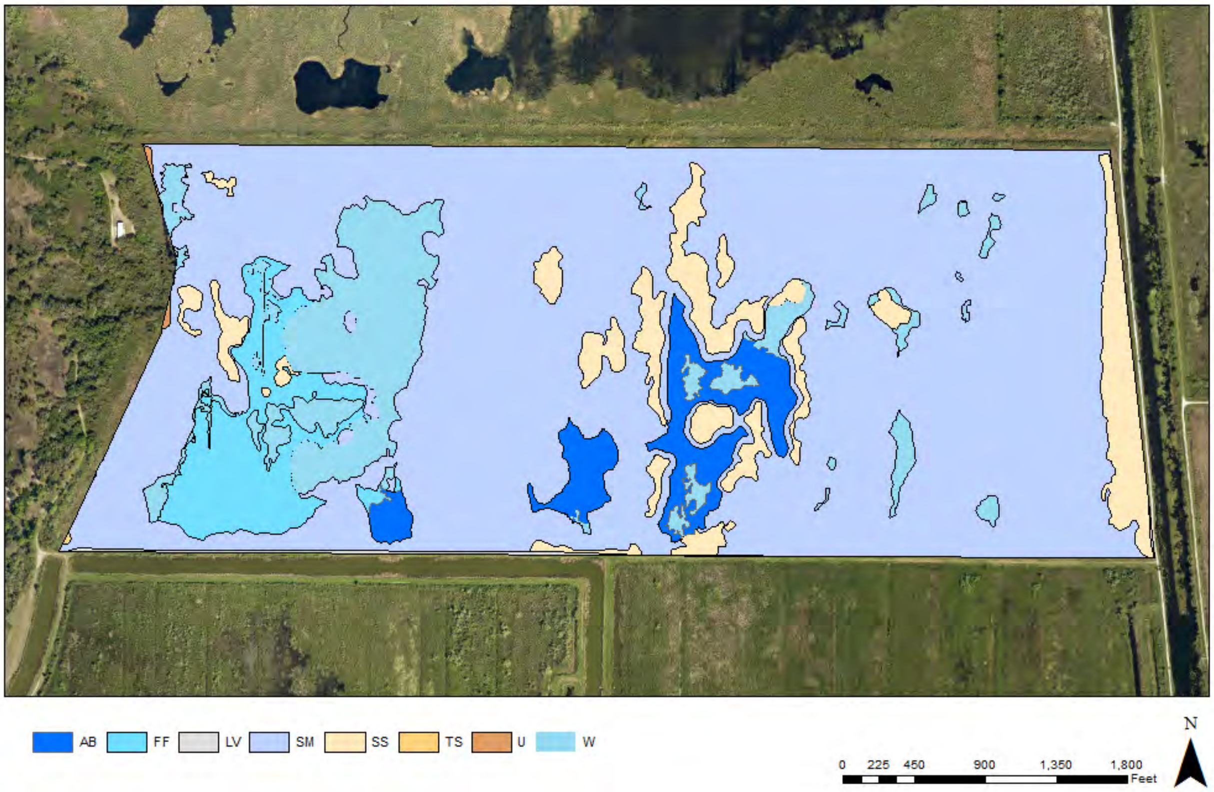


Figure 3. Vegetation map of West Marsh Cell D as of 2017.

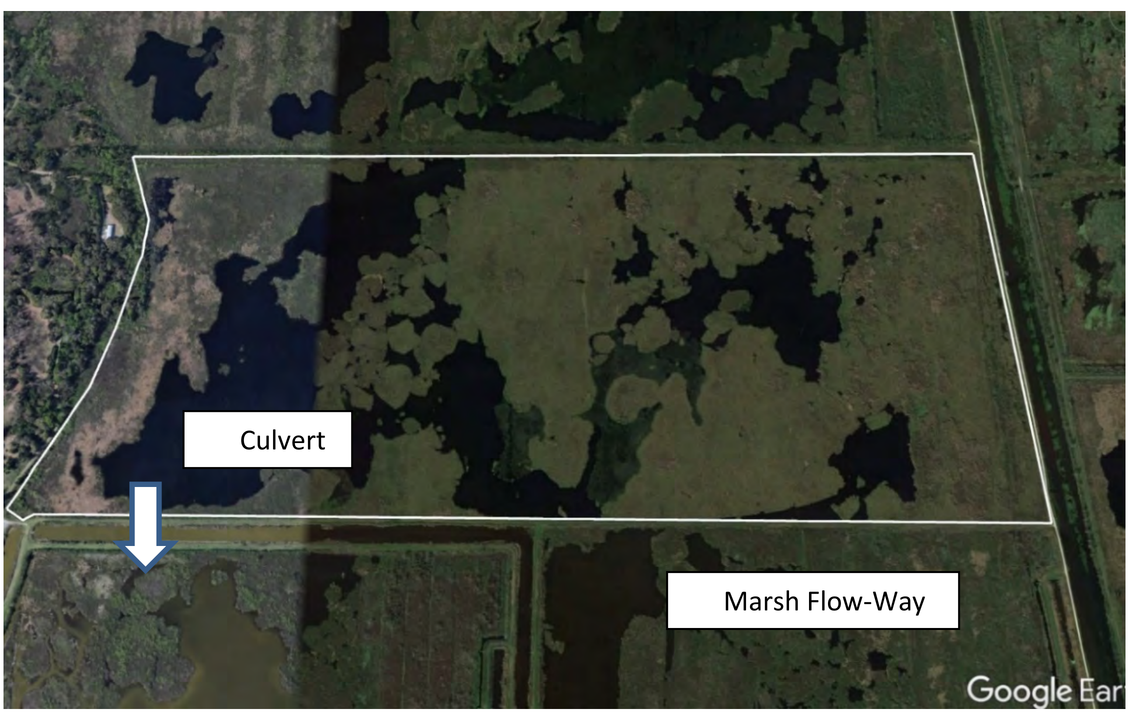


Figure 4. Google Earth image of Cell D as of January 2018.

Table 3. Vegetation key for habitat maps utilized for individual parcel descriptions.

Code	Category	Detailed Description
AB	Water	Aquatic Submerged Beds
BA	Transitional	Freshwater Flats and Barren Areas
CY	Wet Hardwood	Cypress
DS	Upland	Dry Shrub
DP	Transitional	Dry Prairie
FF	Wet Herbaceous	Floating Marsh
HS	Wet Hardwood	Hardwood Swamp
LV	Facility	Levee
PA	Upland	Pasture
PL	Facility	Parking Lot
RD	Facility	Road
SM	Wet Herbaceous	Shallow Marsh
SP	Upland	Spoil
SS	Transitional	Shrub Swamp
TS	Transitional	Transitional Shrub
U	Upland	Upland
W	Water	Water
WP	Wet Herbaceous	Wet Prairie

No bathymetric survey data has been collected for Cell D since the District has had ownership of the land, but ten random water depths were collected in 2017, suggesting bottom elevations between 59.5-62 NAVD88, and an average water depth of 3.5 ft when lake level was at 64.6 NAVD.

Sediments were collected and analyzed in D Cell in 2005 (Table 4). At that time, mean constituent concentrations exceeding the established Toxicity Reference Value (TRVs), or FDEP Residential or Industrial clean up target values included Dieldrin and Toxaphene. Fish sampling was done in 2006, when five samples were collected (1 bowfin, 1 tilapia, and 3 gambusia; all samples were whole body). Fish were weighed, measured and shipped (frozen) to Pace Analytical Inc. for analysis. Table 5 tabulates lipid and pesticide concentrations for those fish collected from Cell D. Organochlorine pesticide concentrations were well below the TRV, with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. Given the time lapse since the most recent collection event, additional sampling will occur prior to material placement into this cell. The District expects no adverse effects to listed species resulting from project implementation with material placement into Cell D of West Marsh.

Table 4. Sediment Summary Data for West Marsh Cell D. Data collected in 2005, all units in ug/kg.

Analyte Name	n	mean	Sdev	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	15	471333.3	18930.95	4887.95	497000	474000	431000			
4,4'-DDD	15	605.1	388.12	100.21	1300	490	49	18000	4200	
4,4'-DDE	15	698.0	355.53	91.80	1300	650	140	13000	2900	1500
4,4'-DDT	15	271.5	327.53	84.57	1400	190	58	13000	2900	
4,4'-DDTr	15	439.0	396.03	102.25	1740	361	99			1500
4,4'-DDTx	15	1574.5	945.99	244.25	3900	1480	269			
Aldrin	15	12.6	8.64	2.23	31	13	1	3000	60	
Dieldrin	15	176.5	93.59	24.17	400	160	24	300	60	140
Endosulfan I	15	1.7	0.52	0.13	2	2	1	6700000	450000	
Endosulfan II	15	35.5	51.73	13.36	160	5	2		450000	
Endosulfan Sulfate	15	8.0	6.55	1.69	23	5	3			
Endrin	15	3.2	0.98	0.25	5	4	2	3400	2500	
Endrin Aldehyde	15	10.0	9.53	2.46	28	6	3			
Endrin Ketone	15	11.6	7.30	1.88	27	9	3			
Heptachlor	15	7.9	6.97	1.80	26	7	1	900	200	400
Heptachlor Epoxide	15	4.3	5.79	1.50	25	3	2			
Methoxychlor	15	24.9	7.43	1.92	36	27	15	7800000	420000	
Oxychlordane	15	11.9	10.66	2.75	34	5	2			50
Phosphorus, total	15	768.0	309.84	80.00	1500	790	250			
Solids, percent	15	29.9	4.22	1.09	36	30	18			
Total Chlordane	15	542.0	286.55	73.99	1158	488	62	12000	2800	
Toxaphene	15	6194.7	3404.56	879.05	15000	6500	820	3700	900	5000
alpha-BHC	15	1.7	0.53	0.14	2	2	1	5000	100	
alpha-Chlordane	15	171.9	98.29	25.38	410	160	16			1000
beta-BHC	15	6.3	1.92	0.50	9	7	4	2100	500	
cis-nonachlor	15	52.4	23.90	6.17	81	59	4			
delta-BHC	15	2.7	1.80	0.46	9	2	1	420000	24000	
gamma-BHC (Lindane)	15	2.4	0.76	0.20	4	3	1	2200	700	
gamma-Chlordane	15	104.3	50.98	13.16	200	98	14			1000
trans-Nonachlor	15	189.3	109.84	28.36	410	190	20			450

Table 5: Summary Data for Fish Tissue OCP Concentrations in Cell D of West Marsh.

Cell D: Fish Tissue OCP Summary Units = ug/kg n=5 Collection Year = 2006 HI=0.5 HQ_{DDE}=0.5							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% lipid	3.6	3	6	3	0.67	0	--
4,4'-DDE	33.0	110	730	74	151.37	0	1500
4,4'-DDTr	29.8	10	65	7	13.02	0	1500
4,4'-DDTx	373.4	122	809	81	166.63	0	3600
Dieldrin	5.0	3	14	1	2.48	0	140
Heptachlor	0.3	0	1	0	0.13	0	400
Heptachlor Epoxide	1.8	1	5	0	0.78	0	100
Oxychlordane	3.3	3	7	1	0.99	0	50
Total Chlordane	47.0	31	101	23	14.74	0	285
Toxaphene	162.6	110	360	43	57.51	0	5000
alpha-Chlordane	8.7	5	19	3	3.15	0	1000
cis-Nonachlor	6.5	4	12	3	1.83	0	550
gamma-Chlordane	0.2	0	0	0	0.09	0	1000
trans-Nonachlor	24.2	17	54	12	7.79	0	450

West Marsh Cell E

Cell E in West Marsh is west of the Apopka-Beauclair Canal and includes 356 acres of mostly shallow marsh and floating marsh, as well as a 29-acre historic storm water pond on the eastern side (E Pond; Figure 5). The District acquired the property in a flooded state, which has continued since ownership. As with Cell D, water is typically discharged from the entire area either through the southwest corner of Cell D into the Marsh Flow-Way, or through a pump and culvert system in Cell F to the North, which discharges to the Apopka-Beauclair Canal (Figure 6). There is an additional culvert connecting E Pond with the AB Canal, which could also discharge water; however, that structure has not historically been used for water management by the District. Water levels tend to fluctuate with rainfall and the lake.

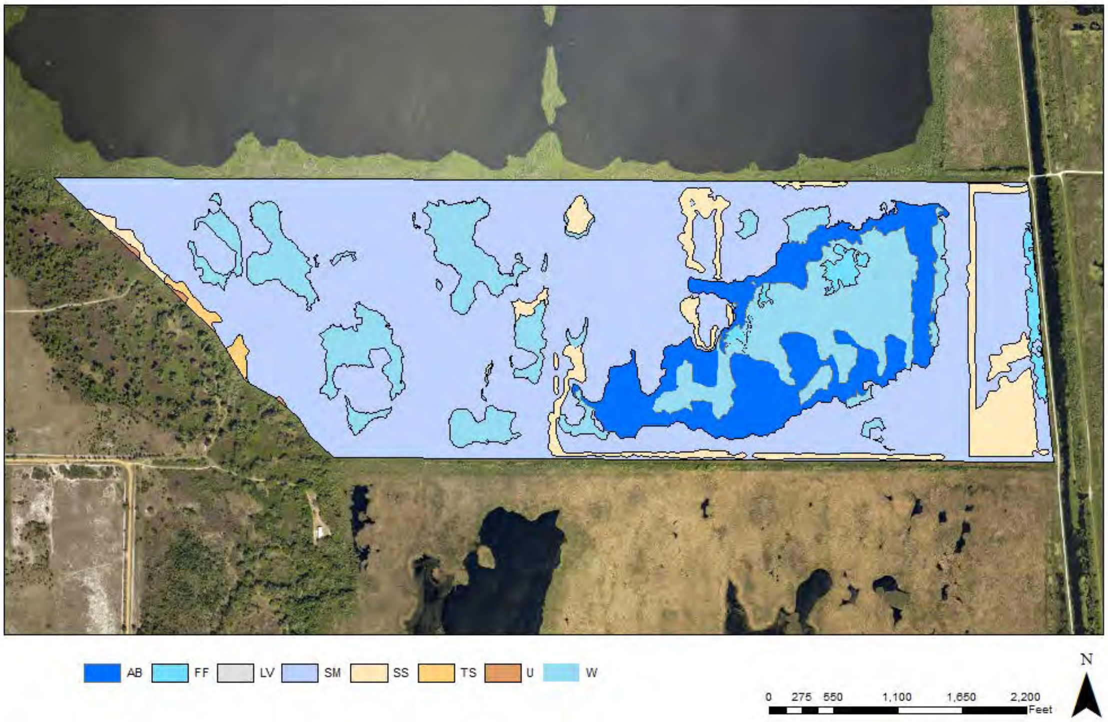


Figure 5. Vegetation map of West Marsh Cell E as of 2017.

Figure 6. Google Earth image of Cell E as of January 2018.

No bathymetric survey data has been collected for Cell E since the District has had ownership of the land, but six random water depths were collected in 2017, suggesting bottom elevations between 59.2-61 NAVD88, and an average water depth of 4.2 ft when lake level was at 64.6 NAVD.

Sediments were collected and analyzed in E Cell in 2005 (Table 6). At that time, mean constituent concentrations did not exceed any established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was done in 2006, when three samples were collected, of which all were gambusia (whole body). Table 7 tabulates lipid and pesticide concentrations for all fish collected from Cell E. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. Given the time lapse since the most recent collection event, additional sampling will occur prior to material placement into this cell. The District expects no adverse effects to listed species resulting from project implementation with material placement into Cell E of West Marsh.

Table 6. Sediment Summary Data for West Marsh Cell E. Data collected in 2005, all units in ug/kg.

Analyte Name	n	mean	Sdev	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	9	465666.7	29231.83	9743.94	504000	470000	421000			
4,4'-DDD	9	365.0	442.79	147.60	1500	230	55	18000	4200	
4,4'-DDE	9	501.1	248.77	82.92	1000	430	210	13000	2900	1500
4,4'-DDT	9	56.3	67.74	22.58	230	31	18	13000	2900	
4,4'-DDTr	9	162.7	169.32	56.44	597	102	43			1500
4,4'-DDTx	9	922.4	734.91	244.97	2730	742	283			
Aldrin	9	5.6	3.53	1.18	11	5	2	3000	60	
Dieldrin	9	48.6	39.99	13.33	120	54	3	300	60	140
Endosulfan I	9	1.4	0.24	0.08	2	1	1	6700000	450000	
Endosulfan II	9	21.7	13.01	4.34	40	24	3		450000	
Endosulfan Sulfate	9	3.5	0.68	0.23	5	3	3			
Endrin	9	2.6	0.50	0.17	4	3	2	3400	2500	
Endrin Aldehyde	9	3.9	0.73	0.24	6	4	3			
Endrin Ketone	9	3.9	0.73	0.24	6	4	3			
Heptachlor	9	2.0	1.07	0.36	4	1	1	900	200	400
Heptachlor Epoxide	9	3.8	4.23	1.41	15	2	2			
Methoxychlor	9	20.4	3.84	1.28	30	19	17	7800000	420000	
Oxychlordane	9	7.4	4.45	1.48	15	8	3			50
Phosphorus, total	9	867.8	332.33	110.78	1600	900	410			
Solids, percent	9	24.3	3.58	1.19	28	26	16			
Total Chlordane	9	81.0	5.20	1.73	87	84	73			
Toxaphene	9	241.6	96.79	32.26	369	260	126	12000	2800	5000
alpha-BHC	9	2560.0	974.11	324.70	3900	2400	940	3700	900	
alpha-Chlordane	9	1.4	0.28	0.09	2	1	1	5000	100	1000
beta-BHC	9	65.2	24.59	8.20	99	72	32			
cis-nonachlor	9	5.2	1.00	0.33	8	5	4	2100	500	
delta-BHC	9	13.0	6.47	2.16	25	12	4			
gamma-BHC (Lindane)	9	1.6	0.31	0.10	2	2	1	420000	24000	
gamma-Chlordane	9	2.0	0.40	0.13	3	2	2	2200	700	1000
trans-Nonachlor	9	52.3	26.96	8.99	100	61	22			450

Table 7: Summary Data for Fish Tissue OCP Concentrations in Cell E of West Marsh.

Cell E: Fish Tissue OCP Summary
Units = ug/kg n=3 Collection Year = 2006
HI=0.2 HQ_{DDE}=0.1

Statistics	Mean	Median	Max	Min	SE	nondetects	TRV
% Lipid	3.6	4	4.13	3	0.40	0	--
4,4'-DDE	153.3	150	170	140	8.82	0	1500
4,4'-DDTr	18.4	18	21	16	1.27	0	1500
4,4'-DDTx	189.8	185	212	172	11.87	0	3600
Dieldrin	1.1	1	1	1	0.11	0	140
Heptachlor	0.6	1	1	1	0.07	0	400
Heptachlor Epoxide	1.8	1	5	0	0.78	0	100
Oxychlordane	2.7	3	3	3	0.12	0	50
Total Chlordane	23.6	22	46	22	1.73	0	285
Toxaphene	40.5	44	360	32	0.70	0	5000
alpha-Chlordane	4.4	4	5	4	3.15	0	1000
cis-Nonachlor	3.4	3	12	3	0.54	0	550
gamma-Chlordane	0.2	0	0	0	0.09	0	1000
trans-Nonachlor	10.6	10	13	9	1.23	0	450

West Marsh Cell H

Cell H in West Marsh is west of the Apopka-Beauclair Canal and includes 290 acres of mostly open water and floating aquatic beds, as well as a 30-acre historic storm water pond on the eastern side, dominated by shallow marsh (H Pond; Figure 7). The District acquired the property in a flooded state, which has continued since ownership. Water is typically discharged from this area either through a pump and culvert system in Cell F to the South, which discharges to the Apopka-Beauclair Canal, or thorough a pump/culvert system in Cell H, that also discharges to the canal (Figure 8). The system in H is not routinely used by the District, however it consists of a culvert connecting H Pond with the AB Canal and a pump that moves water from H Cell to H Pond. Water levels tend to fluctuate with rainfall and the lake; as with other areas on the property, water levels have been much higher since Hurricane Irma, resulting in larger extents of open water habitat.

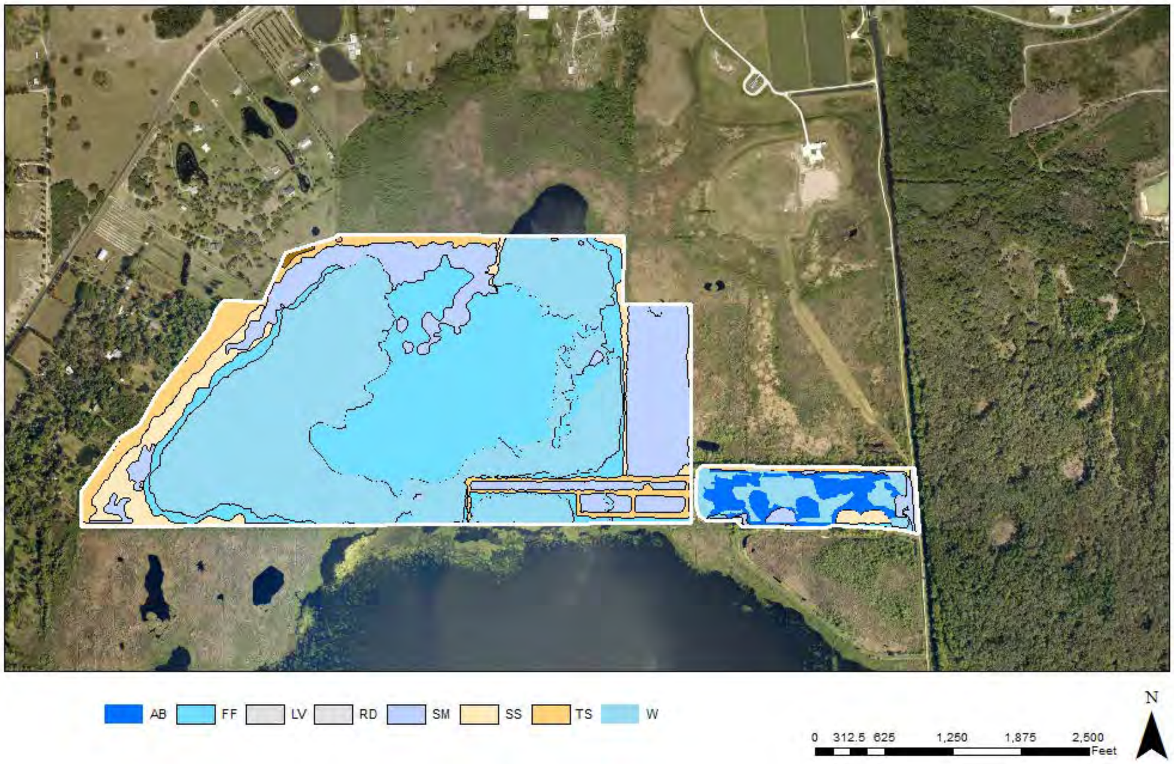


Figure 7. Vegetation map of West Marsh Cell H and H Pond as of 2017.

Figure 8. Google Earth image of Cell H as of January 2018.

No bathymetric survey data has been collected for Cell H since the District has had ownership of the land, but twenty-two random water depths were collected in 2017, suggesting bottom elevations between 59.3-61.6 NAVD88, and an average water depth of 3.9 ft when lake level was at 64.6 NAVD.

Sediments were collected and analyzed in H Cell in 2005 (Table 8). At that time, mean constituent concentrations exceeding the established TRVs, or DEP Residential or Industrial clean up target values included Dieldrin and Toxaphene. The most recent fish sampling event occurred in 2010, when three fish samples were collected (1 Gambusia and two samples of bluefin killifish). Table 9 tabulates lipid and pesticide concentrations for fish collected from Cell H. Organochlorine pesticide concentrations were well below the TRV, with an overall low (HI < 1) hazard index value and hazard quotient for DDE (HQ_{DDE} < 1), suggesting low risk of toxicity to fish-eating birds. Given the time lapse since the most recent collection event, additional fish sampling will occur prior to material placement into this cell. The District expects no adverse effects to listed species resulting from project implementation with material placement into Cell H of West Marsh.

Table 8. Sediment Summary Data for West Marsh Cell H. Data collected in 2005, all units in ug/kg.

Cell H Sediment Data				Collection Year = 2005			Units=ug/kg		
Analyte Name	**n**	**mean**	**SE**	**Max**	**Median**	**Min**	**Industrial**	**Residential**	**TRV**
% Total Organic Carbon	10	300,400	37,298	471,000	323,000	103,000			
4,4'-DDD	10	541	189	1,900	340	5	18000	4200	
4,4'-DDE	10	1,161	294	3,300	1,060	110	13000	2900	1500
4,4'-DDT	10	263	113	1,200	135	12	13000	2900	
4,4'-DDTr	10	449	166	1,800.00	288	20			1500
4,4'-DDTx	10	1,965	576	6,400	1,550	127			
Aldrin	10	7	2	24	4	1	3000	60	
Dieldrin	10	227.21	87.10	900.00	120.00	3	300	60	140
Endosulfan I	10	10	4	35	5	1	6700000	450000	
Endosulfan II	10	97	32	350	66	1		450000	
Endosulfan Sulfate	10	4	1	12	3	2			
Endrin	10	53	31	320	15	1	3400	2500	
Endrin Aldehyde	10	76	32	340	49	2			
Endrin Ketone	10	14	4	35	9	2			
Heptachlor	10	11	5	46	5	1	900	200	400
Heptachlor Epoxide	10	13	6	62	6	1			
Methoxychlor	10	26	6	68	25	9	7800000	420000	
Oxychlordane	10	7	3	29	4	1			50
Phosphorus, total	10	817	89	1,100	910	200			
Solids, percent	10	41	3	55	40	29			
Total Chlordane	10	191	57	628	174	7	12000	2800	
Toxaphene	10	4,367.50	1,137.13	13,000.00	3,650.00	75	3700	900	5000
alpha-BHC	10	2	0	5	1	1	5000	100	
alpha-Chlordane	10	73	23	240	62	1			1000
beta-BHC	10	6	1	17	4	2	2100	500	
cis-nonachlor	10	26	8	84	25	1			
delta-BHC	10	2	1	6	1	1	420000	24000	
gamma-BHC (Lindane)	10	2	1	7	2	1	2200	700	
gamma-Chlordane	10	21	10	97	7	1			1000
trans-Nonachlor	10	39.84	10.49	89.00	41.50	1.50			450

Table 9: Summary Data for Fish Tissue OCP Concentrations in Cell H of West Marsh.

Cell H: Fish Tissue OCP Summary Units = ug/kg n=3 Collection Year = 2010 HI=0.06 HQ_{DDE}=0.16							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	2.5	2.2	3.2	2.1	0.351188	0	--
4,4'-DDE	125.5	147	158	71.4	27.22	0	1500
4,4'-DDTr	9.0	10.57	11	5	1.81	0	1500
4,4'-DDTx	127.1	149	160	73	27.35	0	3600
Dieldrin	0	0	0	0	0	0	140
Heptachlor	0.1	0	0	0	0.07	0	400
Heptachlor Epoxide	0.1	0	0	0	0.14	0	100
Oxychlordane	0.2	0	0	0	0.14	0	50
Total Chlordane	5.2	5	6	4	0.71	0	285
Toxaphene	32.2	30	39	27	3.63	0	5000
alpha-Chlordane	0.9	1	1	0	0.27	0	1000
cis-Nonachlor	0.8	1	1	0	0.19	0	550
gamma-Chlordane	1.7	2	2	2	0.07	0	1000
trans-Nonachlor	1.4	1	2	1	0.36	0	450

Duda

Duda is east of the Apopka-Beauclair Canal and includes 2500 acres of mostly shallow marsh, wet prairie and shrub swamp (Figure 9), as well as Duda East Pond and Duda West Pond (80 acres of shrub swamp). Only Duda proper and Duda East Pond will be considered for material placement, as Duda West Pond is used operationally to settle flocculant from alum-treated water exiting Duda. Field NW-A is in the northwest quadrant of Duda and historically has been kept dry due to OCP concerns and mineral soils; however, in recent years fish tissue concentrations for OCPs have decreased, so flooding of this area was included under the most recent BA. The District flooded Duda in 2002-2003, which was the first phase to be flooded after the mortality event. Inlet structures exist to allow water to be brought into the parcel from the lake or canal, in the event of high water and flood risk around the lake (Figure 10). Water is typically discharged through pumps at the southern end of the parcel into Duda West Pond, where it can gravity flow over a weir into Lake Apopka. An alum injection system provides water treatment upon discharge when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 62.9 NAVD88).

Figure 9. Vegetation map of Duda as of 2017.

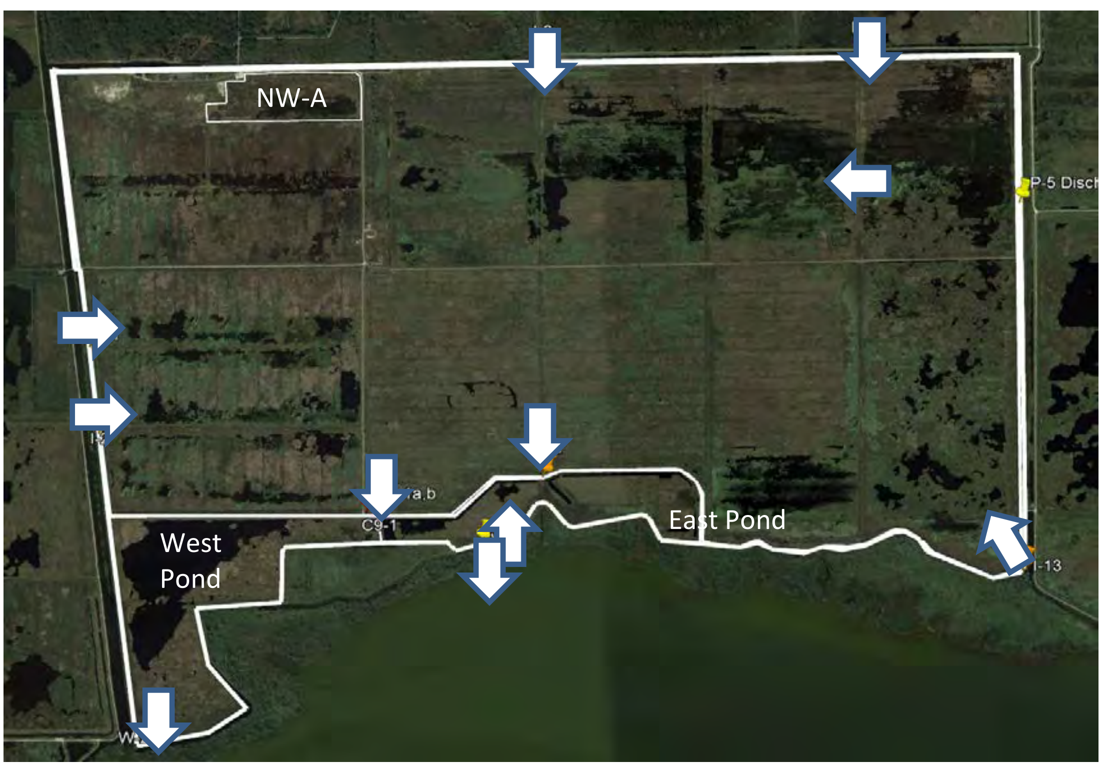


Figure 10. Google Earth image of Duda as of January 2018.

Bathymetric survey data was collected for Duda in 2018, indicating bottom elevations averaging 59-60 NAVD88, with elevation grading higher as one moves north across the property (Figure 11). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above proposed placement elevation.

Sediments were collected and analyzed from Duda in 1999 (Table 10). At that time, only Dieldrin had average concentrations exceed the established TRVs, or FDEP Residential or Industrial clean up target values. Additional samples were collected in 2013 from field NW-A (Table 11), a mineral field that had been kept dry due to OCP concerns. Results from that effort indicated that no constituents exceeded relevant benchmarks. Fish sampling was most recently done in 2016, when three samples were collected, of which all were gambusia (whole body). Table 12 tabulates lipid and pesticide concentrations for all fish collected from Duda. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Duda.

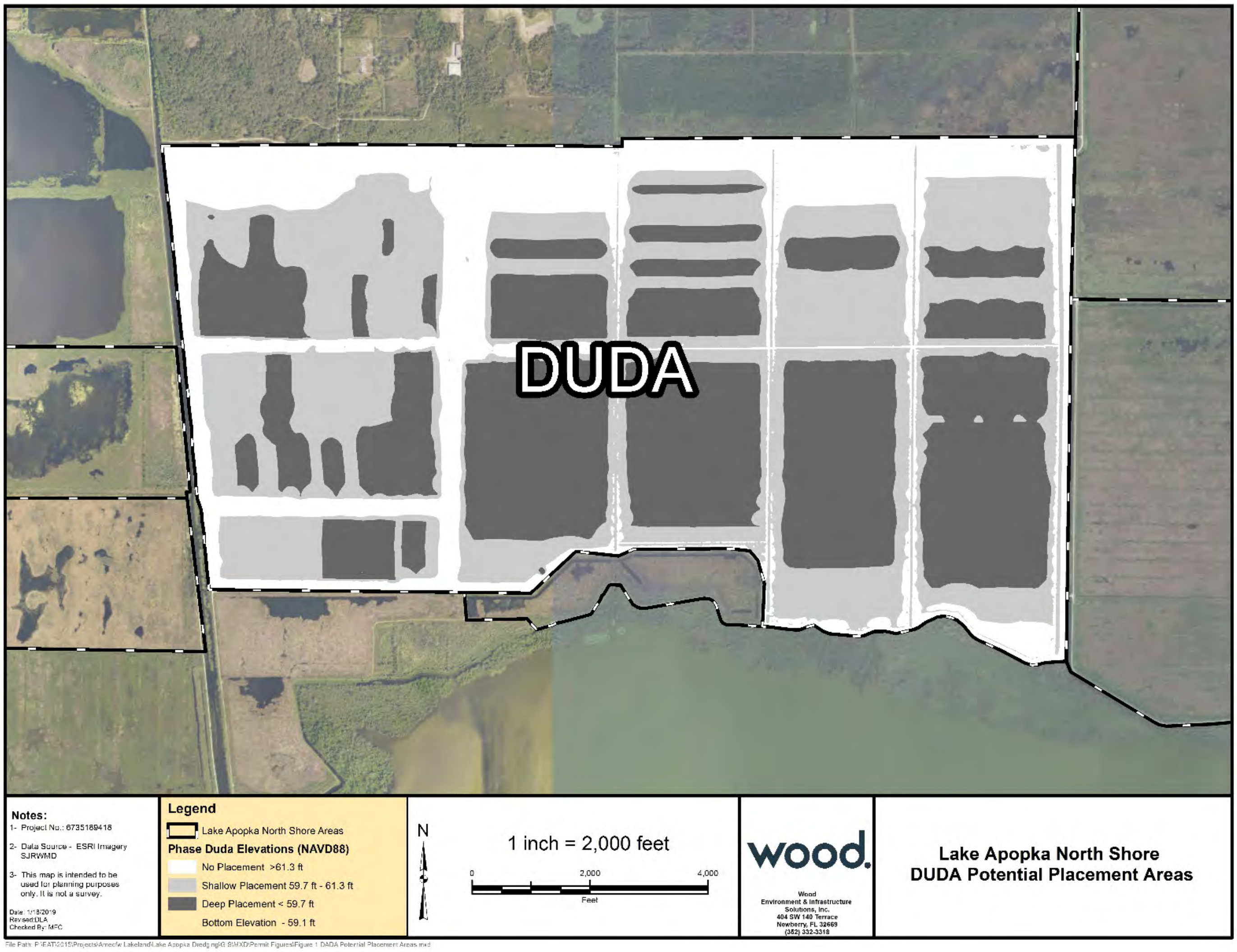


Figure 11. Elevation Map (NAVD88) of Duda indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level), and areas where no material placement will occur.

Table 10. Sediment Summary Data for Duda. Data collected in 1999; all units in ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
4,4'-DDD	89	118.0	18.57	1000	58	6	18000	4200	
4,4'-DDE	89	360.1	36.06	1400	320	6	13000	2900	1500
4,4'-DDT	89	292.6	67.21	3600	61	6	13000	2900	
4,4'-DDTr	89	340.2	71.28	3719	107	7			1500
4,4'-DDTx	89	770.7	108.21	5000	500	18			
Aldrin	89	24.2	2.34	110	21	3	3000	60	
Dieldrin	89	67.1	6.72	360	53	6	300	60	140
Endosulfan I	89	24.2	2.34	110	21	3	6700000	450000	
Endosulfan II	89	66.9	5.98	330	56	6		450000	
Endosulfan sulfate	89	49.0	4.79	230	43	6		450000	
Endrin	89	48.4	4.72	230	43	6	3400	2500	
Endrin aldehyde	89	50.2	4.78	230	45	6			
Endrin ketone	89	48.4	4.72	230	43	6			
Heptachlor	89	24.2	2.34	110	21	3	900	200	400
Heptachlor epoxide	89	24.4	2.34	110	21	3	400	100	100
Methoxychlor	89	241.7	23.36	1100	210	28	7800000	420000	
Solids, percent	89	45.1	1.67	89	41	19			
Toxaphene	89	3580.8	289.59	17000	3200	280	3700	900	5000
alpha-BHC	89	24.2	2.34	110	21	3	5000	100	
alpha-Chlordane	89	84.3	12.07	740	45	3			1000
beta-BHC	89	24.2	2.34	110	21	3	2100	500	
delta-BHC	89	24.2	2.34	110	21	3	420000	24000	
gamma-BHC (Lindane)	89	24.2	2.34	110	21	3	2200	700	
gamma-Chlordane	89	56.1	8.00	360	32	3			1000

Table 11. Sediment Summary Data for Duda, Field NW-A. Data collected 2013; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	4	30475.0	16363.29	78500	19250	4900			
4,4'-DDD	4	6.7	5.30	23	2	1	18000	4200	
4,4'-DDE	4	46.3	39.73	165	10	1	13000	2900	1500
4,4'-DDT	4	19.4	17.28	71	3	1	13000	2900	
4,4'-DDTr	4	23.8	20.99	87	4	1			1500
4,4'-DDTx	4	72.4	62.30	259	14	2			
Aldrin	4	0.5	0.03	1	1	0	3000	60	
Arsenic	4	2.0	0.53	3	2	1	3700	2100	
Dieldrin	4	9.6	8.41	35	1	1	300	60	140
Endosulfan I	4	0.6	0.04	1	1	1	6700000	450000	
Endosulfan II	4	2.1	0.13	2	2	2		450000	
Endosulfan sulfate	4	1.1	0.06	1	1	1		450000	
Endrin	4	0.8	0.05	1	1	1	3400	2500	
Endrin aldehyde	4	1.1	0.07	1	1	1			
Endrin ketone	4	0.9	0.05	1	1	1			
Heptachlor	4	0.4	0.03	0	0	0	900	200	400
Heptachlor epoxide	4	0.7	0.25	1	0	0	400	100	100
Methoxychlor	4	4.0	0.24	5	4	3	7800000	420000	
Moisture, percent	4	31.5	4.29	41	32	21			
Oxychlordane	4	1.5	0.10	2	1	1			50
Solids, percent	4	68.5	4.29	79	68	59			
Total Chlordane	4	19.7	11.52	54	10	5	12000	2800	
Toxaphene	4	73.9	4.58	84	74	63	3700	900	5000
alpha-BHC	4	0.5	0.03	1	1	0	5000	100	
alpha-Chlordane	4	5.2	4.32	18	1	0			1000
beta-BHC	4	0.9	0.05	1	1	1	2100	500	
cis-Nonachlor	4	2.3	0.65	4	2	1			550
delta-BHC	4	0.8	0.05	1	1	1	420000	24000	
gamma-BHC (Lindane)	4	0.5	0.03	1	0	0	2200	700	
gamma-Chlordane	4	3.8	3.30	14	1	0			1000
trans-Nonachlor	4	5.9	3.11	15	4	1			450

Table 12. Summary Data for Fish Tissue OCP Concentrations in Duda.

Duda: Fish Tissue OCP Summary Units = ug/kg n=45 Collection Year = 2016 HI=0.2 HQ_{DDE}=0.1							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	4.2	4	7.2	3	0.18	0	--
4,4'-DDE	125.6	39	766	1	30.04	0	1500
4,4'-DDTr	10.2	3	57	0	2.42	38	1500
4,4'-DDTx	133.7	40	797	1	31.84	38	3600
Dieldrin	1.4	0	9	0	0.36	11	140
Heptachlor	0.0	0	0	0	0.00	45	400
Heptachlor Epoxide	0.1	0	1	0	0.03	43	100
Oxychlordane	3.2	1	17	0	0.80	14	50
Total Chlordane	25.4	7	152	1	6.19	45	285
Toxaphene	60.1	41	215	14	7.63	4	5000
alpha-Chlordane	3.5	1	19	0	0.78	6	1000
cis-Nonachlor	4.1	1	23	0	1.02	12	550
gamma-Chlordane	0.3	0	1	0	0.02	37	1000
trans-Nonachlor	13.6	4	92	4	3.59	5	450

Phase 1

Phase 1 is east of the Apopka-Beauclair Canal and includes 1210 acres of mostly shallow marsh with shrub swamp (Figure 12). This phase receives runoff from Jones Avenue to the north, so often has higher water levels than adjacent phases. Initial flooding of this phase by the District occurred in 2008. Inlet structures exist to allow water to be brought into the phase from the lake, in the event of high water and flood risk around the lake (Figure 13). Water is typically discharged either through the culvert in the northwest corner of the phase, where it can travel north to the Unit 1 pump, or the culvert in the southwest portion of the phase, where it can exit to Phase 4 or the Unit 2 pump. An alum injection system provides water treatment upon discharge to the lake when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 62.8 NAVD88).

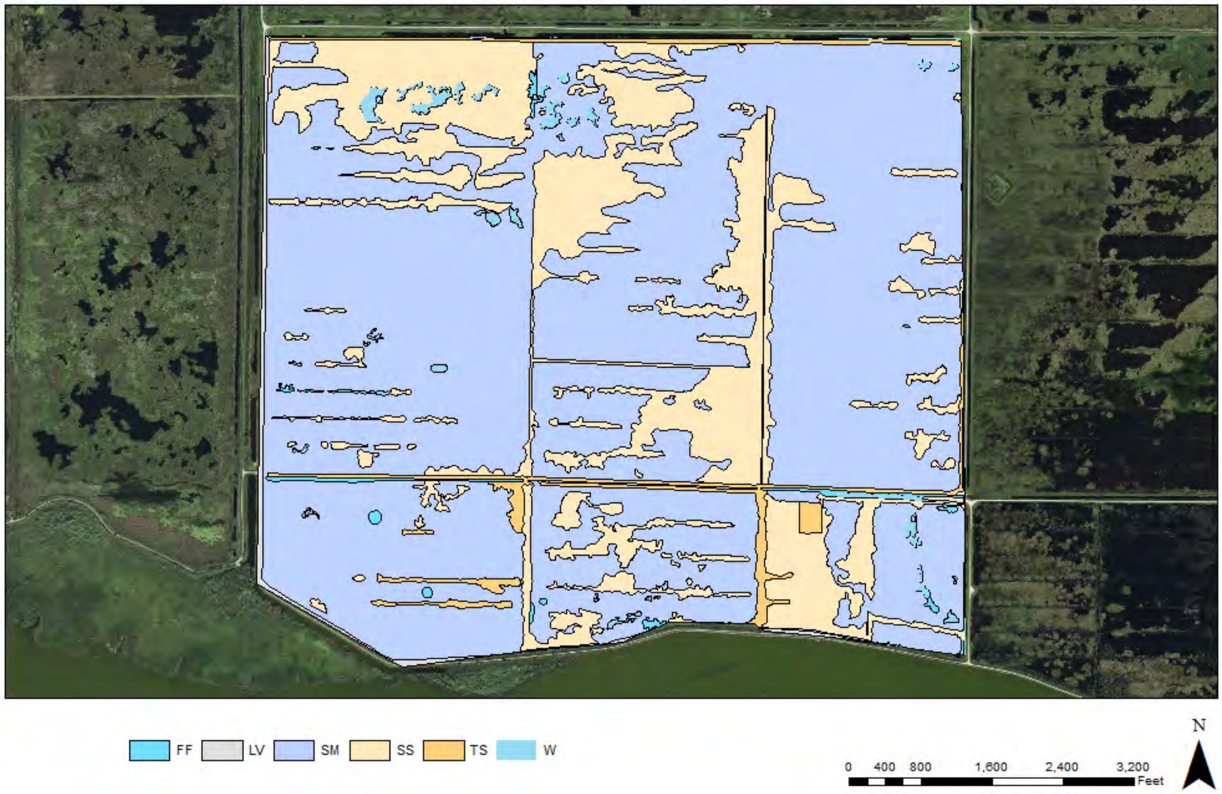


Figure 12. Vegetation map of Phase 1 as of 2017.

Figure 13. Google Earth image of Phase 1 as of January 2018.

Bathymetric survey data was collected for Phase 1 in 2006, indicating bottom elevations average about 60.6 NAVD88 and a high ridge running north-south through the eastern portion of the property (Figure 14). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 1 in 2005 (Table 13). At that time, 4,4'-DDE and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2018, when twenty-one samples were collected, of which all were gambusia (whole body). Table 14 tabulates lipid and pesticide concentrations for all fish collected from Phase 1. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 1.

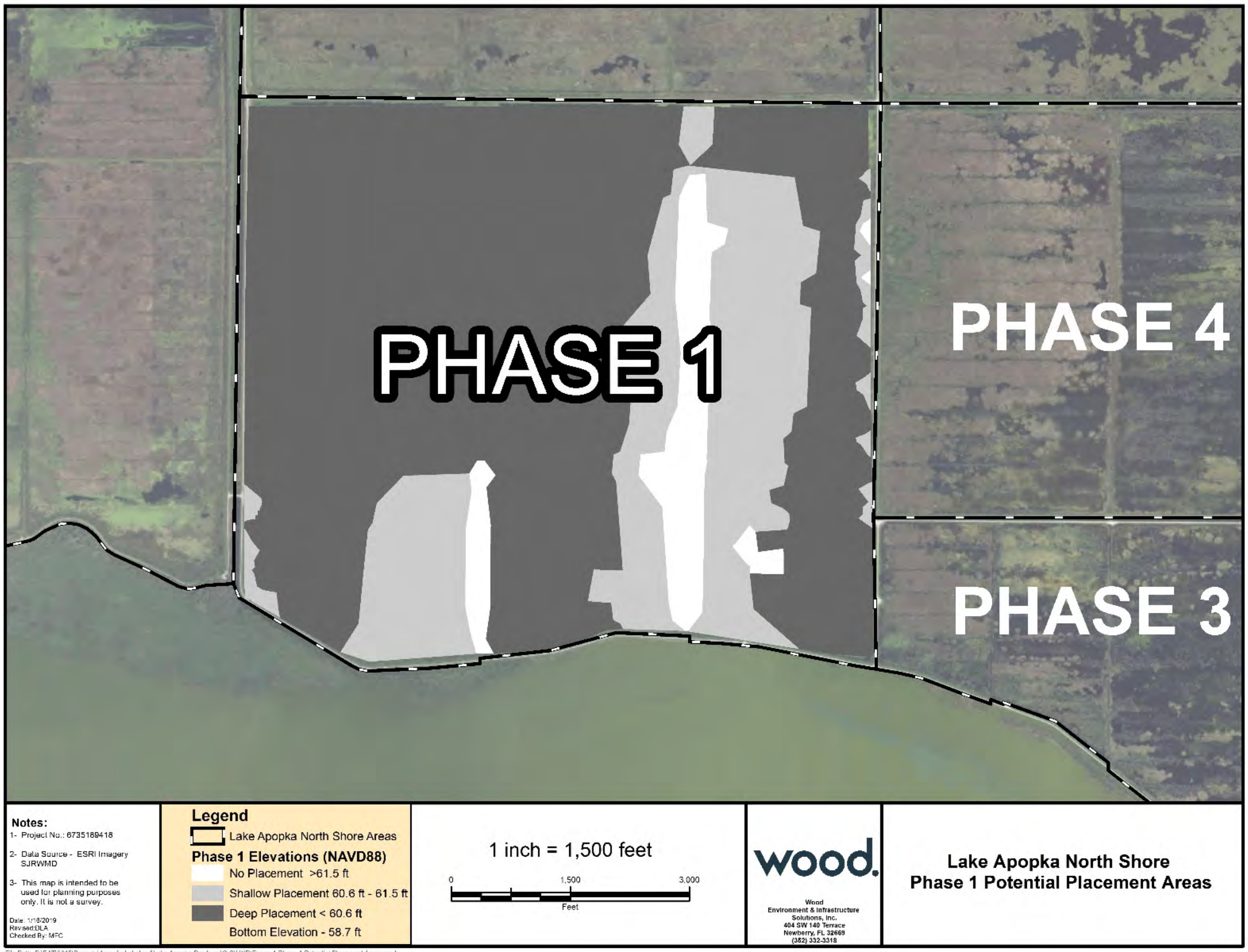


Figure 14. Elevation Map (NAVD88) of Phase 1 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 13. Sediment Summary Data for Phase 1. Data collected in 2005; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	18	312055.6	30095.22	501000	349000	120000			
4,4'-DDD	21	277.1	51.53	1000	200	52	18000	4200	
4,4'-DDE	21	1887.1	284.09	5700	1400	400	13000	2900	1500
4,4'-DDT	21	194.2	57.02	1100	110	1	13000	2900	
4,4'-DDTr	21	375.5	75.08	1522	290	40			1500
4,4'-DDTx	21	2358.5	349.13	7010	1810	459			
Aldrin	21	4.8	1.70	38	3	1	3000	60	
Dieldrin	21	436.2	56.49	1200	370	90	300	60	140
Endosulfan I	21	11.5	5.99	120	2	1	6700000	450000	
Endosulfan II	21	120.8	47.54	740	5	1		450000	
Endosulfan Sulfate	21	9.9	3.93	69	3	1			
Endrin	21	10.3	4.87	92	3	1	3400	2500	
Endrin Aldehyde	21	7.1	2.32	51	4	1			
Endrin Ketone	21	31.9	4.78	92	23	8			
Heptachlor	21	2.8	1.23	27	1	0	900	200	400
Heptachlor Epoxide	21	38.8	7.89	110	30	1			
Methoxychlor	21	113.4	23.42	340	69	8	7800000	420000	
Oxychlordane	21	26.4	5.95	96	14	1			50
Phosphorus, total	4	1220.0	106.77	1400	1250	980			
Solids, percent	21	45.9	3.24	71	42	25			
Total Chlordane	21	438.2	44.49	840	382	189	12000	2800	
Toxaphene	21	10566.7	1636.55	29000	6800	3200	3700	900	5000
alpha-BHC	21	3.0	1.23	27	1	0	5000	100	
alpha-Chlordane	21	165.8	25.17	410	130	50			1000
beta-BHC	21	7.7	1.49	30	5	2	2100	500	
cis-nonachlor	21	61.9	7.90	140	54	2			
delta-BHC	21	4.7	2.26	49	2	1	420000	24000	
gamma-BHC (Lindane)	21	3.7	1.18	26	2	1	2200	700	
gamma-Chlordane	21	68.7	6.71	120	68	3			1000
trans-Nonachlor	21	73.8	9.12	160	71	2			450

Table 14: Summary Data for Fish Tissue OCP Concentrations in Phase 1.

Phase 1: Fish Tissue OCP Summary Units = ug/kg n=21 Collection Year = 2018 HI=0.3 HQ_{DDE}=0.2							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	2.4	2	3.2	2	0.10	0	--
4,4'-DDE	224.5	216	475	86	24.28	0	1500
4,4'-DDTr	16.6	18	33	6	1.73	21	1500
4,4'-DDTx	231.9	231	481	89	24.77	21	3600
Dieldrin	2.2	1	7	0	0.52	9	140
Heptachlor	0.2	0	0	0	0.03	21	400
Heptachlor Epoxide	1.1	1	3	0	0.19	14	100
Oxychlordane	4.6	3	18	1	1.12	2	50
Total Chlordane	24.2	22	53	5	3.52	21	285
Toxaphene	119.8	111	282	34	14.39	0	5000
alpha-Chlordane	3.4	3	7	1	0.50	1	1000
cis-Nonachlor	2.8	3	7	0	0.42	3	550
gamma-Chlordane	0.1	0	2	0	0.08	20	1000
trans-Nonachlor	9.7	10	24	3	1.35	0	450

Phase 2 East

Phase 2 East is on the eastern side of the Lake Apopka North Shore and includes 630 acres of mostly shrub swamp with shallow marsh (Figure 15). Field ZSE-J occurs within the phase, in the northeast corner. This 20-acre field has been singled out due to the high mineral content of the soils, and the District manages water in this phase to keep this field dry as a protective measure for fish-eating birds. Initial flooding of this phase by the District occurred in 2009. Inlet structures exist to allow water to be brought into the parcel from the lake, in the event of high water and flood risk around the lake (Figure 16). Water is typically discharged through the culverts along the northern boundary of the phase, where it can travel northwest to the Unit 2 pump. Additionally, water can be released to Phase 2 West through the culvert in the southwest corner of the phase. An alum injection system provides water treatment upon discharge to the lake when necessary at the Unit 2 pump. Water levels tend to fluctuate within the parcel according to rainfall and are managed to protect levee access (max water level of 61.4 NAVD88).

Figure 15. Vegetation map of Phase 2 East as of 2017.

Figure 16. Google Earth image of Phase 2 East as of January 2018.

Bathymetric survey data was collected for Phase 2 East in 2007, indicating bottom elevations of about 59.4 NAVD88 and high elevations along outer periphery of the phase (Figure 17). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 2 East in 2016 (Table 15). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2015, when six samples were collected, of which all were gambusia (whole body). Table 16 tabulates lipid and pesticide concentrations for all fish collected from Phase 2 East. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 2 East.

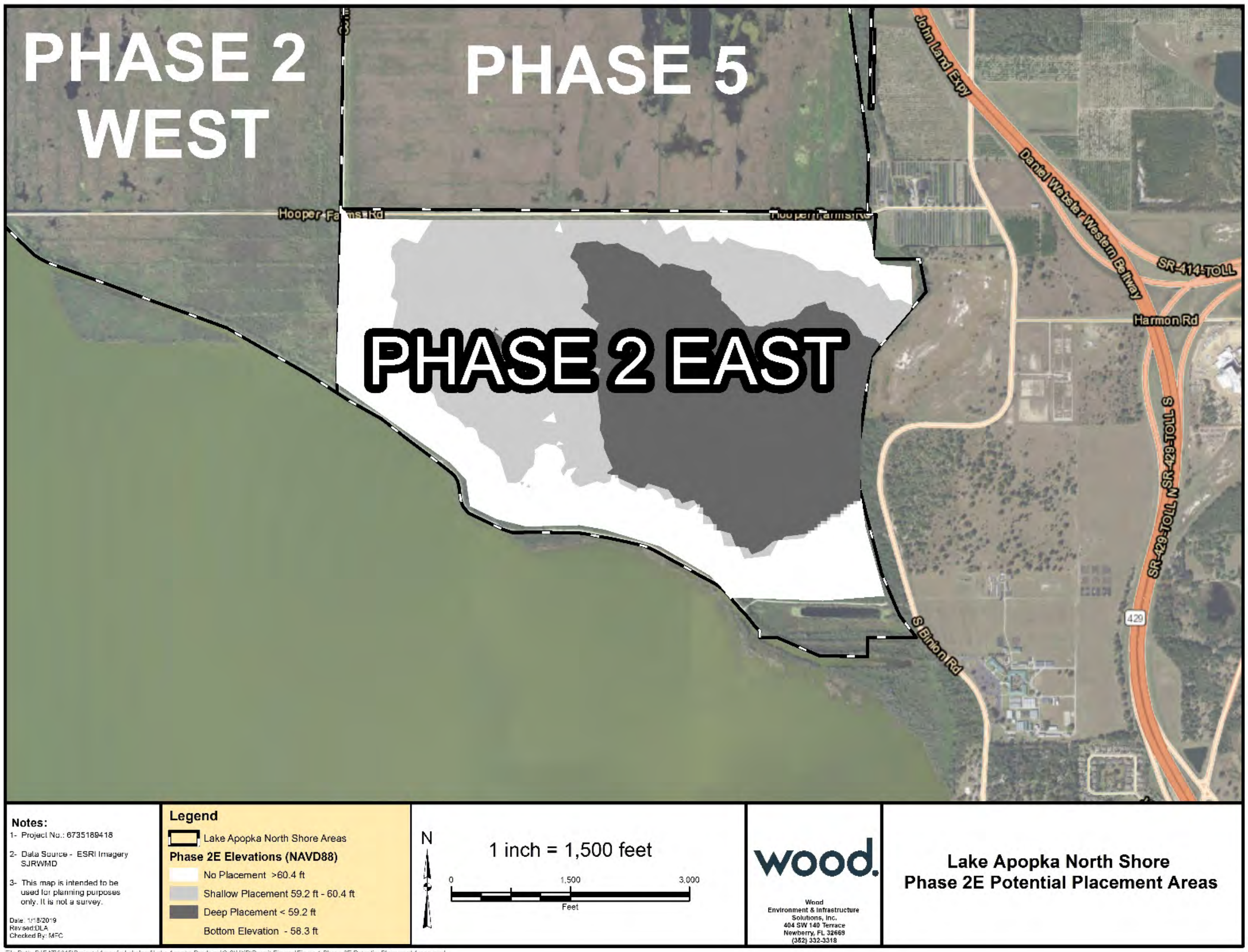


Figure 17. Elevation Map (NAVD88) of Phase 2 East indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 15. Sediment Summary Data for Phase 2 East. Data collected in 2016; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	3	282333.3	88893.82	382000	360000	105000			
4,4'-DDD	3	54.7	22.73111	93.3	56.2	14.6	18000	4200	
4,4'-DDE	3	301	83.67995	439	314	150	13000	2900	1500
4,4'-DDT	3	20.13333	5.776196	29.2	21.8	9.4	13000	2900	
4,4'-DDTr	3	51.14	15.88462	77.12667	53.97333	22.32			1500
4,4'-DDTx	3	375.8333	112.1533	561.5	392	174			
Aldrin	3	4.433333	1.291425	7	3.4	2.9	3000	60	
Arsenic	3	5.9	2.57164	10.7	5.1	1.9	3700	2100	
Barium	3	104.3	26.01583	137	123	52.9		120000	
Cadmium	3	0.536667	0.232475	0.91	0.59	0.11	1300000	82000	
Chromium	3	24.6	7.125307	35.5	27.1	11.2			
Copper	3	103.4333	52.45304	194	104	12.3	76000000	150000	
Dieldrin	3	97.33333	36.73932	138	130	24	300	60	140
Endosulfan I	3	0.993333	0.159304	1.2	1.1	0.68	6700000	450000	
Endosulfan II	3	1.933333	0.31798	2.3	2.2	1.3		450000	
Endosulfan sulfate	3	1.966667	0.338296	2.4	2.2	1.3		450000	
Endrin	3	2.533333	0.417665	3	2.9	1.7	3400	2500	
Endrin aldehyde	3	4	0.655744	4.8	4.5	2.7			
Endrin ketone	3	2.066667	0.31798	2.6	2.1	1.5			
Heptachlor	3	1.163333	0.188886	1.4	1.3	0.79	900	200	400
Heptachlor epoxide	3	0.903333	0.149481	1.1	1	0.61	400	100	100
Lead	3	9.266667	2.107394	12.9	9.3	5.6	920000	400000	
Mercury	3	0.092667	0.01827	0.12	0.1	0.058	26000	3000	
Methoxychlor	3	14.26667	2.351123	17.1	16.1	9.6	7800000	420000	
Moisture, percent	3	58.46667	8.10192	67.5	65.6	42.3			
Oxychlordane	3	1.9	0.404145	2.6	1.9	1.2			50
Selenium	3	2.2	0.608276	3.3	2.1	1.2		440000	
Silver	3	0.676667	0.120046	0.83	0.76	0.44		410000	
Solids, percent	3	41.53333	8.10192	57.7	34.4	32.5			
Total Chlordane	3	104.1333	15.29459	121	117.8	73.6	12000	2800	
Toxaphene	3	1290.333	236.6434	1710	1270	891	3700	900	5000
alpha-BHC	3	1.5	0.251661	1.8	1.7	1	5000	100	
alpha-Chlordane	3	27.93333	3.371119	31.6	31	21.2			1000
beta-BHC	3	1.416667	0.235112	1.7	1.6	0.95	2100	500	
cis-Nonachlor	3	9.966667	2.204037	14.3	8.5	7.1			550
delta-BHC	3	1.416667	0.235112	1.7	1.6	0.95	420000	24000	
gamma-BHC (Lindane)	3	0.993333	0.159304	1.2	1.1	0.68	2200	700	
gamma-Chlordane	3	29.86667	6.221022	38.8	32.9	17.9			1000
trans-Nonachlor	3	32.4	3.939543	38	34.4	24.8			450

Table 16: Summary Data for Fish Tissue OCP Concentrations in Phase 2 East.

Phase 2 East: Fish Tissue OCP Summary n=6 Units = ug/kg Collection Year = 2015 HI=0.3 HQ_{DDE}=0.3							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	3.2	3	4	3	0.23	0	--
4,4'-DDE	292.2	290	431	161	56.66	0	1500
4,4'-DDTr	20.4	20	30	11	3.95	6	1500
4,4'-DDTx	296.5	294	437	163	57.42	6	3600
Dieldrin	1.6	1	3	1	0.44	3	140
Heptachlor	0.0	0	0	0	0.02	6	400
Heptachlor Epoxide	0.1	0	1	0	0.09	6	100
Oxychlordane	4.4	4	5	3	0.27	14	50
Total Chlordane	25.4	7	152	1	6.19	0	285
Toxaphene	78.2	77	92	64	3.85	0	5000
alpha-Chlordane	3.9	4	5	3	0.29	0	1000
cis-Nonachlor	9.2	10	10	8	0.39	0	550
gamma-Chlordane	1.4	1	2	1	0.20	0	1000
trans-Nonachlor	27.0	27	33	21	2.22	0	450

Phase 2 West

Phase 2 West is west of Phase 2 East on the Lake Apopka North Shore and includes 780 acres of mostly shallow marsh with shrub swamp (Figure 18). Initial flooding of this phase by the District occurred in 2009. Inlet structures exist to allow water to be brought into the parcel from the lake, in the event of high water and flood risk around the lake (Figure 19). Water is typically discharged through the culverts along the eastern boundary of the phase, where it can travel north to the Unit 2 pump. Additionally, water can be released to Phase 2 East through the culvert in the southeast corner of the phase. An alum injection system provides water treatment upon discharge to the lake when necessary at the Unit 2 pump. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 61.9 NAVD88).

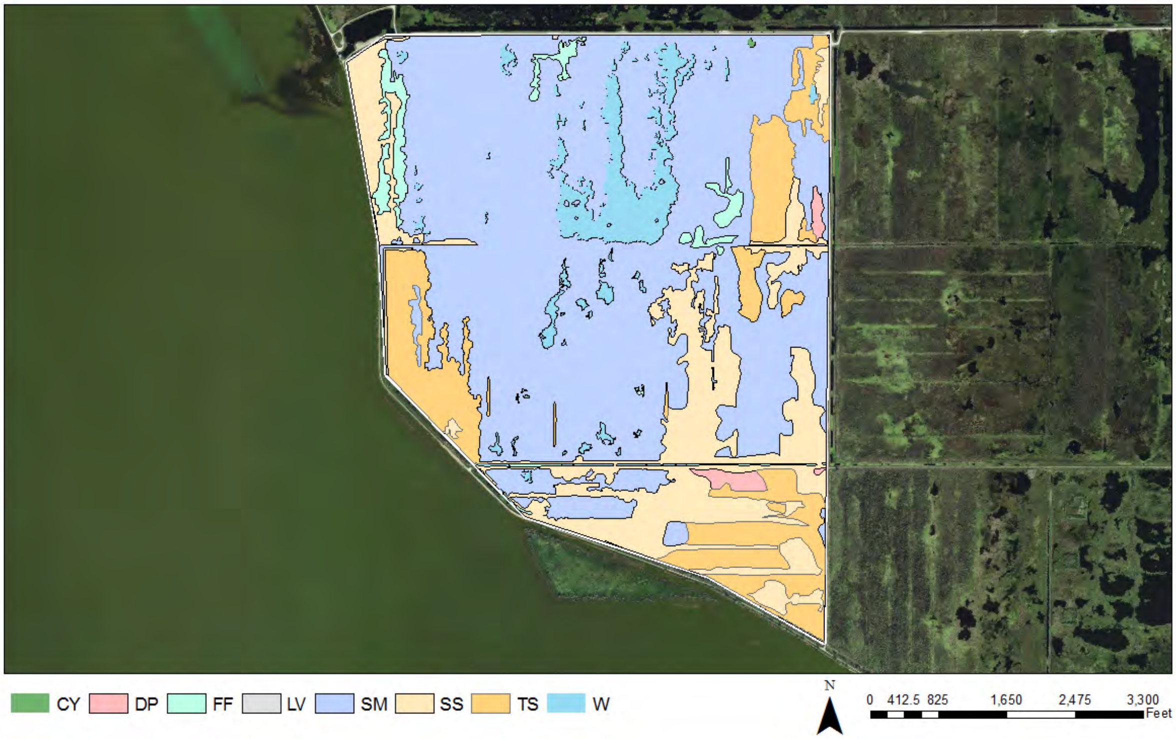


Figure 18. Vegetation map of Phase 2 West as of 2017.

Figure 19. Google Earth image of Phase 2 West as of January 2018.

Bathymetric survey data was collected for Phase 2 West in 2007, indicating bottom elevations of about 59.0 NAVD88 and high elevations along outer periphery of the phase (Figure 20). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 2 West in 2008 (Table 17). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2017, when nine samples were collected, of which all were gambusia (whole body). Table 18 tabulates lipid and pesticide concentrations for all fish collected from Phase 2 West. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 2 West.

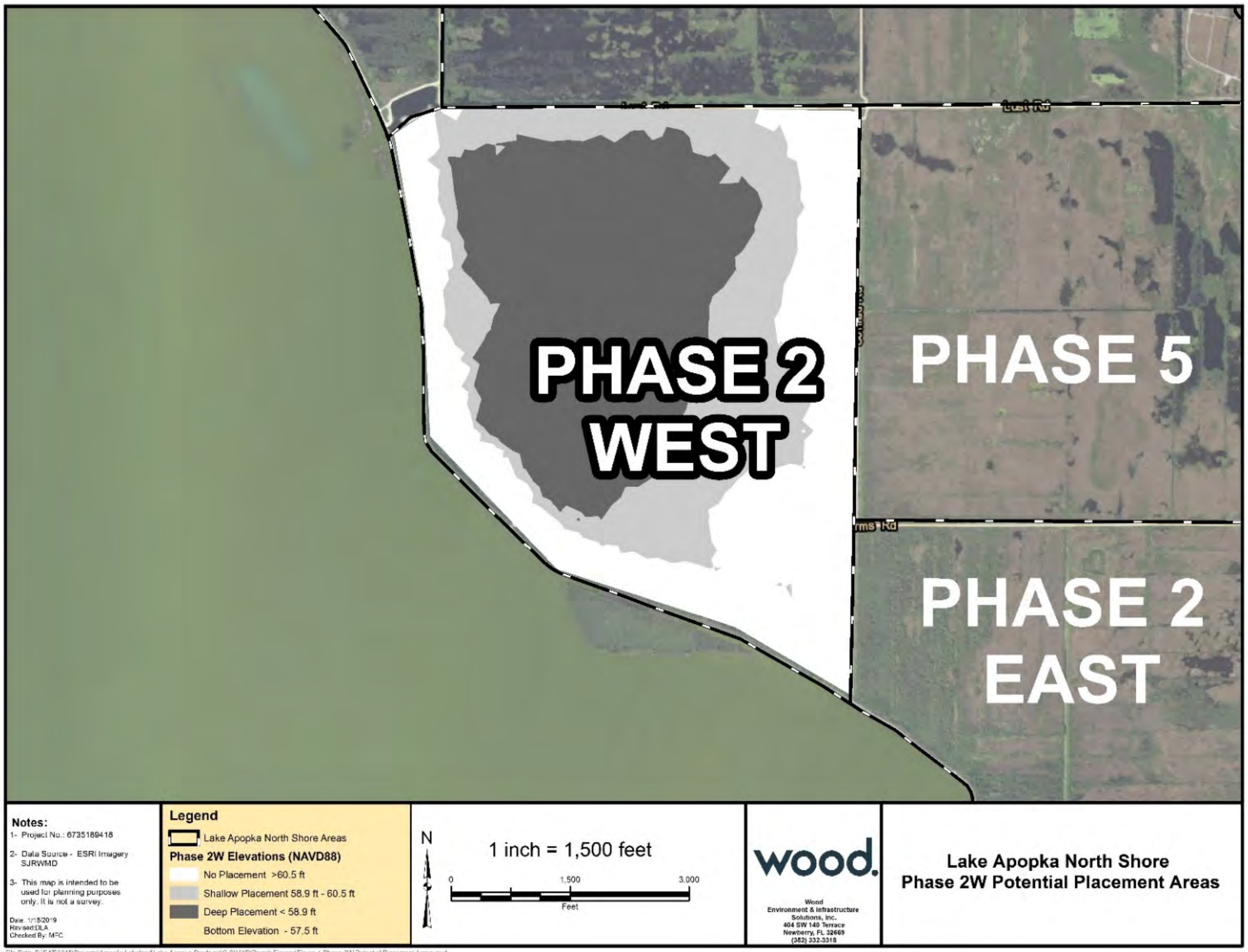


Figure 20. Elevation Map (NAVD88) of Phase 2 West indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 17. Sediment Summary Data for Phase 2 West. Data collected in 2008; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	31	363361.3	26527.29	489000	432000	37000			
4,4'-DDD	31	210.4742	30.75876	497	179	12.6	18000	4200	
4,4'-DDE	31	867.2903	88.15999	2170	816	111	13000	2900	1500
4,4'-DDT	31	220.4871	59.13696	1800	124	10.6	13000	2900	
4,4'-DDTr	31	320.4013	66.27863	2032.067	221.8	24.18667			1500
4,4'-DDTx	31	1298.252	151.2078	4287	1194	189.2			
Aldrin	31	5.619677	0.76906	20.2	4	0.68	3000	60	
Dieldrin	31	425.1	53.02889	1280	408	33.7	300	60	140
Endosulfan I	31	10.74806	2.128099	41.6	2.6	0.69	6700000	450000	
Endosulfan II	31	220.4419	35.26556	767	164	10.4		450000	
Endosulfan sulfate	31	14.72258	3.206374	73.4	7	2.2		450000	
Endrin	31	5.112903	1.278631	42.6	3.7	1.3	3400	2500	
Endrin aldehyde	31	20.56774	12.21658	384	6.8	2.2			
Endrin ketone	31	29.66774	4.676759	113	23.1	3			
Heptachlor	31	2.375161	0.236299	7.3	2	0.68	900	200	400
Heptachlor epoxide	31	26.42452	5.039279	109	13.3	0.76	400	100	100
Methoxychlor	31	73.3	9.183044	180	61.5	8.2	7800000	420000	
Moisture, Percent	11	59.94545	4.513462	79.7	66.9	35			
Moisture, percent	21	59.47143	4.26999	78.7	68.9	18.7			
Oxychlordane	31	24.93871	4.42812	104	16.4	1.7			50
Solids, Percent	31	40.0871	3.250028	81.3	31.4	20.3			
Total Chlordane	31	463.29	59.51895	1626.5	406.7	40.4	12000	2800	
Toxaphene	31	7293.742	1135.016	23500	5250	261	3700	900	5000
alpha-BHC	31	2.256452	0.177425	4.6	2.1	0.64	5000	100	
alpha-Chlordane	31	142.1258	17.50586	462	124	9.7			1000
beta-BHC	31	3.312903	0.248555	6.1	3.1	1	2100	500	
cis-Nonachlor	31	63.99355	9.15347	222	55.2	4.1			550
delta-BHC	31	1.870645	0.144916	3.7	1.7	0.58	420000	24000	
gamma-BHC (Lindane)	31	2.298387	0.17032	4.3	2.1	0.73	2200	700	
gamma-Chlordane	31	94.77419	12.63926	349	82.9	4.1			1000
trans-Nonachlor	31	108.6581	15.49696	434	93	7.7			450

Table 18: Summary Data for Fish Tissue OCP Concentrations in Phase 2 West.

Phase 2 West Fish Tissue OCP Summary n=9 Units = ug/kg Collection Year = 2017 HI=0.04 HQ_{DDE}=0.04							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	2.7	3	3.5	2	0.14	0	--
4,4'-DDE	53.6	51	83.1	42	4.07	0	1500
4,4'-DDTr	4.1	4	7	3	0.38	8	1500
4,4'-DDTx	55.5	52	87	43	4.34	8	3600
Dieldrin	0.2	0	0	0	0.03	9	140
Heptachlor	0.1	0	0	0	0.02	9	400
Heptachlor Epoxide	0.0	0	0	0	0.00	9	100
Oxychlordane	0.6	1	1	0	0.06	14	50
Total Chlordane	4.1	4	7	2	0.50	9	285
Toxaphene	32.2	33	50	19	3.23	0	5000
alpha-Chlordane	0.6	1	1	0	0.29	0	1000
cis-Nonachlor	0.9	1	2	1	0.39	0	550
gamma-Chlordane	0.0	0	0	0	0.00	9	1000
trans-Nonachlor	2.0	2	3	1	0.25	0	450

Phase 3

Phase 3 is northwest of Phase 2 West on the Lake Apopka North Shore and includes 410 acres of mostly shallow marsh with shrub swamp (Figure 21). Initial flooding of this phase by the District occurred in 2013. No lake inlet structures exist for Phase 3, but two sets of culverts allow for water conveyance into or out of the cell (Figure 22). Water discharged from the phase can travel south to the Unit 2 pump to be discharged to the lake, where an alum injection system provides water treatment when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 61.5 NAVD88).

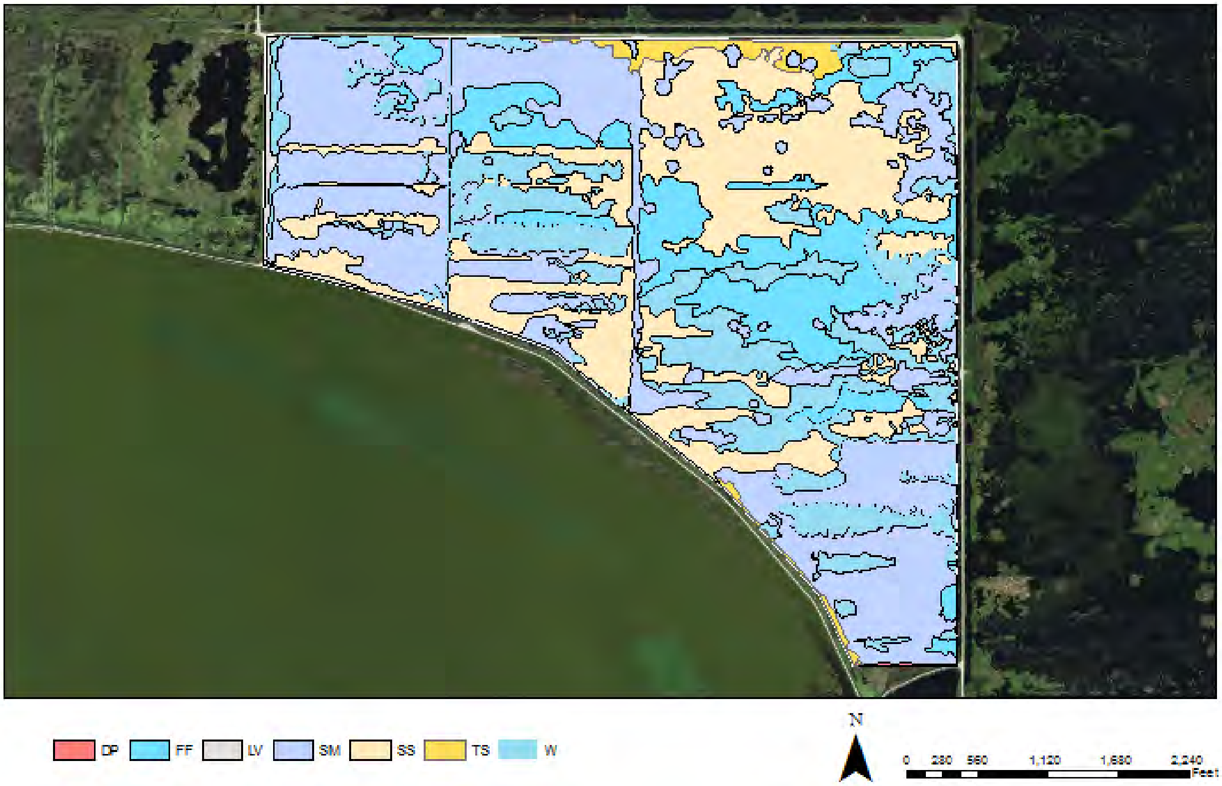


Figure 21. Vegetation map of Phase 3 as of 2017.

Figure 22. Google Earth image of Phase 3 as of January 2018.

Bathymetric survey data was collected for Phase 3 in 2011, indicating bottom elevations of 57.4 ft. NAVD88 and high elevations along southern portion of the phase (Figure 23). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 2 West in 2008 (Table 19). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or DEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2015, when nine samples were collected, of which all were gambusia (whole body). Table 20 tabulates lipid and pesticide concentrations for all fish collected from Phase 2 West. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 3.

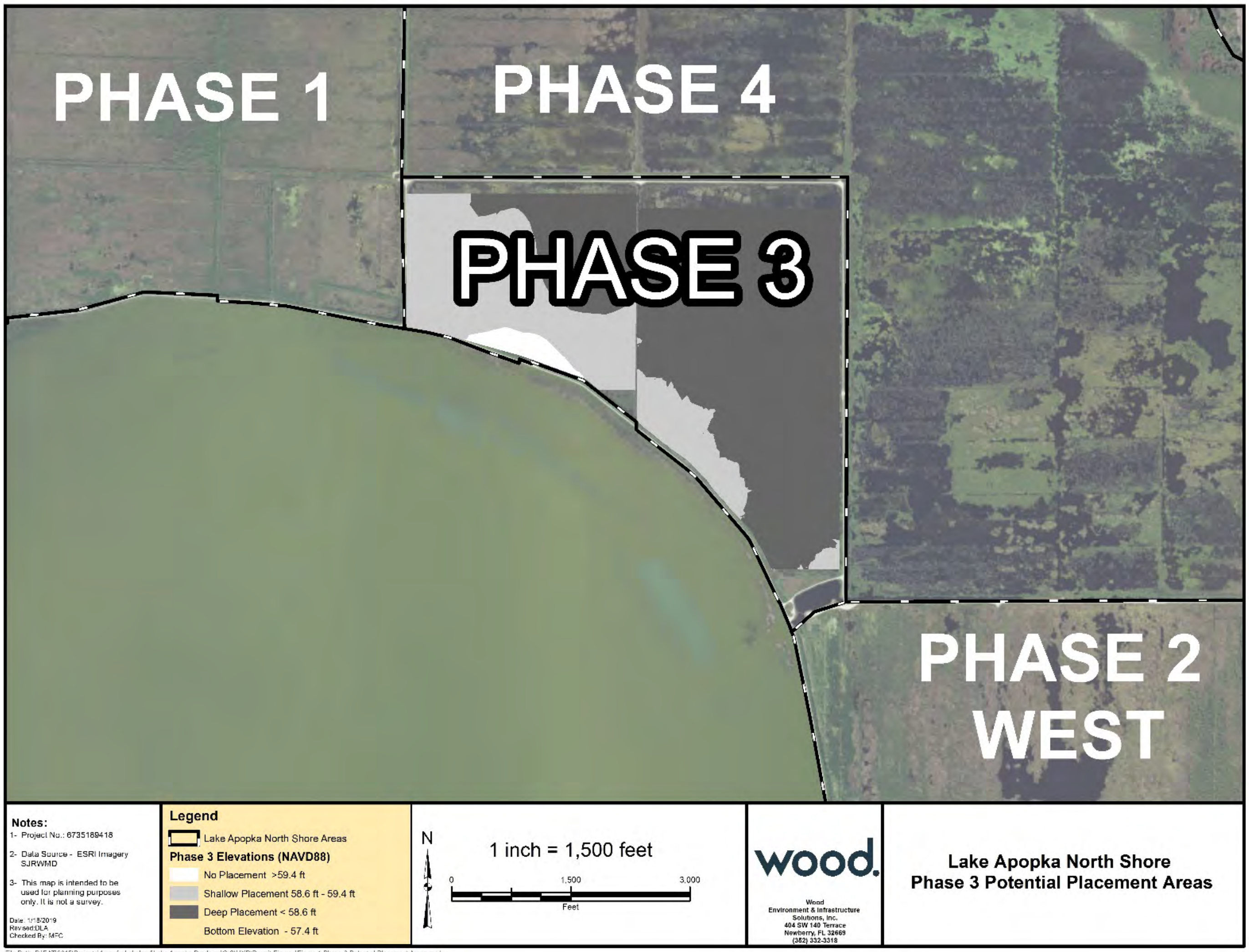


Figure 23. Elevation Map (NAVD88) of Phase 3 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 19. Sediment Summary Data for Phase 3. Data collected in 2008; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	11	388363.6	29969.16	511000	411000	155000			
4,4'-DDD	11	103.8818	21.243	242	85.9	3.9	18000	4200	
4,4'-DDE	11	796.3636	100.5426	1310	728	364	13000	2900	1500
4,4'-DDT	11	220.0182	57.52056	745	154	79.2	13000	2900	
4,4'-DDTr	11	293.8855	58.48628	786.9667	217.8667	104.2467			1500
4,4'-DDTx	11	1120.264	127.6854	1884	1221	447.1			
Aldrin	11	5.709091	1.224927	15.6	5	1	3000	60	
Dieldrin	11	582.4182	119.7736	1310	497	16.6	300	60	140
Endosulfan I	11	14.18182	3.576535	36.1	10.4	1.3	6700000	450000	
Endosulfan II	11	165.3455	31.5904	414	160	6.6		450000	
Endosulfan sulfate	11	9.990909	1.920012	26.9	8.6	2.7		450000	
Endrin	11	4.9	0.738303	9.5	4.5	1.6	3400	2500	
Endrin aldehyde	11	112.7818	24.549	253	111	5.2			
Endrin ketone	11	24.09091	4.305461	56.8	19.7	3.2			
Heptachlor	11	2.159091	0.191028	3.1	2.1	0.85	900	200	400
Heptachlor epoxide	11	36.36364	5.458476	65.2	32	1.6	400	100	100
Methoxychlor	11	48.56364	11.08536	147	47.2	13.3	7800000	420000	
Moisture, percent	11	67.64545	3.858152	80.7	72.4	34.6			
Oxychlordane	11	14.43636	2.383629	29.8	13.5	3.6			50
Solids, Percent	11	32.35455	3.858152	65.4	27.6	19.3			
Total Chlordane	11	492.6773	67.92974	882.1	468.7	113.85	12000	2800	
Toxaphene	11	5861.455	898.0652	12600	5180	866	3700	900	5000
alpha-BHC	11	2.026364	0.18157	2.9	1.9	0.79	5000	100	
alpha-Chlordane	11	168.9818	22.89868	295	161	32.8			1000
beta-BHC	11	3.245455	0.283922	4.6	3.1	1.3	2100	500	
cis-Nonachlor	11	57.9	9.170318	128	49.6	13.1			550
delta-BHC	11	1.865455	0.163465	2.6	1.8	0.72	420000	24000	
gamma-BHC (Lindane)	11	2.319091	0.203338	3.3	2.2	0.91	2200	700	
gamma-Chlordane	11	98.65455	14.94492	176	93.9	30.7			1000
trans-Nonachlor	11	114.1818	17.73204	207	85.8	31.2			450

Table 20: Summary Data for Fish Tissue OCP Concentrations in Phase 3.

Phase 3 Fish Tissue OCP Summary n=3 Units = ug/kg Collection Year = 2015 HI=0.2 HQ_{DDE}=0.2							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	3.4	3.7	4.0	2.4	0.4	0	--
4,4'-DDE	199.0	211.0	226.0	148.0	18.0	0	1500
4,4'-DDTr	14.5	15.4	16.5	10.5	1.4	4	1500
4,4'-DDTx	203.8	216.6	231.9	149.9	19.0	4	3600
Dieldrin	6.5	6.6	8.4	4.2	0.9	0	140
Heptachlor	0.0	0.0	0.0	0.0	0.0	4	400
Heptachlor Epoxide	0.0	0.0	0.2	0.0	0.0	4	100
Oxychlordane	2.1	2.1	2.2	2.0	0.0	0	50
Total Chlordane	36.3	41.1	44.9	18.1	6.3	4	285
Toxaphene	70.2	69.6	81.5	59.9	4.4	0	5000
alpha-Chlordane	5.4	6.5	7.5	1.3	1.5	0	1000
cis-Nonachlor	6.7	7.5	7.9	3.8	1.0	0	550
gamma-Chlordane	1.2	1.2	1.8	0.6	0.3	1	1000
trans-Nonachlor	20.9	23.7	26.1	9.9	3.8	0	450

Phase 4

Phase 4 is northeast of Phase 3 on the Lake Apopka North Shore and includes 2130 acres of a large variety of habitat, with mixed areas open water and aquatic beds, shrub swamp, and shallow marsh (Figure 24). Initial flooding of this phase by the District occurred in 2013. No lake inlet structures exist for Phase 3, but numerous culverts allow for water conveyance into or out of the cell (Figure 25). Water discharged from the phase can travel south to the Unit 2 pump to be discharged to the lake, or north to Unit 1. An internal pump sits at the southwestern corner of the phase to assist in moving water across the property as needed (red arrow, Figure 25). Alum injection systems exist at both Unit 1 and Unit 2 pumps, to provide water treatment upon discharge to the lake when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 61.4 NAVD88).

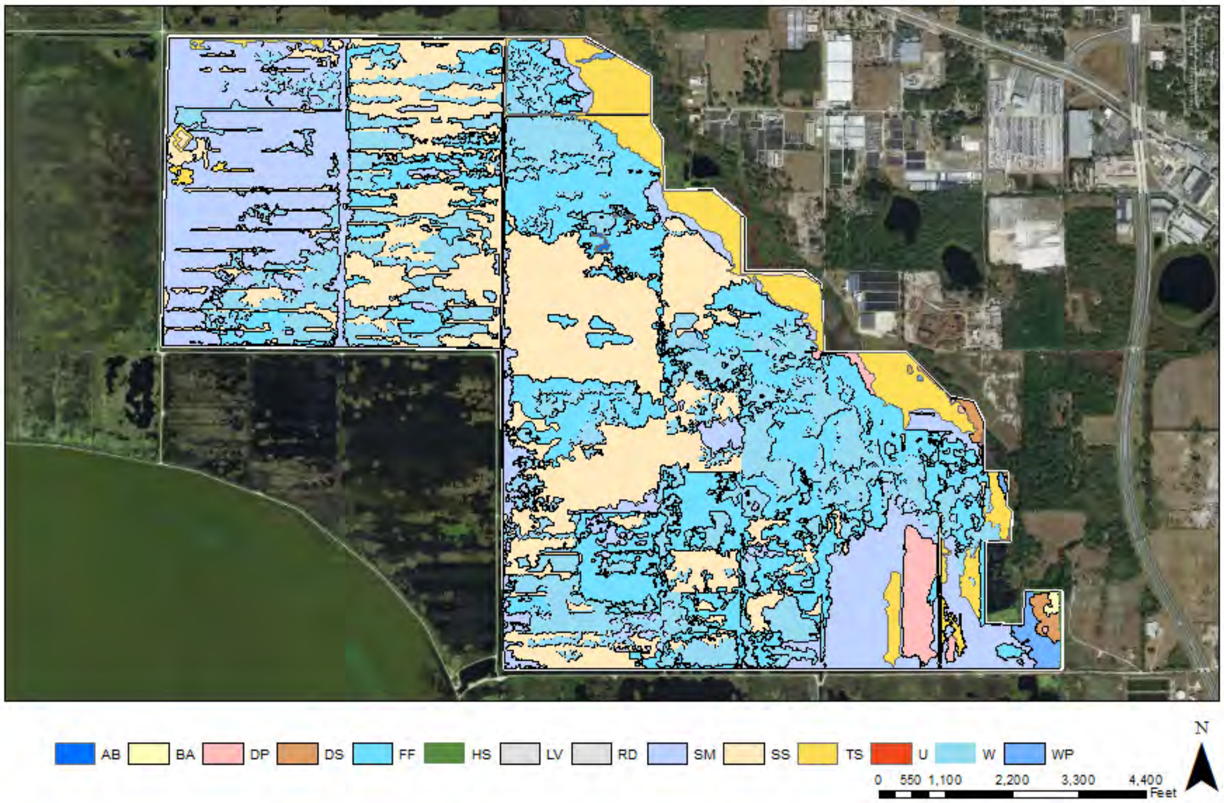


Figure 24. Vegetation map of Phase 4 as of 2017.

Figure 25. Google Earth image of Phase 4 as of January 2018.

Bathymetric survey data was collected for Phase 4 in 2007, indicating bottom elevations of about 55.4 ft. NAVD88 and high elevations along eastern edge of the phase (Figure 26). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 4 in 2009 (Table 21). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2016, when nine samples were collected, of which all were gambusia (whole body). Table 22 tabulates lipid and pesticide concentrations for all fish collected from Phase 4. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 4.

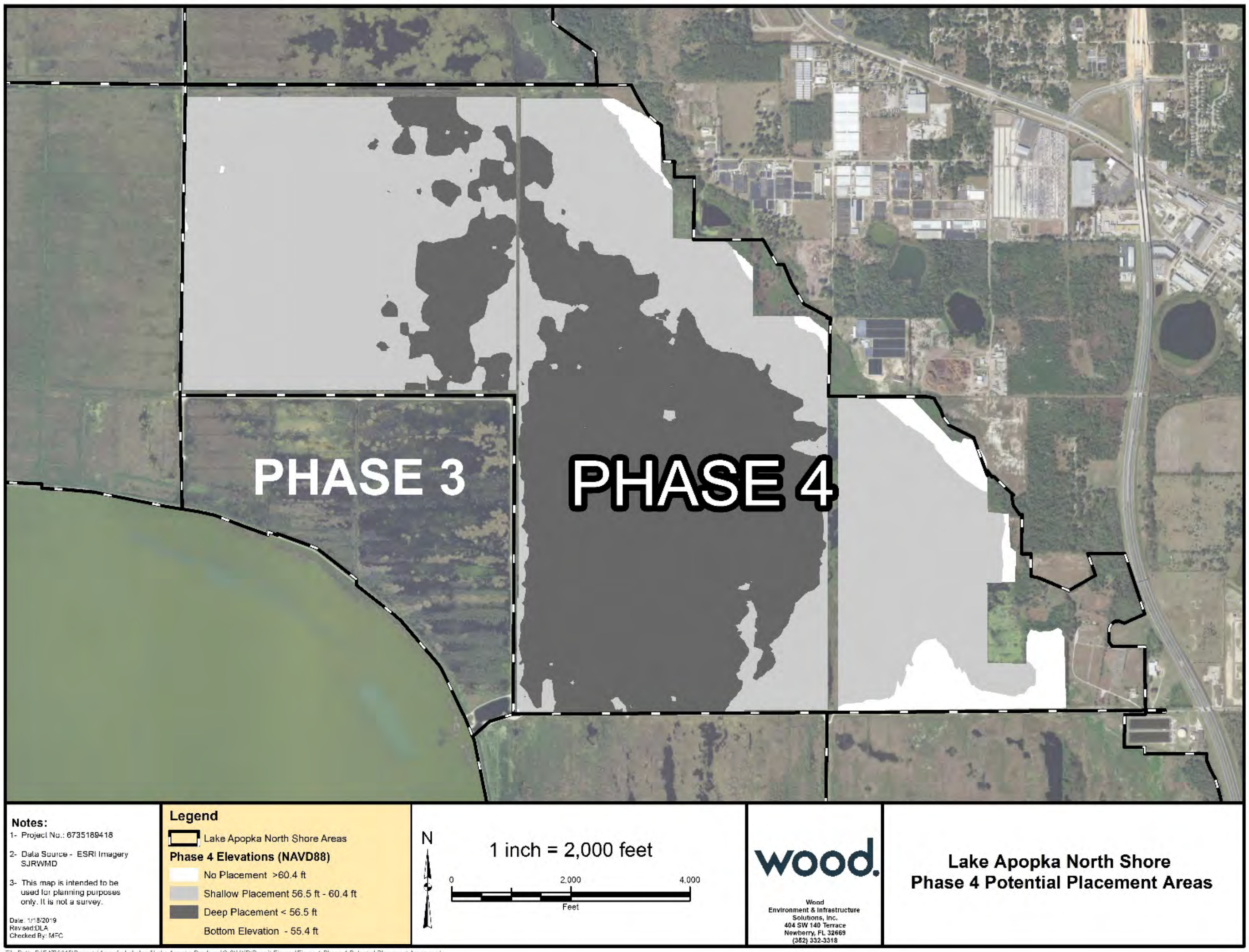


Figure 26. Elevation Map (NAVD88) of Phase 4 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 21. Sediment Summary Data for Phase 4. Data collected in 2008; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	49	330257.1	22984.26	511000	389000	17000			
4,4'-DDD	49	311.2898	55.99883	1700	166	9.4	18000	4200	
4,4'-DDE	49	925.0061	87.22782	2170	754	88.3	13000	2900	1500
4,4'-DDT	49	390.9612	90.07934	3400	167	13	13000	2900	
4,4'-DDTr	49	514.8863	98.07664	3601.067	228.4667	24.36667			1500
4,4'-DDTx	49	1627.257	192.5649	5612	1158	130.5			
Aldrin	49	3.157143	0.436558	20.5	2.6	0.58	3000	60	
Dieldrin	49	262.9551	30.70752	819	195	11.2	300	60	140
Endosulfan I	49	12.82224	1.62458	41.6	8.6	0.63	6700000	450000	
Endosulfan II	49	149.0857	16.23873	600	120	13.5		450000	
Endosulfan sulfate	49	14.60204	2.351826	78.5	8.5	1.9		450000	
Endrin	49	5.930612	0.625324	19.8	4.8	1.2	3400	2500	
Endrin aldehyde	49	38.20204	8.648998	366	12.5	2			
Endrin ketone	49	18.90408	2.525267	90.3	14.5	1.7			
Heptachlor	49	2.377959	0.17159	5.8	2.1	0.62	900	200	400
Heptachlor epoxide	49	23.30204	2.445424	88.6	21	1.4	400	100	100
Methoxychlor	49	50.44286	6.144848	199	32.2	6.8	7800000	420000	
Moisture, Percent	37	67.75676	2.35459	83.3	71.9	21.3			
Moisture, percent	12	32.425	4.968555	64.4	31.2	11.1			
Oxychlordane	49	13.26245	1.66606	62.7	10.8	0.96			50
Solids, Percent	49	40.89592	3.055244	88.9	31.7	16.7			
Total Chlordane	49	247.9629	25.07833	918.2	215.8	20.67	12000	2800	
Toxaphene	49	4869.857	448.9703	14000	4180	564	3700	900	5000
alpha-BHC	49	2.216735	0.16184	5.5	2	0.58	5000	100	
alpha-Chlordane	49	81.57347	7.908137	273	73.1	5.3			1000
beta-BHC	49	3.598367	0.258676	8.8	3.2	0.94	2100	500	
cis-Nonachlor	49	43.61633	4.353366	143	36.2	5			550
delta-BHC	49	2.102245	0.166061	5.8	1.8	0.53	420000	24000	
gamma-BHC (Lindane)	49	2.544286	0.184362	6.3	2.3	0.67	2200	700	
gamma-Chlordane	49	37.9	4.670911	164	25.4	2.5			1000
trans-Nonachlor	49	45.93061	6.306413	263	31	3			450

Table 22: Summary Data for Fish Tissue OCP Concentrations in Phase 4.

Phase 4 Fish Tissue OCP Summary
n=6 Units = ug/kg Collection Year = 2016 HI=0.3 HQ_{DDE}=0.6

Statistics	Mean	Median	Max	Min	SE	nondetects	TRV
% Lipid	3.2	3.2	3.8	2.4	0.2	0	--
4,4'-DDE	728.7	673.0	1080.0	575.0	74.9	0	1500
4,4'-DDTr	55.7	51.4	89.0	39.6	7.3	6	1500
4,4'-DDTx	762.6	712.1	1162.4	580.3	85.2	6	3600
Dieldrin	3.9	3.8	5.6	2.8	0.4	0	140
Heptachlor	0.0	0.0	0.0	0.0	0.0	6	400
Heptachlor Epoxide	0.7	0.7	1.4	0.3	0.2	6	100
Oxychlordane	3.3	2.7	7.1	0.9	1.1	0	50
Total Chlordane	20.3	16.4	43.2	7.3	6.2	6	285
Toxaphene	178.3	176.0	309.0	59.8	50.0	0	5000
alpha-Chlordane	2.1	1.8	4.1	0.5	0.7	1	1000
cis-Nonachlor	4.2	3.5	8.8	1.5	1.2	0	550
gamma-Chlordane	0.2	0.0	1.4	0.0	0.2	6	1000
trans-Nonachlor	9.7	7.9	20.4	3.7	2.9	0	450

Phase 5

Phase 5 is southeast of Phase 4 on the Lake Apopka North Shore and includes 740 acres of mostly shallow marsh (Figure 27). Initial flooding of this phase by the District occurred in 2013. No lake inlet structures exist for Phase 5, but two sets of culverts allow for water conveyance into or out of the cell (Figure 28). Water discharged from the phase travels west to the Unit 2 pump to be discharged to the lake. An alum injection system exists at the Unit 2 pump, to provide water treatment upon discharge to the lake when necessary. Water levels tend to fluctuate within the cell according to rainfall and are managed to protect levee access (max water level of 61.4 NAVD88).

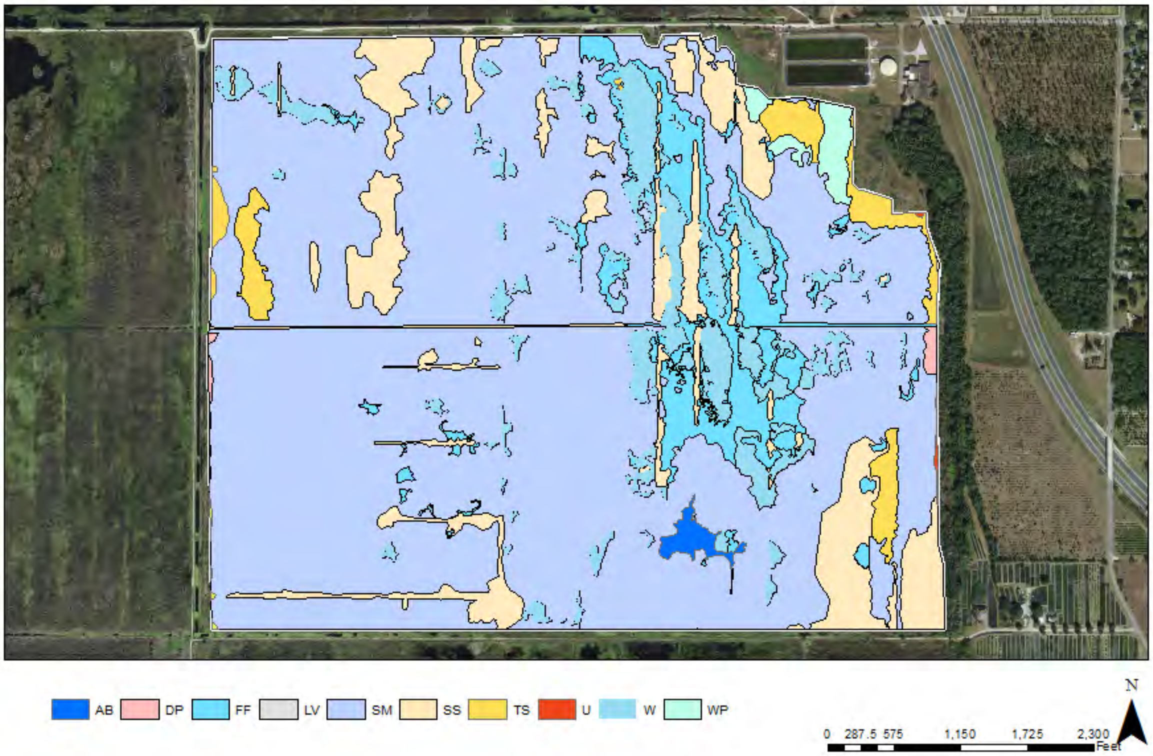


Figure 27. Vegetation map of Phase 5 as of 2017.

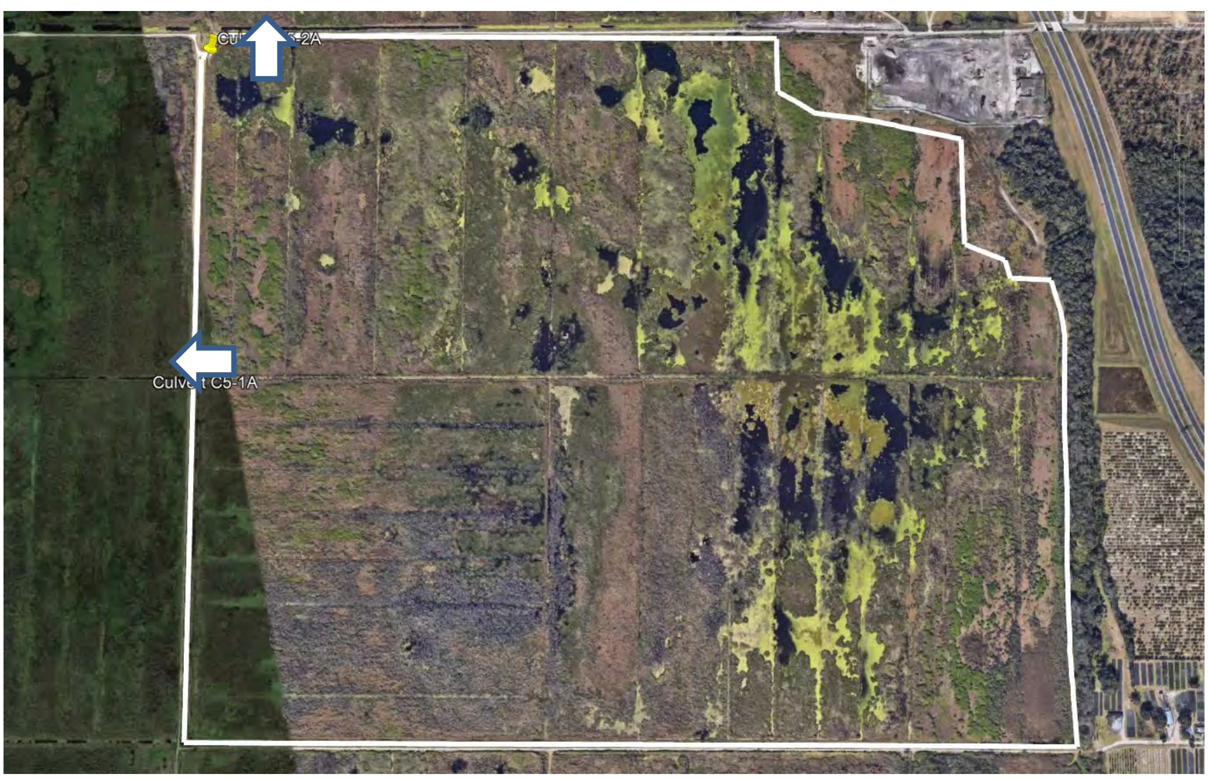


Figure 28. Google Earth image of Phase 5 as of January 2018.

Bathymetric survey data was collected for Phase 5 somewhere between 2006-2011, indicating bottom elevations of about 58.1 NAVD88 and high elevations along the outer edge of the phase (Figure 29). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 5 in 2009 (Table 23). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2015, when six samples were collected, of which all were gambusia (whole body). Table 24 tabulates lipid and pesticide concentrations for all fish collected from Phase 5. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 5.

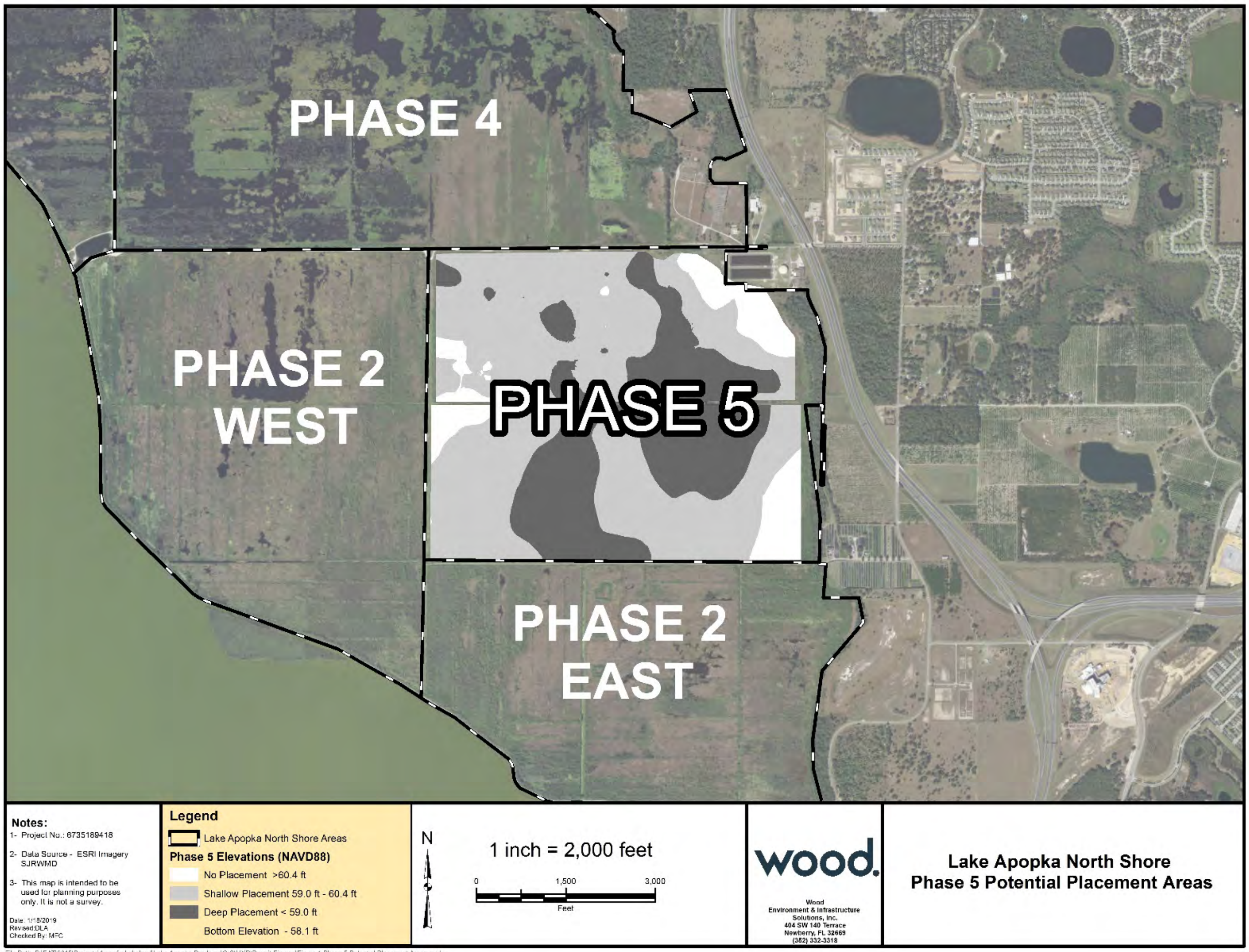


Figure 29. Elevation Map (NAVD88) of Phase 5 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 23. Sediment Summary Data for Phase 5. Data collected in 2009; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Content	9	226266.7	46076.49	399000	244000	21100			
4,4'-DDD	9	244.1	66.44625	573	305	9.5	18000	4200	
4,4'-DDE	9	893	215.8851	2000	919	180	13000	2900	1500
4,4'-DDT	9	527.8222	189.7614	1730	341	19.2	13000	2900	
4,4'-DDTr	9	636.1756	212.1866	1977.933	478.4	33.1			1500
4,4'-DDTx	9	1664.922	443.3223	4303	1654	208.7			
Aldrin	9	2.618889	0.688665	6.9	2.3	0.55	3000	60	
Dieldrin	9	295.8778	84.08921	734	282	28.3	300	60	140
Endosulfan I	9	13.01	3.892624	29.8	15.2	0.6	6700000	450000	
Endosulfan II	9	265.8889	74.09897	610	270	17.9		450000	
Endosulfan sulfate	9	24.42222	12.1556	113	9	2.2		450000	
Endrin	9	3.8	0.799131	8.5	3.9	1.1	3400	2500	
Endrin aldehyde	9	83.3	59.33223	543	8.7	2.3			
Endrin ketone	9	30.88889	8.119429	68.9	30.2	1.6			
Heptachlor	9	2.067778	0.44154	4.7	2.1	0.59	900	200	400
Heptachlor epoxide	9	35.4	9.696678	94.7	37.8	4.5	400	100	100
Methoxychlor	9	108.1444	47.25274	464	75.7	8.8	7800000	420000	
Moisture, Percent	4	33.9	11.90217	55.5	37.05	6			
Moisture, percent	5	46.28	6.395342	62.2	46.9	31.1			
Oxychlordane	9	21.62222	5.411274	54.1	25.3	2.3			50
Solids, Percent	9	59.22222	6.300943	94	53.1	37.8			
Total Chlordane	9	470.8678	122.3948	1089.4	426.5	62.59	12000	2800	
Toxaphene	9	8740	2370.587	21400	8370	1120	3700	900	5000
alpha-BHC	9	1.918889	0.403882	4.3	2	0.55	5000	100	
alpha-Chlordane	9	139.7667	35.60336	302	128	16			1000
beta-BHC	9	3.087778	0.647139	6.9	3.1	0.89	2100	500	
cis-Nonachlor	9	87.93333	24.0372	223	93.1	10.6			550
delta-BHC	9	1.8	0.38112	3.9	1.8	0.5	420000	24000	
gamma-BHC (Lindane)	9	2.206667	0.461053	4.9	2.2	0.63	2200	700	
gamma-Chlordane	9	76.56667	22.37047	212	57.1	7.7			1000
trans-Nonachlor	9	107.5111	36.09709	357	94.7	11.2			450

Table 24: Summary Data for Fish Tissue OCP Concentrations in Phase 5.

Phase 5 Fish Tissue OCP Summary n=6 Units = ug/kg Collection Year = 2015 HI=0.2 HQ_{DDE}=0.2							
Statistics	**Mean**	**Median**	**Max**	**Min**	**SE**	**nondetects**	**TRV**
% Lipid	2.7	2.7	3.0	2.4	0.1	0	--
4,4'-DDE	198.3	201.0	268.0	132.0	22.6	0	1500
4,4'-DDTr	14.6	14.7	19.8	10.5	1.6	6	1500
4,4'-DDTx	202.9	205.8	275.6	137.3	23.2	6	3600
Dieldrin	4.2	3.9	7.1	2.4	0.7	0	140
Heptachlor	0.0	0.0	0.1	0.0	0.0	6	400
Heptachlor Epoxide	0.3	0.3	0.6	0.0	0.1	6	100
Oxychlordane	3.2	3.2	4.3	2.2	0.4	0	50
Total Chlordane	25.8	23.6	36.0	18.1	3.1	6	285
Toxaphene	75.1	68.3	110.0	59.9	7.9	0	5000
alpha-Chlordane	2.2	2.0	3.4	1.2	0.4	0	1000
cis-Nonachlor	5.2	4.9	6.8	3.8	0.5	0	550
gamma-Chlordane	0.6	0.6	0.9	0.2	0.1	4	1000
trans-Nonachlor	14.2	13.1	19.9	9.9	1.7	0	450

Phase 6

Phase 6 is north of Phase 4 on the Lake Apopka North Shore and includes 930 acres of mostly shallow marsh (Figure 30). Initial flooding of this phase by the District occurred in 2010-2011. No lake inlet structures exist for Phase 6, but culverts allow for water conveyance into or out of the cell (Figure 31). Water discharged from the phase can travel east to the Unit 1 pump, or south to the Unit 2 pump, where via either pump it can be discharged to the lake. An alum injection system exists at each pump, to provide water treatment upon discharge to the lake when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 60.4 NAVD88).

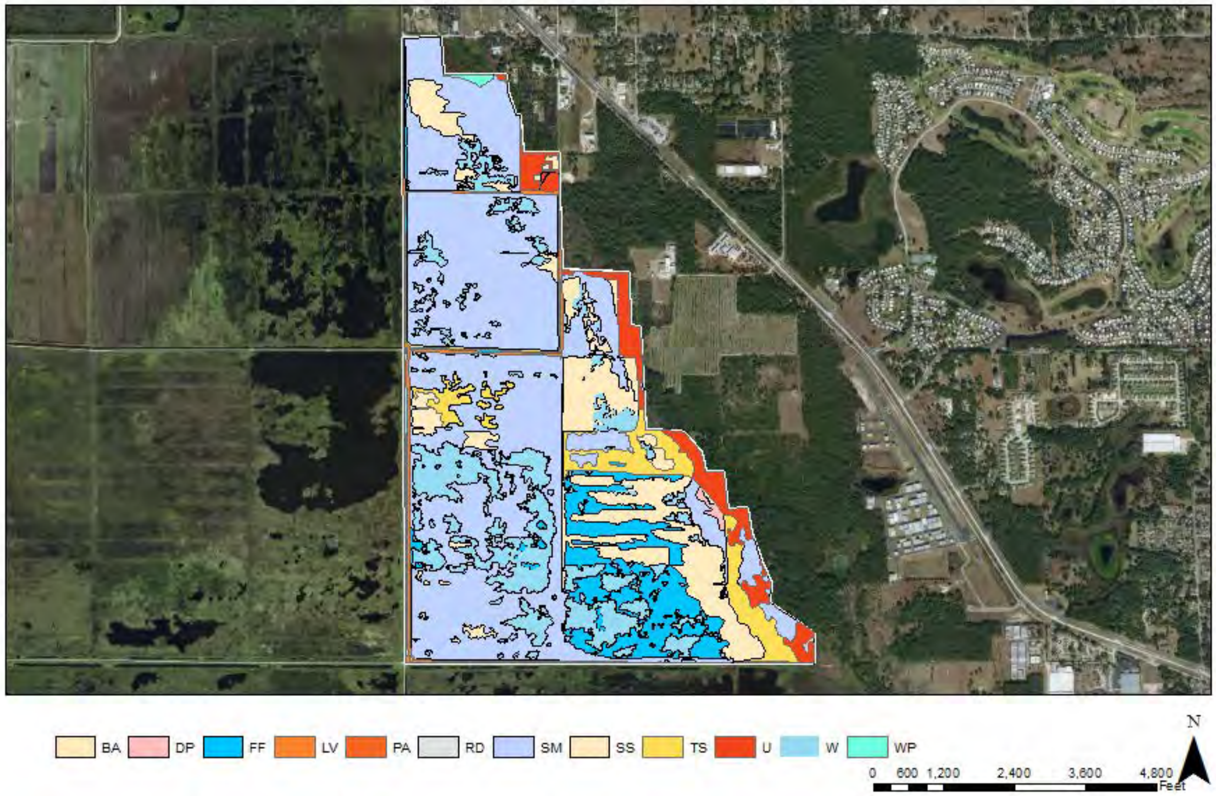


Figure 30. Vegetation map of Phase 6 as of 2017.

Figure 31. Google Earth image of Phase 6 as of January 2018.

Bathymetric survey data was collected for Phase 6 somewhere between 2006-2011, indicating bottom elevations of about 56.3 NAVD88 and high elevations along the eastern edge of the phase (Figure 32). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 6 in 2009 (Table 25). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2018, when twelve samples were collected, of which all were gambusia (whole body). Table 26 tabulates lipid and pesticide concentrations for all fish collected from Phase 6. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 6.

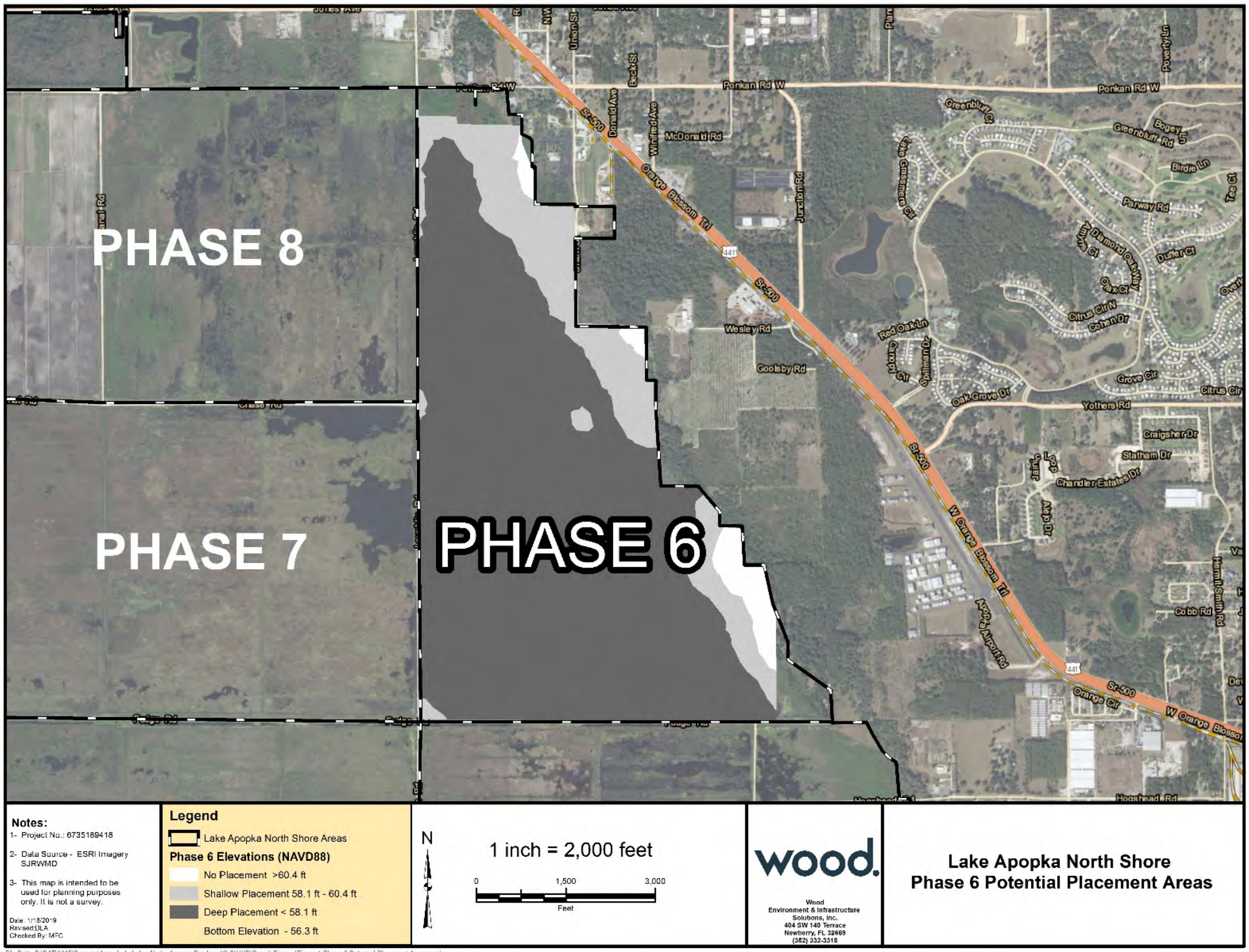


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Figure 32. Elevation Map (NAVD88) of Phase 6 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 25. Sediment Summary Data for Phase 6. Data collected in 2009; all units ug/kg.

Analyte Name	n	mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	36	298603.6	27225.88	539000	299500	3030			
4,4'-DDD	36	343.7944	68.3741	1710	163.5	1.6	18000	4200	
4,4'-DDE	36	1043.2	234.238	6020	558	11.9	13000	2900	1500
4,4'-DDT	36	1074.114	428.5995	11100	200.5	5.3	13000	2900	
4,4'-DDTr	36	1212.419	452.3143	11721.33	310.75	7.053333			1500
4,4'-DDTx	36	2461.108	704.7613	18220	962.85	22			
Aldrin	36	3.402222	0.776208	23.4	2.05	0.46	3000	60	
Dieldrin	36	132.3194	19.27449	471	118.5	1.2	300	60	140
Endosulfan I	36	12.32056	2.676978	60.7	3.7	0.45	6700000	450000	
Endosulfan II	36	162.0889	26.3846	683	113	1.9		450000	
Endosulfan sulfate	36	22.33972	6.480715	182	9.2	0.85		450000	
Endrin	36	15.61111	4.940996	132	4.45	1	3400	2500	
Endrin aldehyde	36	130.6056	26.28559	707	83.85	2.5			
Endrin ketone	36	17.18889	2.908741	70.9	9.75	1.4			
Heptachlor	36	3.325278	0.648107	18	2.05	0.55	900	200	400
Heptachlor epoxide	36	25.24806	4.575779	132	18.85	0.46	400	100	100
Methoxychlor	36	75.78333	20.00992	614	36.05	5.1	7800000	420000	
Moisture, Percent	33	57.85758	3.895707	83.6	65.8	2.8			
Moisture, percent	3	62.2	10.1933	75.2	69.3	42.1			
Oxychlordane	36	13.45556	2.392874	67.1	10	0.9			50
Solids, Percent	36	41.78056	3.640785	97.2	34.05	16.4			
Total Chlordane	36	317.9786	54.19827	1415.2	228.65	4.61	12000	2800	
Toxaphene	36	6790.186	1275.716	34200	4515	59.7	3700	900	5000
alpha-BHC	36	4.740833	0.963047	27.6	3.15	0.84	5000	100	
alpha-Chlordane	36	105.7289	17.665	481	72.75	0.94			1000
beta-BHC	36	6.972222	1.350712	38.7	4.55	1.2	2100	500	
cis-Nonachlor	36	54.74472	8.989161	239	39.3	0.61			550
delta-BHC	36	4.576944	1.005744	27.6	2.5	0.65	420000	24000	
gamma-BHC (Lindane)	36	2.721944	0.553205	15.9	1.85	0.48	2200	700	
gamma-Chlordane	36	58.17778	9.368121	243	43.2	0.59			1000
trans-Nonachlor	36	57.29833	14.17207	466	33.65	0.56			450

Table 26. Summary Data for Fish Tissue OCP Concentrations in Phase 6.

Phase 6 Fish Tissue OCP Summary
n=12 Units = ug/kg Collection Year = 2018 HI=0.4 HQ_{DDE}=0.3

Statistics	Mean	Median	Max	Min	SE	nondetects	TRV
% Lipid	2.1	2.1	3.0	1.2	0.1	0	--
4,4'-DDE	266.1	151.0	836.0	76.9	73.0	0	1500
4,4'-DDTr	19.0	11.0	58.8	5.8	5.1	12	1500
4,4'-DDTx	271.6	154.5	850.1	79.8	74.1	12	3600
Dieldrin	0.9	0.0	4.1	0.0	0.4	9	140
Heptachlor	0.4	0.4	0.6	0.0	0.0	7	400
Heptachlor Epoxide	0.4	0.1	1.7	0.0	0.2	9	100
Oxychlordane	6.5	2.1	24.9	0.9	2.5	0	50
Total Chlordane	38.8	14.5	144.2	8.4	13.7	10	285
Toxaphene	114.5	48.2	351.0	34.8	35.3	0	5000
alpha-Chlordane	4.7	2.2	16.6	1.1	1.5	0	1000
cis-Nonachlor	6.3	2.8	21.7	1.5	2.0	0	550
gamma-Chlordane	2.8	1.0	10.7	0.5	1.0	1	1000
trans-Nonachlor	17.9	6.6	68.0	3.2	6.5	0	450

Phase 7

Phase 7 is west of Phase 6 on the Lake Apopka North Shore and includes 920 acres of mostly shallow marsh (Figure 33). Initial flooding of this phase by the District occurred in 2011. No lake inlet structures exist for Phase 7, but culverts allow for water conveyance into or out of the cell, as well as a pump station that can move water through the canal system (red arrow; Figure 34). Water discharged from the phase can travel west to the Unit 1 pump, or south to the Unit 2 pump, where via either pump it can be discharged to the lake. An alum injection system exists at each pump, to provide water treatment upon discharge to the lake when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 61.8 NAVD88).

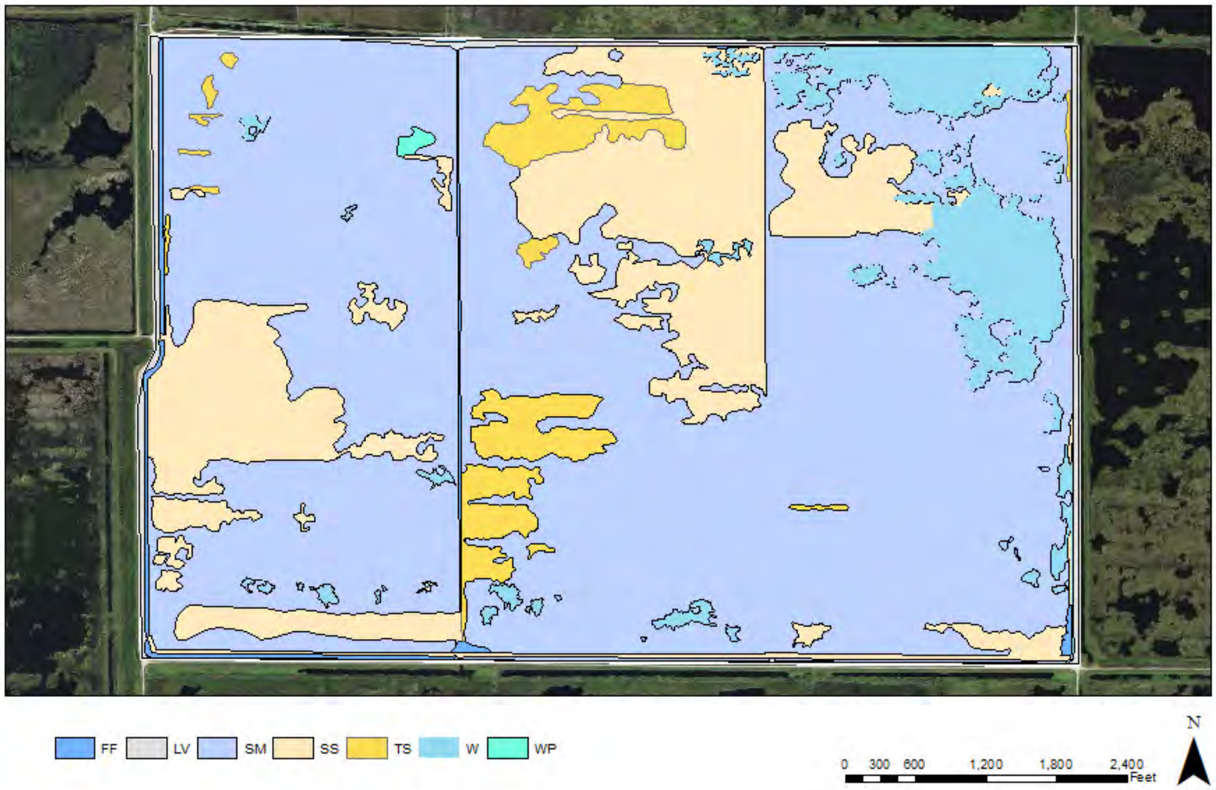

Figure 33. Vegetation map of Phase 7 as of 2017.

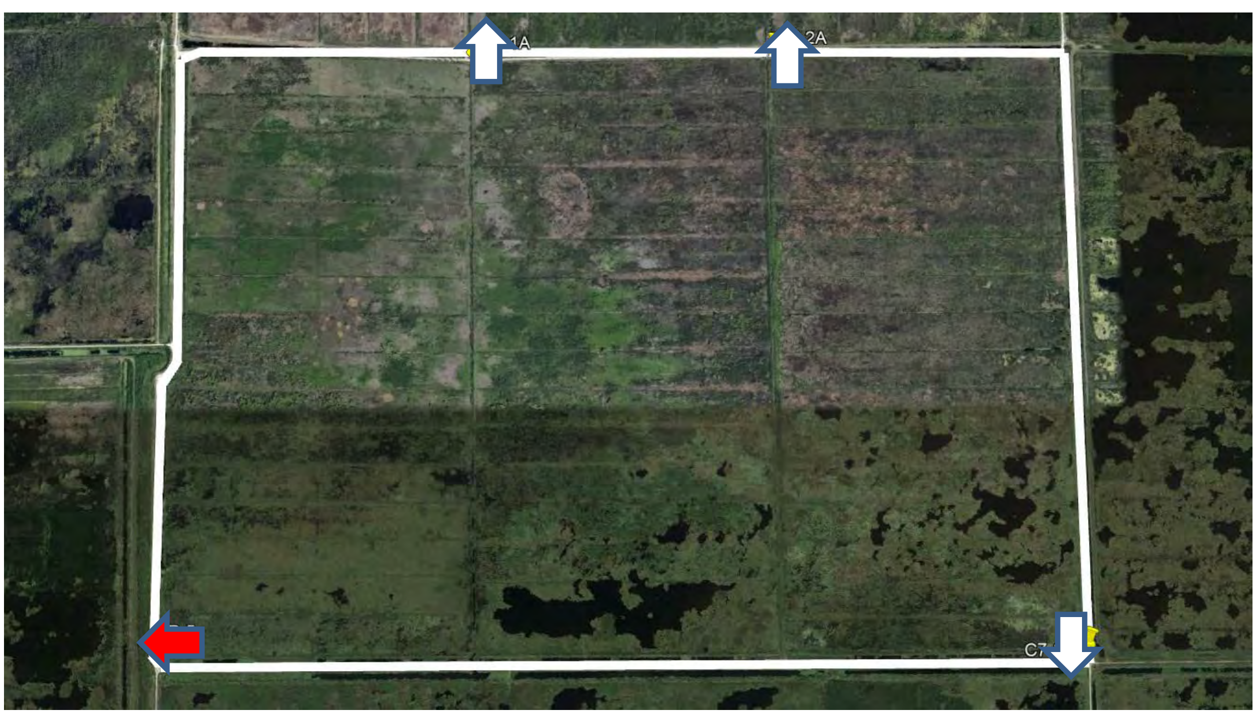

Figure 34. Google Earth image of Phase 7 as of January 2018.

Bathymetric survey data was collected for Phase 7 in 2007, indicating bottom elevations of about 58.9 NAVD88 and high elevations in the northwestern corner of the phase (Figure 35). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 7 in 2009 (Table 27). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2018, when nine samples were collected, of which all were gambusia (whole body). Table 28 tabulates lipid and pesticide concentrations for all fish collected from Phase 7. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE (HQ_{DDE} < 1), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 7.

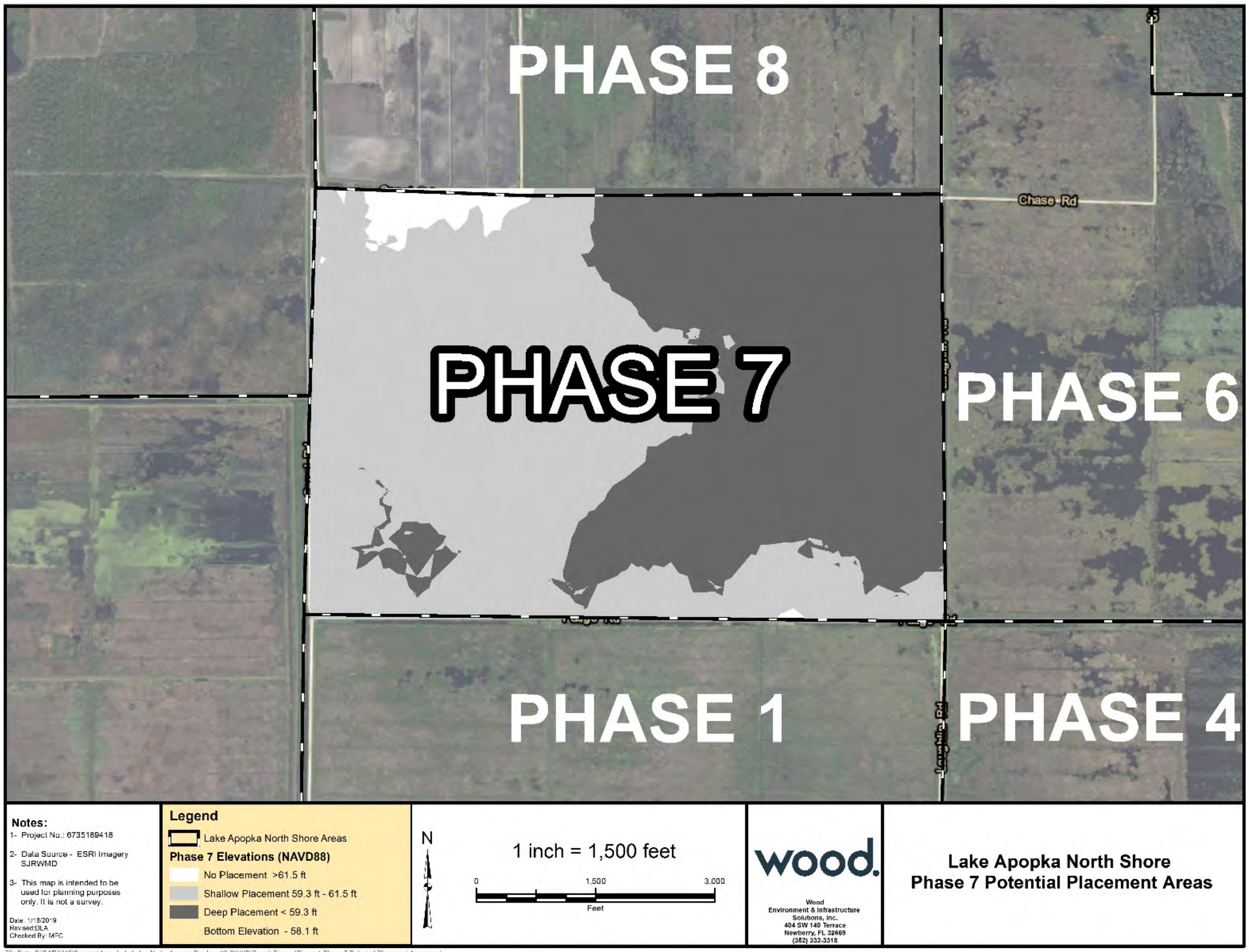

Figure 35. Elevation Map (NAVD88) of Phase 7 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 27. Sediment Summary Data for Phase 7. Data collected in 2009; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Content	34	161650	23955.12	466000	130000	5600			
4,4'-DDD	34	121.9382	27.09492	687	58.1	2.2	18000	4200	
4,4'-DDE	34	442.3176	77.92304	1860	239.5	1.4	13000	2900	1500
4,4'-DDT	34	64.19412	15.07861	369	30.6	2.2	13000	2900	
4,4'-DDTr	34	118.0696	23.43763	551.8	66.6467	2.733			1500
4,4'-DDTx	34	628.45	112.4084	2523	344.25	5.8			
Aldrin	34	2.018824	0.321994	6.9	1.05	0.54	3000	60	
Dieldrin	34	153.5029	33.15939	928	83.3	1.7	300	60	140
Endosulfan I	34	7.274706	1.67319	40.3	3.05	0.53	6700000	450000	
Endosulfan II	34	126.8824	25.38319	697	74.4	1.8		450000	
Endosulfan sulfate	34	6.179412	1.308159	35.7	2.95	1		450000	
Endrin	34	3.444118	0.650369	21.6	2.1	1.2	3400	2500	
Endrin aldehyde	34	70.70882	15.05641	401	31.2	2.7			
Endrin ketone	34	10.83824	2.018316	50.9	7.1	1.8			
Heptachlor	34	1.422647	0.154759	4.1	1	0.65	900	200	400
Heptachlor epoxide	34	22.14118	4.31622	99.6	13.75	0.66	400	100	100
Methoxychlor	34	33.85588	4.795702	117	24.45	6.8	7800000	420000	
Moisture, Percent	27	41.80741	3.137717	75.3	41.1	16.7			
Moisture, percent	7	48.21429	5.738277	69.2	52.8	24.2			
Oxychlordane	34	11.72059	2.734218	72.1	5.15	1.1			50
Solids, Percent	34	56.87353	2.756054	83.3	56.4	24.7			
Total Chlordane	34	289.1074	51.03123	1121.6	177.495	6.14	12000	2800	
Toxaphene	34	4164.391	739.6996	18000	2805	33	3700	900	5000
alpha-BHC	34	2.182059	0.238932	6.3	1.6	0.99	5000	100	
alpha-Chlordane	34	101.1326	18.2711	457	61.1	0.91			1000
beta-BHC	34	3.102941	0.357165	9.1	2.2	1.4	2100	500	
cis-Nonachlor	34	41.53676	8.373312	217	22.2	0.87			550
delta-BHC	34	2.070588	0.443843	15.4	1.2	0.77	420000	24000	
gamma-BHC (Lindane)	34	1.247941	0.135951	3.6	0.915	0.57	2200	700	
gamma-Chlordane	34	64.15971	10.82167	223	38.95	0.83			1000
trans-Nonachlor	34	46.99382	9.157869	204	23.95	0.79			450

Table 28: Summary Data for Fish Tissue OCP Concentrations in Phase 7.

Phase 7 Fish Tissue OCP Summary
n=9 Units = ug/kg Collection Year = 2018 HI=0.5 HQ_{DDE}=0.3

Statistics	Mean	Median	Max	Min	SE	# nondetects	TRV
% Lipid	3.8	2.9	5.9	2.3	0.5	0	--
4,4'-DDE	361.1	359.0	424.0	299.0	18.5	0	1500
4,4'-DDTr	25.5	25.5	30.0	20.9	1.2	9	1500
4,4'-DDTx	367.1	364.9	431.0	303.4	18.5	9	3600
Dieldrin	2.2	2.1	3.7	1.4	0.3	1	140
Heptachlor	0.3	0.3	0.5	0.1	0.0	9	400
Heptachlor Epoxide	0.2	0.0	0.9	0.0	0.1	8	100
Oxychlordane	13.1	12.4	18.3	8.6	1.2	0	50
Total Chlordane	69.5	72.9	90.3	44.0	5.8	9	285
Toxaphene	181.2	171.0	344.0	132.0	21.5	0	5000
alpha-Chlordane	11.5	9.8	18.2	5.8	1.7	0	1000
cis-Nonachlor	10.5	10.7	13.6	7.4	0.6	0	550
gamma-Chlordane	4.3	4.1	6.5	3.0	0.4	0	1000
trans-Nonachlor	29.6	28.2	40.8	18.7	2.5	0	450

Phase 8

Phase 8 is north of Phase 7 on the Lake Apopka North Shore and includes 594 acres of mostly shallow marsh (Figure 36). Initial flooding of this phase by the District occurred in 2014. No lake inlet structures exist for Phase 8, but culverts allow for water conveyance into or out of the cell (Figure 37). Water discharged from the phase travels west to the Unit 1 pump where it can be discharged to the lake. An alum injection system exists at the pump, to provide water treatment upon discharge to the lake when necessary. Water levels tend to fluctuate within the phase according to rainfall and are managed to protect levee access (max water level of 61.8 NAVD88).

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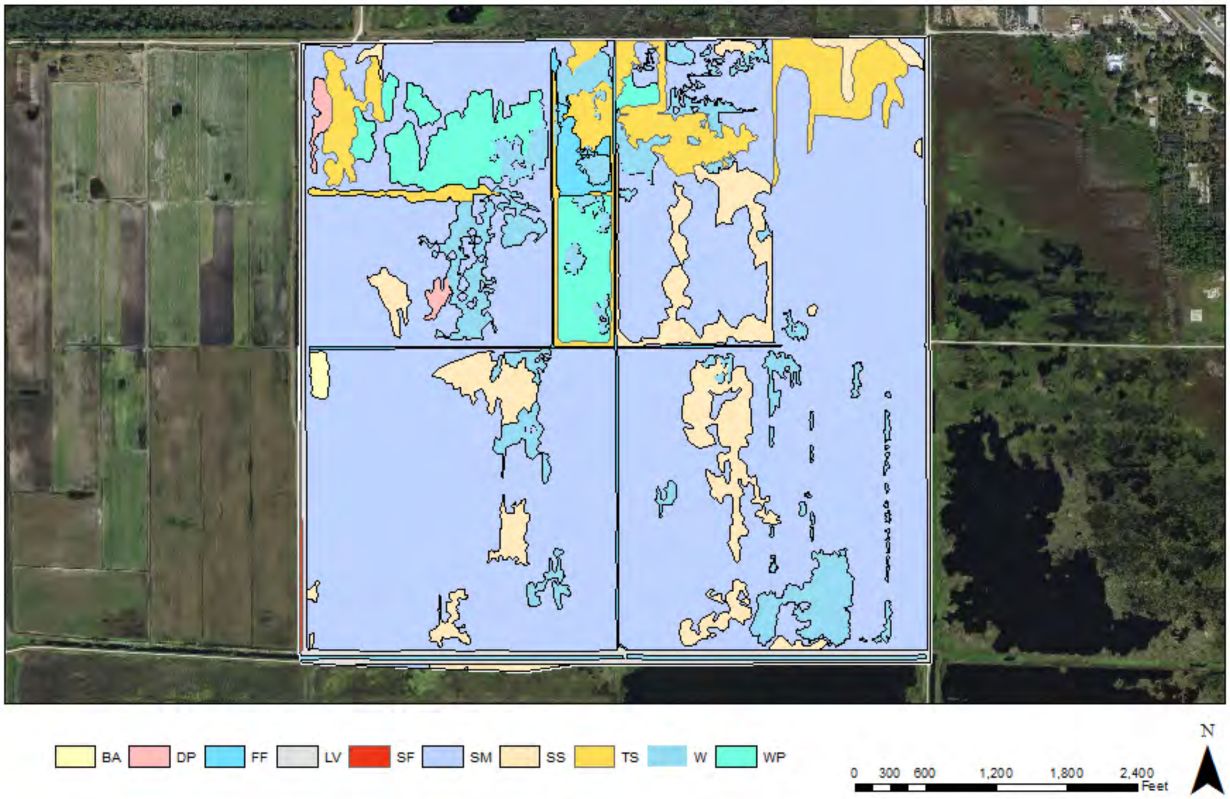

Figure 36. Vegetation map of Phase 8 as of 2017.

Figure 37. Google Earth image of Phase 8 as of January 2018.

Bathymetric survey data was collected for Phase 8 in 2006, indicating bottom elevations averaging 57.4 NAVD88 and high elevations along the western third of the phase (Figure 38). Dark grey color shows deep placement areas, while the light grey represents shallow placement locations and white areas are above placement elevation.

Sediments were most recently collected and analyzed from Phase 8 in 2009 (Table 29). At that time, Dieldrin and Toxaphene had average concentrations that exceeded the established TRVs, or FDEP Residential or Industrial clean up target values. Fish sampling was most recently done in 2016, when twelve samples were collected, of which all were gambusia (whole body). Table 30 tabulates lipid and pesticide concentrations for all fish collected from Phase 8. Organochlorine pesticide concentrations were well below the Toxicity Reference Value (TRV), with an overall low (HI < 1) hazard index value and hazard quotient for DDE ($HQ_{DDE} < 1$), suggesting low risk of toxicity to fish-eating birds. The District expects no adverse effects to listed species resulting from project implementation with material placement into Phase 8.

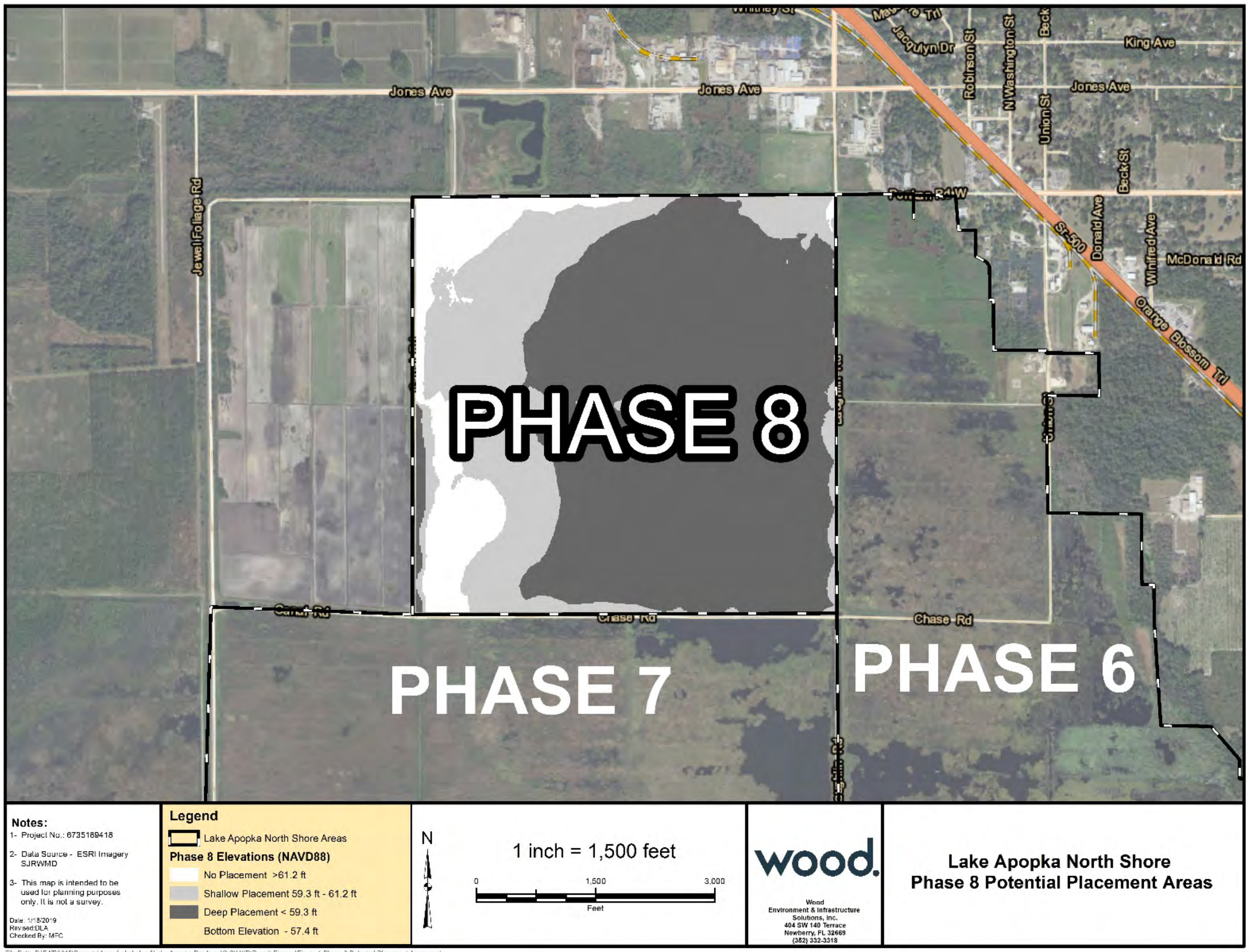

Figure 38. Elevation Map (NAVD88) of Phase 8 indicating areas of deep placement (dark grey), areas likely to receive shallow placement (between deep placement elevation and operational water level - grey), and areas where no material placement will occur (white).

Table 29. Sediment Summary Data for Phase 8. Data collected in 2009; all units ug/kg.

Analyte Name	n	Mean	SE	Max	Median	Min	Industrial	Residential	TRV
% Total Organic Carbon	41	172171.5	23889.13	482000	123000	3030			
4,4'-DDD	41	268.9317	57.06439	2010	133	3.3	18000	4200	
4,4'-DDE	41	719.278	139.3221	4610	323	9.4	13000	2900	1500
4,4'-DDT	41	358.8317	96.41223	3400	176	4.6	13000	2900	
4,4'-DDTr	41	460.5699	108.9987	3763.933	222.5067	5.886667			1500
4,4'-DDTx	41	1347.041	262.0361	7122	785.8	17.3			
Aldrin	41	3.381951	1.300714	54	1.3	0.53	3000	60	
Dieldrin	41	151.3659	37.84802	1430	80.7	3.6	300	60	140
Endosulfan I	41	6.261951	2.102029	82.7	2.5	0.55	6700000	450000	
Endosulfan II	41	139.7415	29.71157	1050	69.8	2.2		450000	
Endosulfan sulfate	41	18.41707	3.872738	110	9.6	1.1		450000	
Endrin	41	6.914634	2.825806	117	2.3	1.1	3400	2500	
Endrin aldehyde	41	73.9	17.31502	549	28.7	2.9			
Endrin ketone	41	15.99512	3.971041	159	8.8	1.7			
Heptachlor	41	3.625122	1.541662	64	1.3	0.62	900	200	400
Heptachlor epoxide	41	19.2922	4.322029	164	9.4	0.68	400	100	100
Methoxychlor	41	55.40732	15.43603	601	26.3	6.5	7800000	420000	
Moisture, Percent	19	34.12632	3.717493	70	29.8	14.9			
Moisture, percent	22	44.20455	3.744904	71.6	40.65	13.5			
Oxychlordane	41	12.87805	2.97783	106	6.7	1.1			50
Solids, Percent	41	60.46585	2.732049	86.5	64.2	28.4			
Total Chlordane	41	290.329	68.85055	2535	124.1	7.05	12000	2800	
Toxaphene	41	10162.76	5810.804	240000	2380	74.3	3700	900	5000
alpha-BHC	41	5.50878	2.366988	98.2	1.7	0.96	5000	100	
alpha-Chlordane	41	101.3707	24.04854	867	43.3	1.1			1000
beta-BHC	41	7.7	3.302815	137	2.4	1.3	2100	500	
cis-Nonachlor	41	45.66634	9.704056	326	22.3	0.82			550
delta-BHC	41	4.333415	1.840166	76.4	1.6	0.74	420000	24000	
gamma-BHC (Lindane)	41	3.168293	1.359538	56.4	1	0.55	2200	700	
gamma-Chlordane	41	55.31854	13.43878	493	23.1	0.86			1000
trans-Nonachlor	41	52.17805	13.65353	515	17.9	1.4			450

Table 30: Summary Data for Fish Tissue OCP Concentrations in Phase 8

Phase 8 Fish Tissue OCP Summary

n=12 Units = ug/kg Collection Year = 2016 HI=0.5 HQ_{DDE}=0.4

Statistics	Mean	Median	Max	Min	SE	# nondetects	TRV
% Lipid	3.4	3.5	4.2	2.7	0.2	0	--
4,4'-DDE	312.9	136.0	1040.0	45.6	108.1	0	1500
4,4'-DDTr	23.8	9.5	84.8	3.4	8.5	11	1500
4,4'-DDTx	351.1	166.1	1103.8	47.6	84.1	20	3600
Dieldrin	20.6	2.0	98.0	0.4	10.2	6	140
Heptachlor	0.1	0.0	0.5	0.0	0.1	12	400
Heptachlor Epoxide	0.0	0.0	0.0	0.0	0.0	12	100
Oxychlordane	2.0	2.3	3.8	0.3	0.4	3	50
Total Chlordane	19.7	14.4	59.3	2.1	5.6	12	285
Toxaphene	224.5	96.2	828.0	28.9	78.2	0	5000
alpha-Chlordane	4.1	2.5	15.7	0.4	1.4	3	1000
cis-Nonachlor	3.2	2.5	8.1	0.6	0.8	3	550
gamma-Chlordane	1.0	0.7	3.7	0.0	0.3	7	1000
trans-Nonachlor	9.4	6.4	29.1	0.9	2.8	0	450

Potential Dredge Material Properties

Limited sediment data have been collected from Lake Apopka, especially in recent years, however project specific sampling has occurred in the lake to support the Test Sump Dredging project, as well as the Newton Park Access Channel dredging (sampling occurred to support this project, but the project was later shelved). Chemical analyses included organochlorine pesticides and metals, as well as phosphorus. Results indicated that all constituents were under the FDEP SCTL residential targets, except for arsenic. Median arsenic samples historically collected from the lake suggest concentrations ranging from 6.2 mg/kg dwt (Sump Dredging Project, AMEC 2016) to 9.6 mg/kg dwt (Segal and Pollman, 1992). This range is within natural background levels for Florida histosols (Chen et al. 2002), however exceeds the FDEP Residential SCTL for arsenic; therefore, we propose to compare mean arsenic concentration for the volume of dredged sediment to the FDEP Industrial SCTL for arsenic.

If no recent data are available (within last 5 years), sediment sampling will occur within the footprint of the targeted dredge area prior to project commencement, and results will be compared to FDEP residential SCTLs as well as historical concentrations at the placement site. A minimum of ten sites will be sampled for projects up to 800 acres; projects larger than that will have one sample collected for every 80 acres. Samples will extend from the top of the sediment surface to 6-12” below the target dredging depth. Suitability will be determined on mean concentration of contaminants in the sediment volume to be removed, which should fall below FDEP Residential SCTLs, or the FDEP Industrial SCTL for arsenic.

Species Accounts

Orange County Federally Listed Species

Five birds, three reptiles, one amphibian, and seven plants are federally-listed threatened or endangered species in Orange County, Florida (Table 31). The gopher tortoise and the striped newt have been added to the species list, as candidates for listing.

At a January 31, 2001 meeting in Jacksonville regarding the Biological Assessment for the Duda sub-East Project, it was agreed that, for the Orange County list, all seven plant species, the Florida scrub-jay, red-cockaded woodpecker and sand skink are upland species and would not be found on the project area due to lack of suitable habitat. Similarly, the gopher tortoise is an upland species, and is not expected to be found on the project site. Striped newts are normally found in longleaf pine-dominated savanna, scrub, or sandhill habitats, and they breed in shallow, isolated temporary ponds and are not expected on the project site (USFWS 2011). Audubon’s crested caracara and eastern indigo snake were not included in the Biological Opinion for Duda sub-East and the letter of concurrence for Phase 1 (Unit 2 West; USFWS 2002, 2006). However, because of the greater flexibility in management now in place on the LANS, it is possible that the eastern indigo snake could be found on site and its account is included here.

Table 31. Orange County, Florida, Federally Listed Species

The following table lists those federally-listed species known to be present in the county.
Code Key: E = Endangered, T = Threatened, CH = Critical Habitat Designated, C = Candidate Note 1

Category	Species Common Name	Species Scientific Name	Code
Mammals	None		
Birds	Audubon's Crested Caracara	*Polyborus plancus audubinii*	T
	Everglade Snail Kite	*Rostrhamus sociabilis plumbeus*	E
	Florida Scrub-jay	*Aphelocoma coeruluscens*	T
	Wood Stork	*Mycteria americana*	E
	Red-cockaded Woodpecker	*Picoides borealis*	E
Fish	None		
Reptiles	Gopher Tortoise	*Gopherus polyphemus*	C
	Sand Skink	*Neoseps reynoldsi*	T
	Eastern Indigo Snake	*Dymarchon corais couperi*	T
Amphibians	Striped Newt	*Notophthalmus perstriatus*	C
Mollusks	None		
Crustaceans	None		
Plants	Britton's Beargrass	*Nolina brittoniana*	E
	Florida Bonamia	*Bonamia grandiflora*	T
	Scrub Lupine	*Lupinus aridorum*	E
	Beautiful Pawpaw	*Deeringothamnus pulchellus*	E
	Sandlace	*Polygonella myriophylla*	E
	Papery Whitlow-wort	*Paronychia chartacea = Nyachia pulvinata*	T
	Scrub Wild Buckwheat	*Eriogonum longifolium* var. *gnaphalifolium*	T

Note 1. Candidate species receive no statutory protection under the ESA. The FWS encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA. (Table available at http://www.fws.gov/northflorida/CountyList/Orange.htm; accessed 1-29-2019)

Lake County Federally Listed Species

One mammal, four birds, two reptiles, and nine plant species are federally listed in Lake County, Florida (Table 31). The gopher tortoise and the striped newt have been added to the species list, as candidates for listing.

The North Shore Restoration- Phase II Biological Assessment and the Duda sub-East Project (which is included in this project plan) were deemed not suitable habitat for upland species such as the Florida scrub-jay, red-cockaded woodpecker, gopher tortoise and sand skink (USFWS, 2002). The West Indian Manatee does not occur at this site. It is found in the St. Johns River, but is restricted from the Ocklawaha River by Kirkpatrick Dam. Therefore, we suggest that all flooded parcels within the LANS are not suitable for these species. Listed bird species that could potentially occur onsite include the Everglade snail kite and the wood stork.

Striped newts are normally found in longleaf pine-dominated savanna, scrub, or sandhill habitats, and they breed in shallow, isolated temporary ponds and are not expected on the project site (USFWS 2011).The eastern indigo snake was not included in the Biological Assessment for Duda sub-East Project; however, it was included for consideration in the Biological Assessment for Active Management of the Lake Apopka North Shore (Bowen et al. 2018), due to the larger flexibility in water management now available across the LANS.

There are nine plant species listed in Lake County (Table 31): Britton’s Beargrass, Florida Bonamia, Papery Whitlow-wort and the Scrub Wild Buckwheat were excluded from both the Biological Assessments and Opinions for Duda sub-East project and the Marsh Flow-Way project. The remaining plant species Pygmy Fringetree, Scrub Plum, Lewton's Polygala, Wide-leaf Warea, and Pigeon Wings are plant species that occur in scrub habitat and high pine habitat (Myers and Ewel 1990). Listed plant species are not expected to occur in the project area as target placement sites contain open water or wet/dry marsh habitat.

Table 32. Lake County, Florida, Federally Listed Species

The following table lists those federally-listed species known to be present in the county.
Code Key: E = Endangered, T = Threatened, CH = Critical Habitat Designated, C = Candidate Note 1

Category	Species Common Name	Species Scientific Name	Code
Mammals	West Indian (Florida) Manatee	*Trichechus manatus latirostris*	E/CH
Birds	Everglade Snail Kite	*Rostrhamus sociabilis plumbeus*	E
	Florida Scrub-jay	*Aphelocoma coeruluscens*	T
	Wood Stork	*Mycteria americana*	E
	Red-cockaded Woodpecker	*Picoides borealis*	E
Fish	None		
Reptiles	Gopher Tortoise	*Gopherus polyphemus*	C
	Sand Skink	*Neoseps reynoldsi*	T
	Eastern Indigo Snake	*Dymarchon corais couperi*	T
Amphibians	Striped Newt	*Notophthalmus perstriatus*	C
Mollusks	None		
Crustaceans	None		
Plants	Britton's Beargrass	*Nolina brittoniana*	E
	Florida Bonamia	*Bonamia grandiflora*	T
	Pygmy Fringetree	*Chionanthus pygmaeus*	E
	Scrub Plum	*Prunus geniculata*	E
	Lewton's Polygala	*Polygala lewtonii*	E
	Wide-leaf Warea	*Warea Amplexifolia*	E
	Papery Whitlow-wort	*Paronychia chartacea (= Nyachia) pulvinata*	T
	Scrub Wild Buckwheat	*Eriogonum longifolium* var. *gnaphalifolium*	T
	Pigeon Wings	*Clitoria fragrans*	T

Note 1. Candidate species receive no statutory protection under the ESA. The FWS encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA. (Table available at http://www.fws.gov/northflorida/CountyList/Orange.htm; accessed 1-29-2019)

Site-Specific Listed Species

Two threatened and one endangered species potentially have suitable habitat present on the LANS and are assumed to possibly be present on the project site. These species are the endangered snail kite, and the threatened wood stork and eastern indigo snake. Each of these species are discussed below.

Everglade Snail Kite

The species was federally-listed as endangered in 1967 and critical habitat was determined in 1977 (FR 42(155): 40685-40688). The project location does not fall in any critical habitat identified for the Everglades Snail Kite. Protection was continued under the Endangered Species Conservation Act (ESCA) of 1969 and the ESCA, as amended. The snail kite (*Rostrhamus sociabilis*) was listed because of its limited distribution and threats to its habitat posed by large-scale conversion of habitat in southern Florida to agricultural uses.

<u>Distribution</u>

Six large freshwater systems (Upper St. Johns River, Kissimmee Chain of Lakes, Lake Okeechobee, Loxahatchee Clough, Everglades and Big Cypress basin) generally encompass the current species range, although radio tracking of snail kites has revealed that frequented habitats include many other smaller widely dispersed wetlands (Bennetts and Kitchens 1997).

<u>Habitat</u>

Snail kite habitat consists of subtropical fresh-water marshes and the shallow vegetated edges of subtropical lakes (natural and man-made) where apple snails (*Pomacea paludosa*) are present. Suitable foraging habitat for the snail kite is typically a combination of low profile (<10 feet) marsh with a matrix of shallow (0.65 - 4.25 ft) open water, which is relatively clear and calm.

Nesting and roosting sites almost always occur over water. Nesting habitat include small trees (usually < 32.8 ft in height), herbaceous vegetation, such as sawgrass (*Cladium* sp), cattail (*Typha* sp.), bulrush (*Scirpus* sp.), and reed (*Phragmites* sp.) (USFWS, 1999). Suitable nesting habitat must be close to suitable foraging habitat, so extensive areas of contiguous woody vegetation are generally unsuitable for nesting.

<u>Foraging</u>

The snail kite feeds almost exclusively on apple snails, primarily the Florida endemic species *Pomacea paludosa*, but may also feed on the various invasive apple snail species present in Florida (e.g., *P. insularum, P. diffusa*, and potentially *P. canaliculata*). Apple snails are primarily herbivores. Snail kites spend between 25 to 50% of their time foraging and between 31 and 68% of the time foraging during pre- and post-nest desertion periods. Feeding perches include living and dead woody-stemmed plants, blades of sawgrass and cattails, and fence posts.

<u>Project Effect</u>

We do not anticipate any project related effects to snail kites as the project area is outside of the typical distribution range for the species and there has been no evidence of mature snail kites actively using the LANS to forage or nest. Since August 1998, there have been single sightings of snail kites across the property by expert birder Harry Robinson in the non-breeding season. According to Mr. Robinson, it is likely that these were all immatures and there were no adult males. There has been no evidence of snail kites nesting in the area.

It is possible that snail kites, a highly mobile species, may move into the Lake Apopka area in response to future regional hydrologic conditions. Within a short radius of the site are numerous natural water bodies as well as other state-owned former farm properties in the Upper Ocklawaha River Basin that are presently under various stages of wetland restoration. The flooding of the North Shore has also created suitable conditions for the snail kite to forage and/or nest.

The snail kite's main prey organism, the native apple snail (*Pomacea paludosa*), is not expected to populate the project area in numbers sufficient for foraging birds (Darby *et al.* 1997). It is possible that an invasive non-native species of apple snail could colonize the area, providing more prey for snail kites. It is unlikely that snail kites would exhibit effects from foraging on the project site because projected OCP levels in fish are far below the TRVs for the contaminants of concern and less than one for field value calculated HIs. We suspect apple snails may have lower OCP levels than fish due to their vegetarian diet, potentially transferring smaller amounts to the snail kites if they were to forage on the LANS.

We believe that overall this project is not likely to adversely affect snail kite populations.

Wood Stork

The United States population of wood stork (*Mycteria americana*) was listed as endangered in 1984 because it had declined by more than 75 percent since the 1930s (49 FR 7335).

Distribution

No critical habitat has been designated for this species. Wood storks are found in Lake and Orange Counties, as well as all of the surrounding counties. Numerous wood stork colonies have been documented in central Florida during the past decade (Figure 39). Wood storks may forage many miles from their colonies (Figure 39). Wood storks in south Florida typically feed within 31 miles of the colony but could travel up to 81 miles (Coulter *et al*. 1999). In north Florida, the average foraging distance was 7.5 miles; however, more than 90% of the foraging trips were within 15.5 miles of the colony or roost. Bryan and Coulter (1987) found that 86% of wood stork foraging sites were within 12.4 miles of the colony and only one site was more than 31 miles from the colony.

Habitat

The wood stork is primarily associated with freshwater for nesting, roosting, foraging, and rearing. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1991). During the non-breeding season or while foraging, wood storks occur in a wide variety of wetland and other aquatic habitats that include freshwater marshes, ponds, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, swamps and sloughs.

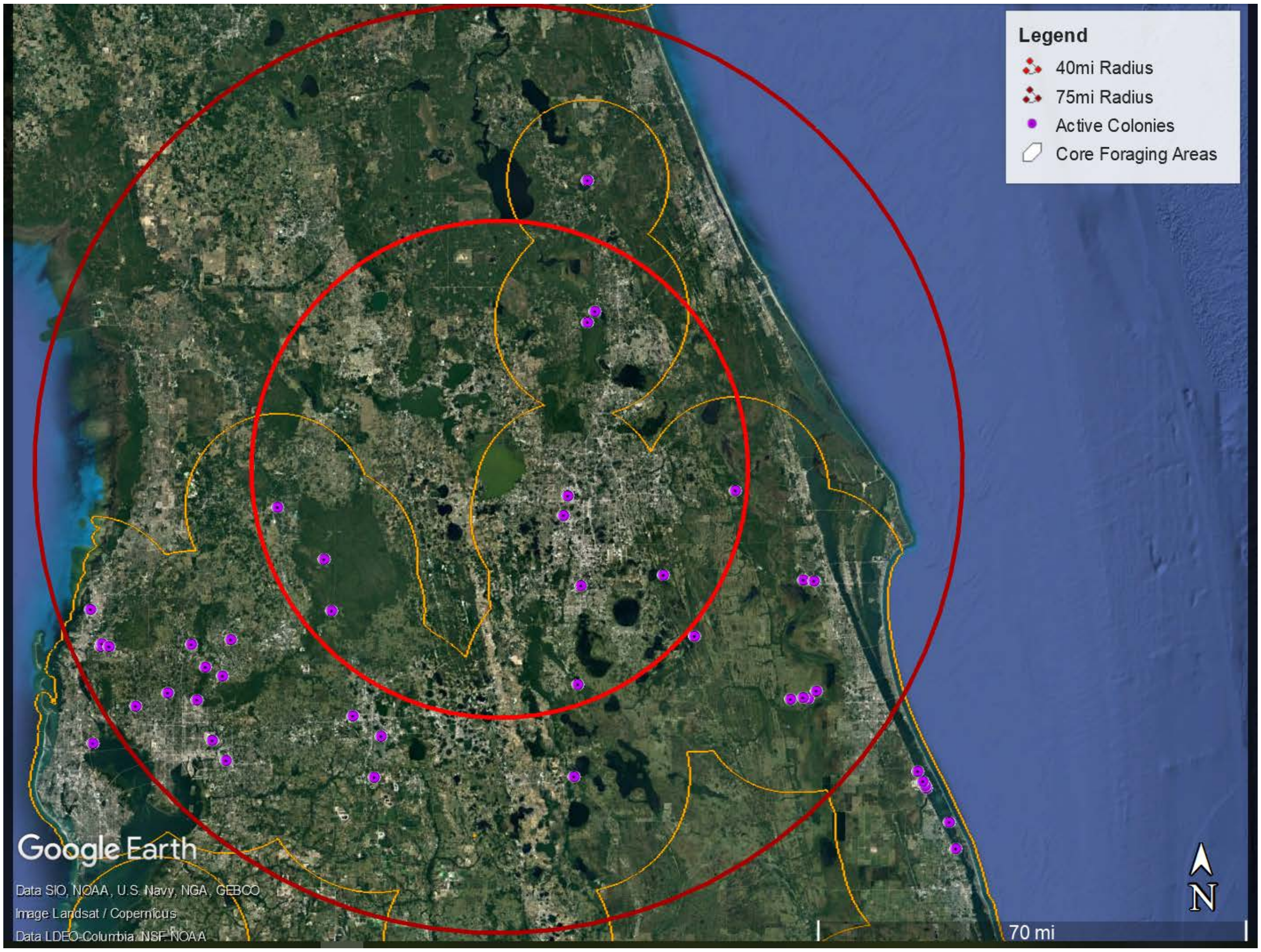

Figure 39. The location of active wood stork colonies in 2008-2017 in relation to their distance from the Lake Apopka drainage basin (data source: USFWS 2019). Orange buffer lines represent Core Foraging Area whle purple dots are active colonies of wood storks.

Foraging

The natural hydrologic regime in Florida involves seasonal flooding of extensive areas of the flat, low-lying peninsula, followed by drying events, which confine water to ponds and sloughs. Fish populations increase during the wet season and become concentrated into smaller areas as drying events occur. Wood storks are able to exploit these high concentrations of fish in drying pools and sloughs.

Storks forage in a wide variety of shallow wetlands, wherever prey reach high densities in water that is shallow and open (Ogden *et al.* 1978; Browder 1984; Coulter 1987). Good feeding conditions usually occur in relatively calm open water, where depths are between 4 to 10 inches, (Coulter and Bryan 1993). Typical foraging sites throughout the wood stork's range include freshwater marshes and stock ponds; shallow, seasonally flooded roadside or agricultural ditches; narrow tidal creeks or shallow tidal pools; managed impoundments; and depressions in cypress heads and swamp sloughs. Almost any shallow wetland depression that concentrates fish, either through local reproduction or the consequences of area drying, may be used as feeding habitat.

Project Effect

In general, wood storks move into and out of the Lake Apopka Basin in response to suitable regional hydrologic conditions. Wood stork observations typically occur during dry periods, when fish are often concentrated in smaller bodies of water and when forage depths are optimally shallow, relative to wetter periods. The recent transition of the LANS to active management may enhance opportunities for wood stork foraging, as water will be allowed to follow a more natural fluctuation such that seasonal recession of areas may lead to dense foraging and/or local nesting. If feeding conditions become optimal, wood storks may quickly congregate in large numbers. Hazard index values for all parcels have been well below the threshold of 1, suggesting the risk of adverse impacts to foraging birds is very low. Temporary impacts to foraging areas may occur during project operation but are likely to be limited to discharge location in placement phase and mixing zone.

Utilizing the Wood Stork Key, the following determinations are made:

A. Project is greater than 2500 ft from an active colony site
B. Project may temporarily impact suitable foraging habitat
C. Project impacts are likely to be larger than 0.5 acres, but temporary in nature
D. Project impacts may occur within a Core Foraging Area (CFA), which is defined by the USFWS as an area within 15 miles of an active nesting colony (Figure 39), depending on placement area within the LANS; however, impacts will be temporary in nature
E. Project impacts which may occur are increase in turbidity in placement areas during material placement (temporary). Upon project completion, placed material will cover existing OCPs in LANS sediment and reduce exposure of forage fish to OCPs, thereby improving suitable foraging habitat for wood storks
    i. Based on results from this key, project is NLAA wood storks

We do not expect this project to adversely affect wood stork populations.

Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais*) is one of eight subspecies of a primarily tropical species, of which only the eastern indigo and the Texas indigo (*Drymarchon corais erebennus*) occur within the United States (USFWS 1982). The eastern indigo snake is the longest snake in North America, obtaining lengths of up to 104 inches (Ashton and Ashton 1981). The eastern indigo snake was federally listed as threatened on January 31, 1978, due to population declines caused by habitat loss (Speake and Mount 1973; Speake and McGlincy 1981). No critical habitat has been designated for the eastern indigo snake.

Habitat

Eastern indigo snakes use a variety of habitats that includes longleaf pine forest ecosystems that are habituated by gopher tortoises (*Gopherus polyphemus*) and red-cockaded woodpeckers (*Picoides borealis*). On the sandy central and coastal ridges of south Florida, indigo snakes use gopher tortoise burrows more than other underground refugia (Layne and Steiner 1996). Other underground refugia include burrows of armadillos (*Dasypus novemcinctus*) and cotton rats (*Sigmodon hispidus*), hollows at the base of trees or shrubs, ground litter, trash piles and in the crevices of rock-lined ditch walls (Layne and Steiner, 1996). These refugia sites are used most frequently where tortoise burrows are not available, principally in low-lying areas of central and coastal ridges.

Monitoring of radio-fitted indigo snakes on the central ridge of south Florida indicated that snakes used a wide variety of natural, disturbed, and non-natural habitat types throughout the year (Smith 1987). On the ridge itself, eastern indigo snakes favored mature oak phase scrub, turkey oak sandhill, and abandoned citrus grove habitats, while snakes found off the sandy ridges used flatwoods, seasonal ponds, improved pasture, active and inactive agricultural lands. There was no apparent selection for one habitat type over another as the use of habitats closely reflected the relative availability and distribution of vegetation types in these areas (Layne and Steiner 1996).

Foraging

The eastern indigo snake is an active terrestrial and fossorial predator that will eat any vertebrate small enough to be overpowered. Layne and Steiner (1996) documented several instances of indigos flushing prey from cover and then chasing it. Though unusual, indigo snakes may also climb shrubs or trees in search of prey. An adult eastern indigo snake's diet may include fish, frogs, toads, other snakes, lizards, turtles, turtle eggs, juvenile gopher tortoises, small alligators, birds and small mammals (Keegan 1944; Babis 1949; Kochman 1978; Steiner *et al.* 1983).

Project Effect

We anticipate that this project is not likely to adversely affect the eastern indigo snake, as the project occurs outside suitable habitat and is accessible only via levees. The LANS is a series of flooded farm fields interconnected with levees and roads, with little to no underground refugia; however, indigo snakes may wander out along the levee during project operation.

There was one possible observation of an eastern indigo snake on the south side of field unit B2 of the Marsh Flow-Way, which is west of the project area. This sighting was previously reported several years ago in the Marsh Flow-Way OCP one-year monitoring report submitted to the US Fish and Wildlife Service (Reference Number FWS/R4/ES/-JAFL). A second, documented sighting occurred just outside the eastern boundary of Phase 2 West on Airport Rd in 2011 (Figure 10).

It is unlikely that eastern indigo snakes would exhibit effects from foraging on the project, since projected OCP levels in fish are far below the TRVs for the contaminants of concern and less than one for HIs calculated from field values. Based on laboratory analyses of various prey items such as frogs and rodents, we expect other food items would have lower OCP levels than fish. We anticipate that this project is not likely to adversely affect the eastern indigo snake, as the project occurs outside its suitable habitat and is only accessible by levee, with infrequent visitation expected; however Indigo Snake Standard Protection Measures will be instituted and followed during any project operation.
When using the *Eastern Indigo Snake Programmatic Effect Determination Key* (USFWS 2013a), this project meets the following criteria:

- Project is not solely located in open water or salt marsh
- Permit will be conditioned for use of the Service's *Standard Protection Measures For The Eastern Indigo Snake* (USFWS 2013b) during site preparation and project construction
- There are no gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities

The above inputs into the *Eastern Indigo Snake Effect Determination Key* results in 'NLAA', meaning that the project is 'not likely to adversely affect' the eastern indigo snake, meeting the requirements of section 7 of the Endangered Species Act and no further action is required. Any project changes not included in this document would require consultation with USFWS.

Management Plan and Minimization of Impacts to Listed Species of Concern

Actions Taken

- Water levels inside placement areas will not exceed the 25th percentile inundation frequency, to prevent material placement in areas not typically inundated. This will limit material placement at higher elevations and retain management strategies to restrict willow germination during the dry spring season.
- If water must be discharged from the placement area, water will be treated for phosphorus to background levels in the LANS, currently set at 0.12 mg/L TP-T and will not exceed 29 NTU above background for turbidity. Once discharged to the surrounding LANS, discharge water will be treated with alum before discharge from the LANS, as needed.
- Material placement will focus on deep areas of cells, to maximize deep placement. Maximum elevations for deep placement were set to retain the District's ability to manage for willow during the spring dry season. It is expected that some material will settle into areas above the

deep placement maximum; however, no material will be placed at high elevations that would be at risk of no longer supporting wetland vegetation.

- Vegetation clearing is not expected to occur as part of this project, but pathways for pipes may require small temporary impacts to vegetation. If any land-clearing activities are required, they will be indicated as such in the pre-construction notice.
- The standard protection measures for indigo snakes will be followed during construction staging, depositing of material into any phase on the LANS, as well as during project decommissioning.
- Flocculent and coagulant will be added to dredge inflows with the goal of sequestering phosphorus and settling and consolidating spoil as rapidly as possible. This step will reduce turbidity within the placement area.
- During summer periods, oxygen content of recipient waters is typically at a minimum. Should a fish kill occur, the Fish Kill Contingency Plan (Appendix D) will be implemented.

Monitoring

- During dredging and pumping, daily monitoring of water column turbidity inside the placement cell as well as in the lake will be required. Monitoring should occur near the dredging activity, as well as at background sites at both locations. In addition, daily monitoring of dissolved oxygen will be required inside the placement cell, to occur within one hour of sunrise.
- District staff will be onsite daily, and staff will be trained on how to identify sick and/or injured birds. In addition, the Lake Apopka Wildlife Drive, as well as the Lake Apopka Loop Trail, traverse much of the North Shore and are open to the public. The Wildlife Drive is open weekends and federal holidays, and regularly has 300 vehicles visit daily each day it is open (Fedler, et *al*., 2018). There is an active Facebook group that posts wildlife pictures from most recipient areas across the LANS, providing ample opportunity to detect problems for foraging birds or other wildlife.
- Water levels in the recipient cells will be continuously monitored by the District using data loggers and telemetry to be installed prior to material placement.
- Fish from recipient cells will be sampled once pre-project (if not sampled within the last 5 years of PCN), 5 years after project completion, and additional collection may occur in the event of a major fish kill by the District. Fish samples would be collected and analyzed according to standard methodology. Fish tissue will be analyzed for lipid, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, *alpha*-chlordane, *cis*-nonachlor, dieldrin, *gamma*-chlordane, heptachlor, heptachlor epoxide, oxychlordane, *trans*-nonachlor and toxaphene content. In the event of fish tissue analysis, the District will provide results to USFWS.

Contingency Plans

- The dredge contractor will follow the Fish Kill Contingency Plan, should dead fish be observed (Appendix D).
- If dead or sick birds are observed, the District will comply with salvage permit requirements, #MB032131-0.
- The dredge contractor will be capable of ceasing operation within 2 hours of any stop work determination.

Conclusions

The St. Johns River Water Management District is currently seeking a 10-year permit to restore Lake Apopka through maintenance dredging to remove unconsolidated floc from the bottom of the lake and place material into the Lake Apopka North Shore. This project benefits the lake by removing easily resuspended material believed to inhibit submerged habitat expansion within the lake. Additionally, material placed on the LANS will bury existing OCP contaminated soils and offset historical subsidence in deep areas of the north shore. Measures are in place to ensure the ability to maintain wetland habitat on the LANS and continue to allow for flexibility in water management across the North Shore, as well as managing nutrient loading to Lake Apopka. Although temporary impacts to foraging habitat of listed species may occur during project operation, no adverse impacts are expected to result to listed species as a result of this project.

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Fish Kill Contingency Plan for UCF Dredging and Placement on the Lake Apopka North Shore

Contents

Introduction

Background

The St. Johns River Water Management District (SJRWMD) is planning a series of dredging projects over the next ten (10) years to remove unconsolidated flocculent (UCF) sediments from Lake Apopka and place the sediments in reflooded former agricultural areas on the Lake Apopka North Shore (LANS). The benefits of these projects include 1) removal of UCF to improve water clarity in Lake Apopka and therefore growth of submersed plants, and 2) placement of UCF on the former agricultural areas to accelerate restoration of wetlands by covering pesticide contaminated sediments and raising soil elevations to offset oxidation and subsidence.

Risk for Fish Kills

The project areas on the LANS to receive UCF sediments are wetlands in various stages of restoration. They primarily are vegetated (emergent, floating, and submersed plants). Most of the areas are shallow, and fish kills occur occasionally during summer months in these wetlands under normal conditions when high water temperatures reduce oxygen solubility and increase detrital decomposition rate and oxygen demand. Especially during periods with little rain and low water levels, dissolved oxygen (DO) levels become marginal for many fish species. Under these conditions, Gambusia spp. and other small and tolerant species dominate the fish community in shallow, vegetated areas, and larger species are present mostly in ditches and canals.

The placement of UCF sediments in the LANS may exacerbate the already poor DO conditions in these wetlands due to the low DO in the sediment slurry and the added organic matter. As a result, fish kills may occur more frequently or be more extensive. Although it will not be possible to attribute fish kills solely to dredging, fish kills may occur during dredging operations when these are conducted during summer months. As fish kills associated with low DO have been observed on the LANS, it is reasonable to expect that future fish kills will be related to low DO conditions, unless conditions suggest other potential causes.

Possible Harmful Consequences of Fish Kills on the LANS

Increased OCP exposure to fish-eating birds

The LANS was the site of a large bird mortality event in 1998 – 1999 ultimately attributed to residual organochlorine pesticides (OCP) in the soils. The most contaminated areas (4,000 acres) were remediated using an innovative soil inversion technique. Previous projects that included placement of dredge material on the LANS have included fish-kill contingency plans. These plans were motivated primarily by the need to avoid exposure of fish-eating birds to large numbers of dead or dying contaminated fish. However, soil remediation and deposition of fresh plant litter reduced access to and diluted sediments with OCPs. Reduced exposure together with natural depuration have reduced OCP levels in fish. Recent Biological Assessments found that fish in the LANS no longer present an unacceptable hazard to fish-eating birds.

Avian botulism

The naturally-occurring sediment bacterium Clostridium botulinum produces a potent neurotoxin that is the cause of botulism poisoning. C. botulinum is an obligate anaerobe, i.e., it requires the absence of oxygen for growth. Waterbird mortalities generally are caused by type C toxin strains. Genes for toxin production are carried in a virus (phage) that infects the Clostridium bacteria, and both the bacteria and phages are common in wetland soils. When larger (e.g., vertebrate) animals die in wetlands or other shallow waters, the decomposing carcasses provide an anaerobic environment and proteinaceous substrate that favor the growth of C. botulinum and production of botulinum toxin. The larvae (maggots) of carrion-feeding flies ingest and bioaccumulate the toxin and are eaten by birds when they leave the carcass. Ingestion of just a few maggots with type C toxin can kill a bird, resulting in more carrion to decompose and further toxin production. This decomposition cycle is most common at higher ambient temperatures and likely occurs at very low levels in wetlands with only minor harm. The threat to birds develops when larger amounts of carrion are present, and the cycle expands exponentially. Outbreaks of avian botulism that kill thousands of waterbirds are not uncommon in the US and Canada, and outbreaks with over one million deaths have been recorded. Large outbreaks have not occurred in Florida, and only a few avian botulism deaths have been reported in the state. Avian botulism should be considered a possible but not a likely consequence of a fish kill on the LANS.

Degraded recreational and aesthetic value

Virtually every LANS project area considered for sediment placement is adjacent to sections of the Lake Apopka Wildlife Drive and/or the Lake Apopka Loop Trail. Even moderate fish kills in project areas adjacent to these trails would lower the aesthetic and recreational value of the trails. The negative effects would be both visual (accumulations of dead fish) and olfactory as fish decompose at high summer temperatures. The negative effects on recreation value could be large since both the wildlife drive and the loop trail are used extensively.

Objectives for Dealing with Fish Kills

Responding to fish kills will involve removing the dead fish after a threshold number of dead fish has been exceeded. Removal of the fish minimizes each of the potentially harmful consequences discussed above. Because OCP concentrations in fish have declined with time, consumption of fish by birds no longer is the primary concern. Instead, the primary objectives of this plan are to minimize impacts on recreational use of the LANS and to prevent conditions that might lead to avian botulism.

Recreational and aesthetic values of the LANS will be affected whenever significant fish kills occur in project areas adjacent to portions of the wildlife drive or the loop trail. These areas generally are accessible by jon boat or airboat. In contrast, accumulations of dead fish conducive to botulism could occur anywhere, and removal from areas not easily accessed from levees or roads would be difficult. In the larger wetland parcels in the LANS, much of the area will be difficult to access.

The steps in the fish kill plan are the following:

- Notify SJRWMD staff
- Remove accumulations of dead fish from accessible perimeter project areas adjacent to recreational drives/trails
- If large fish kills are observed (over 1000 fish), or multiple fish kills occur in a short time, conduct aerial surveillance of the interior of project areas to look for accumulations of dead fish or other affected wildlife not visible from the perimeter
- Determine when dredging shall stop and resume
- Raise water levels to minimize risk of botulism if necessary
- Report

Fish Kill Contingency Plan

Definitions

1. The term "project area" in this plan refers to the particular area(s) on the LANS (Cells D, E, and H; Duda; Phases 1 – 8) used for sediment placement in a single dredging project
2. A fish kill is defined as more than 50 dead fish of any size or 20 dead fish greater than 6 inches body length visible at one location
3. Designated SJRWMD Staff for fish-kill reporting and response are, in priority order:
    a. Lori McCloud (Bureau of Water Resources): 386-329-4491 (office) / 352-256-0064 (mobile); lmccloud@sjrwmd.com
    b. Jim Peterson (Bureau of Water Resource Information): 352-427-0926 (mobile); jpeterson@sjrwmd.com
    c. Rebecca (Becky) Trudeau (Bureau of District Projects and Construction): 386-329-4834 (office) / 386-937-0292 (mobile); rtrudeau@sjrwmd.com
    d. Bob Naleway (Bureau of District Projects and Construction): 386-312-2366 (office); rnaleway@sjrwmd.com

Surveillance for Fish Kills

1. Contractor staff will be on site daily and will monitor the perimeter of project areas at least daily
2. SJRWMD will be on site frequently and will monitor the perimeter of project areas at least weekly

Contractor Responsibilities

Contractor Notification

1. If a fish kill is observed, notify a designated SJRWMD staff person by phone ASAP but no later than the same day. Designated SJRWMD staff are listed above in priority order
2. If you cannot reach any of these persons by phone, send an email the same day to all the persons listed above
3. Be prepared to provide the following information on the phone or in the email
    a. Approximate size of the kill(s) (estimated numbers of dead fish greater than 6 inches and less than 6 inches body length)
    b. Approximate extent of the kill(s) (where are the dead fish located? Area affected)
    c. Types of fish killed (if feasible, e.g., minnows, panfish (bream), tilapia, catfish, largemouth bass, gar, gizzard shad)
    d. A quick visual assessment of the dead fish, if this is feasible, including
        i. Are the eyes bulging?
        ii. Are any fish gasping at the surface?
        iii. Are fish pectoral fins thrust in an extreme forward position?
        iv. Photographs, if feasible, especially for large events

Contractor Response

1. Remove all dead fish from accessible perimeter areas adjacent to recreational drives and trails as designated by SJRWMD. Use a shad scoop net or other similar equipment attached to a boat. Multiple boats may be utilized as required. Haul collected fish offsite and dispose of fish appropriately in a landfill or by other means acceptable to SJRWMD
2. Be prepared to continue removal of fish in areas adjacent to recreational drives and trails on following days if fish continue to die, even if material placement in the project area has stopped
3. Continue dredging but be prepared to stop dredging within two (2) hours if notified to do so by SJRWMD. When dredging is stopped, it will not resume until three (3) days have passed without further fish mortality and site conditions appear to have returned to normal. At the discretion of SJRWMD, placement operations may be moved to an alternate permitted project area to resume dredging more quickly.

SJRWMD Responsibilities

Preparation prior to start of dredging

1. Modify the map(s) in the generic Fish Kill Investigation Report form to apply to the project area
2. Identify on the map(s) the perimeter sections of the project area where the contractor is obligated to remove dead fish. Show any preferred access points for jon boats or airboats
3. Be prepared to conduct aerial surveillance of the project site within 72 hours by fixed-wing aircraft or drone after an extensive fish kill (defined below)

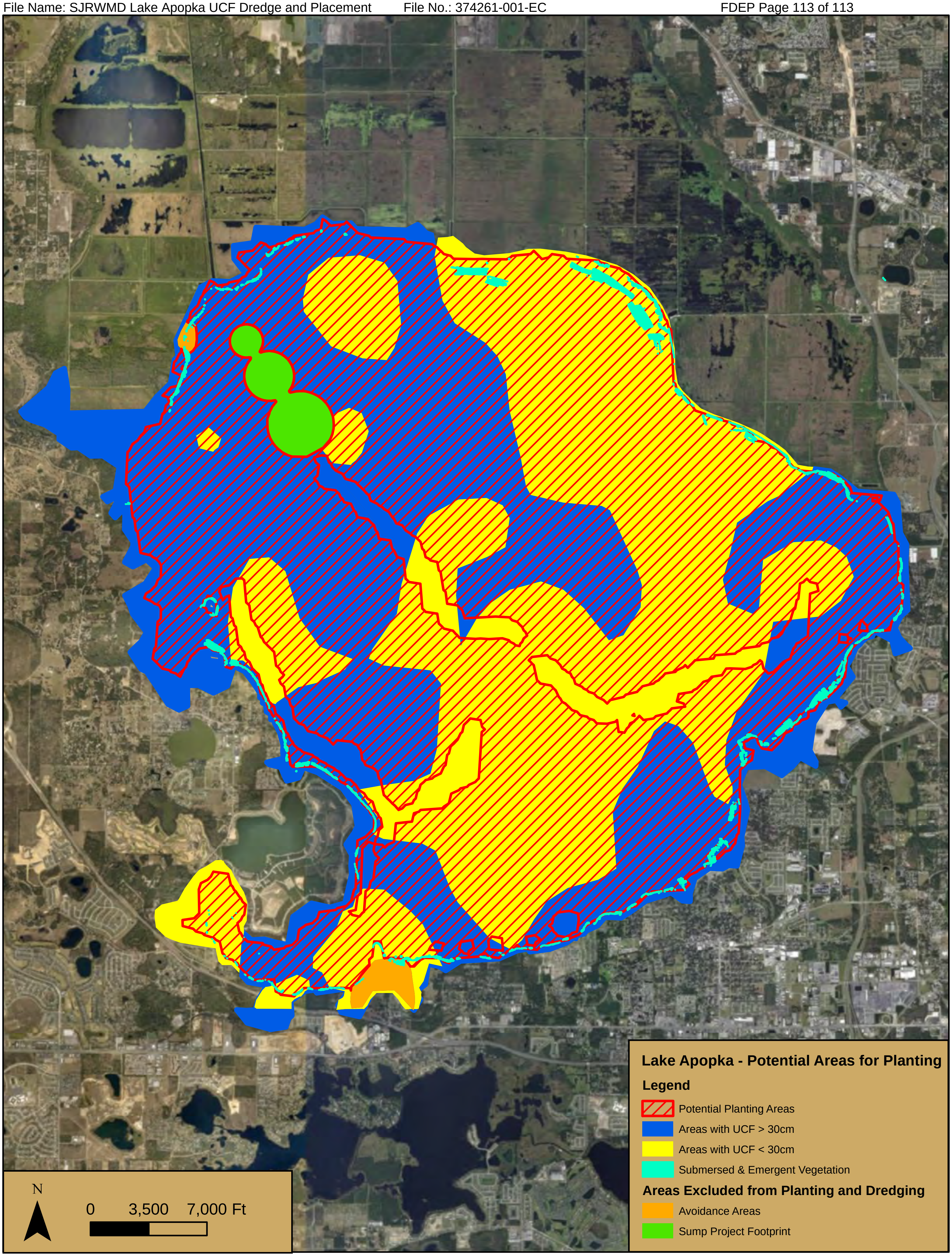
SJRWMD Notification

1. Upon notification of a fish kill, Designated Staff should complete a phone log describing details communicated during the call
2. With information from the phone log, Designated Staff will review the potential response items below to determine a course of action and coordinate with the Environmental Resource Coordinator (Becky Trudeau) for concurrence on the decision. All correspondence should copy Lori McCloud and Bob Naleway

SJRWMD Responses

1. Responsibility for archiving all phone logs and Investigation Reports lies with the WR Scientist (Lori McCloud)
2. If the kill occurs at only one location and affects fewer than 50 fish greater than 6 inches
    a. Designated Staff who received notification will complete an Investigation Report including any supporting information (e.g., symptoms and appearance of dying and dead fish)
    b. Forward phone log and Investigation Report to the WR Scientist (Lori McCloud) who will file and arrange follow-up visit(s) within 72 hours as surveillance for additional deterioration
3. If the kill occurs at multiple locations or multiple days or involves more than 50 fish greater than 6 inches at a single location
    a. Mobilize staff to measure DO and make other observations at the site(s)

   b. Designated Staff who received notification will complete an Investigation Report including any supporting information (e.g., DO measurements, symptoms and appearance of dying and dead fish)
   c. Forward phone log and Investigation Report to the WR Scientist (Lori McCloud) who will file and arrange follow-up visit(s) within 72 hours as surveillance for additional deterioration
4. If the kill is extensive and involves more than 1000 fish greater than 6 inches in the aggregate (all locations and all days)
   a. Mobilize staff to measure DO and make other observations at the site(s)
   b. Designated Staff who received notification will complete an Investigation Report including any supporting information (e.g., DO measurements, symptoms and appearance of dying and dead fish)
   c. Forward phone log and Investigation Report to the WR Scientist (Lori McCloud) who will file and arrange follow-up visit(s) within 72 hours as surveillance for additional deterioration
   d. Inform Contractor that dredging should cease within two (2) hours and will not resume until three (3) days have passed without further fish mortality and site conditions appear to have returned to normal. At the discretion of SJRWMD, placement operations may be moved to an alternate permitted project area to resume dredging more quickly.
   e. Conduct aerial surveillance of the project site by fixed-wing aircraft or drone within 72 hours to detect any large accumulations of dead fish or other affected wildlife internal to the project site. Remove accumulated dead fish, if feasible
   f. If large accumulations of dead fish are found and removal is not feasible, SJRWMD will consider raising water levels in the project area to lift dead fish out of contact with soils and to help disperse rafting dead fish to reduce the risk for botulism. Water levels will not exceed the maximum control elevation for the project area
5. If dead birds are found at any time in the project area
   a. Make reasonable efforts to identify the cause of death
   b. Notify Becky Trudeau of the observation, including species, location, timing, and condition
   c. Becky Trudeau will determine whether to collect or dispose of the dead bird. All activities will comply with salvage permit MB032131-0 (attached) or the equivalent permit under future statutes
   d. To reduce the risk for botulism, dead birds should be removed from the wetland if feasible


Lake Apopka - Potential Areas for Planting
Legend
Potential Planting Areas
Areas with UCF > 30cm
Areas with UCF < 30cm
Submersed & Emergent Vegetation
Areas Excluded from Planting and Dredging
Avoidance Areas
Sump Project Footprint
N
0 3,500 7,000 Ft

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-2019-00608(SP-JED)

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

AS-BUILT CERTIFICATION BY PROFESSIONAL ENGINEER

Within sixty (60) days of completion of the authorized work, submit this form and one set of as-built engineering drawings via electronic mail to saj-rd-enforcement@usace.army.mil (preferred, but 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. If you have questions regarding this requirement, please contact the Enforcement Branch at 904-232-3131.*

1. Department of the Army Permit Number: SAJ-2019-00608 (SP-JED)

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

Date Work Started:____________________ Date Work Completed:______________________

Identify any deviations from the approved permit drawings and/or special conditions (attach additional pages if necessary):

ATTACHMENT 5: LANS DISCHARGE AREA TARGET ELEVATIONS

TARGET ELEVATIONS FOR LANS DISCHARGE AREAS PROVIDED IN THE TABLE BELOW:

Site	Area (acres)	Bottom Elev ft	Target Placement Elev ft	Maximal Operating Water Elev ft	Maximal Control Water Elev ft
Cell D	374	61.1	63.0	64.0	64.0
Cell E & E Pond	385	60.2	63.0	64.0	64.0
Cell H & H Pond	320	60.6	63.0	64.0	64.0
Duda	2,500	59.1	59.7	61.3	62.9
Duda East Pond	80	59.1	59.7	61.3	64.9
Phase 1	1,210	58.7	60.6	61.5	62.8
Phase 2 East	630	58.3	59.2	60.4	61.9
Phase 2 West	780	57.5	58.9	60.5	61.4
Phase 3	410	57.4	58.6	59.4	61.5
Phase 4	2,130	55.4	56.5	60.4	61.4
Phase 5	740	58.1	59.0	60.4	61.4
Phase 6	930	56.3	58.1	60.4	62.3
Phase 7	920	58.1	59.3	61.5	61.8
Phase 8 (excl. Lake Jem Sod Farm)	594	57.4	59.3	61.2	61.8
Total	**12,003**				

REFERENCE SHEET 20 OF THE LAKE APOPKA DREDGE AND PLACEMENT TYPICAL PLANS INCLUDED IN ATTACHMENT 1 FOR ADDITIONAL INFORMATION REGARDING THE LOCATION OF EACH DISCHARGE SITE AND THE PORTION OF THE LAKE DREDGE WHICH WOULD PROVIDE THE DREDGE MATERIAL FOR EACH DISCHARGE SITE.

ORANGE COUNTY GOVERNMENT
F L O R I D A

Environmental Protection Division

CONCEPTUAL SHORELINE ALTERATION/DREDGE & FILL PERMIT

Permit No.: SADF-19-02-002
Date Issued: January 13, 2020
Date Expires: January 13, 2040

A Permit Authorizing:

Conceptual approval of a Shoreline Alteration Dredge and Fill (SADF) permit for dredging of the Unconsolidated Flocculent Sediment (UCF) layer within approximately 12,825 acres from Lake Apopka, pumping of the dredged material onto approximately 9,630 acres of wetlands in the Lake Apopka North Shore Area (LANS) and planting approximately 600 acres of littoral zone of Lake Apopka with native vegetation.

This permit is issued pursuant to Orange County Code, Chapter 15, Article VI, Pumping and Dredging Control and is subject to the permit conditions provided on the following pages:

Activity Location:

3451 Lust Road, Apopka, FL 32703
Parcel ID Nos.: 12-21-27-0000-00-006, 01-22-27-0000-00-083, 07-21-27-0000-00-002, and 31-21-28-2855-24-000
Property Description: Board of Trustees of Internal Improvement (state-owned) parcels identified by Parcel ID Nos. 01-22-27-0000-00-083, 07-21-27-0000-00-002, 28-21-31-2855-24-000 and St. Johns River Water Management District (SJRWMD) lands, Lake Apopka North Shore Area, identified by Parcel No. 12-21-27-0000-00-006
Orange County Commission Districts: 1 and 2

Permittee / Authorized Entity:

Ann Shortelle, St. Johns River Water Management District
c/o Joe Wagner
Wood Environment & Infrastructure Solutions, Inc.
E-mail: joseph.wagner@woodplc.com

The Board of County Commissioners approved this permit on December 17, 2019, subject to the following conditions:

Specific Conditions

1. This permit shall become final and effective upon expiration of the 30 calendar-day appeal period following the date of issuance, unless an appeal has been filed within this timeframe. Any appeal shall stay the effective date of this permit until any and all appeals are resolved.

2. The permittee must submit detailed construction plans in conformance with the conceptual plans prepared by Wood Environment & Infrastructure Solutions, Inc., dated as received by EPD on July 30, 2019 for EPD review and approval prior to commencing any construction including, but not limited to, staging, laying of pipes and mooring of dredge vessels. The detailed construction plans and submittals shall include all the information outlined in these permit conditions and EPD reserves the right to request additional information for any submittal. EPD may approve detailed construction plans that are consistent with and conform to all of the conditions listed in this SADF permit without further approval by the Board.

3. In the event there are inconsistencies between the conceptual construction plans referenced above and any future construction proposal(s) in any geographic area or parameters established by the conditions of this permit are exceeded, the conceptual SADF permit shall be amended and approved by the Board prior to approval of any construction plans.

4. This permit shall be valid for a period of 20 years.

5. Public notice shall be provided via standard mail to property owners within 500 feet of any construction phase at least 30 days prior to commencement of construction. EPD shall be copied on the notice.

6. All construction phases will be subject to the 'Fish Kill Contingency Plan' received by EPD on February 26, 2019 (Attachment A).

7. Native vegetation, including but not limited to *Taxodium distichum, Taxodium ascendens, Panicum hemitomom, Juncus effusus, Canna flaccida, Cladium jamaicense, Cyperus sp., Iris virginica, Saggitaria sp., Eleocharis sp., Scirpus sp., Pontederia cordata,* and *Nymphaea odorata*, may not be removed from the shoreline outside of the specified dredge area, specific to project.

8. No filling of wetlands to create uplands is approved with this permit.

9. The permittee shall submit the following for each phase of construction for review and approval by EPD. The review period shall comply with the timeframes in Section 125.022, Florida Statutes (FS) (2019):

    a. Detailed construction plans that are signed and sealed by a professional engineer, licensed in the State of Florida. The construction plans shall include:

        i. A table containing the estimated amount of material to be excavated and the resulting elevation to which the fill will be placed in the LANS wetland cells.
        ii. The limits of the dredging footprint.
        iii. The proposed location for the material placement, including maximum placement elevations.

iv. The proposed locations for all floating pipelines, booster pumps, floating intake or outfall pipes.

v. A plan demonstrating that the barge, floating pipelines and any intake or outfall pipes have all required navigational safety equipment in accordance with Coast Guard requirements per 33 CFR 88.15 and 33 CFR 88.13.

vi. A detailed 'Sediment and Erosion Control Plan.' Construction activities shall be conducted in a manner that does not cause or contribute to violations of state water quality standards. Turbidity and sediments shall be controlled to prevent violations of water quality pursuant to Rules 62-302.500, 62-302.530(70) and 62-4.242 Florida Administrative Code (F.A.C.). Performance-based BMPs shall be implemented prior to and be maintained during and after construction as needed to prevent adverse impacts to the water resources and adjacent lands. Appropriate dredging BMPs shall be implemented, unless a project specific erosion and sediment control plan is approved or other water quality control measures are incorporated as part of the construction phase approval.

vii. A map of all equipment staging, boat launching and boat mooring areas to be utilized within Orange County during the project. The map must include EPD-approved wetland lines for all wetlands within 50 feet of any staging area. A minimum 25-foot upland buffer between the wetland boundary and the staging area must be provided to the greatest extent possible depending on the location and configuration of the available uplands. A separate Conservation Area Impact permit will be required to address and mitigate for any permanent direct and/or secondary impacts to wetlands outside of the scope of the actual dredging operations and placement in the wetland cells.

b. A water quality monitoring program that will monitor water quality conditions to ensure compliance with permit conditions. The monitoring plan shall include at a minimum:

i. Two (2) control sites to provide background conditions during dredging.

ii. Two (2) sentinel sites near the dredge to provide project conditions during dredging.

iii. Monitoring events shall occur twice daily while work is being performed (beginning of workday and end of workday).

iv. Parameters shall include turbidity measurements.

v. Work shall cease in the event of any observation of turbidity greater than 29 NTUs above background within the work area. Turbidity monitoring will continue for the lesser of seven (7) days or until turbidity measurements within the work area fall below 29 NTUs above background for two consecutive readings.

vi. Upon completion of the dredging project turbidity monitoring will continue for two days or until post-construction turbidity values remain less than 29 NTUs above background values for two consecutive readings.

vii. Copies of data and field notes shall be submitted quarterly to EPD at wetlandpermitting@ocfl.net for the length of each construction phase.

c. A survey of existing aquatic vegetation within the littoral zone of the proposed dredge footprint for each construction phase. Dredging activities will avoid all beds of native vegetation with greater than 10 percent areal coverage. Within 90 days of completion of dredging activities for each project, the permittee shall review the avoidance areas identified in the pre-dredge survey. Any dredge impacts to vegetation within those avoidance areas shall be restored to background conditions (similar species and density) within 90 days following completion of dredging. A copy of the restoration plans shall be submitted to EPD at wetlandpermitting@ocfl.net at least 14 days prior to implementation of planting.

d. A geotechnical report including a characterization of the coring data within the dredging footprint to include a delineation of the limits of UCF (horizontally and vertically).

e. Details regarding the specialized heads utilized during hydraulic dredging and how the vertical control of the heads will be established and maintained during project dredging operations. These details shall be submitted to EPD at wetlandpermitting@ocfl.net at least 30 days prior to commencement of construction.

f. An 'Emergency Action Plan' in the event of an emergency (such as a hurricane or fuel spill) for each phase of construction.

g. A monitoring plan to be conducted weekly at one central location within the UCF placement cell(s) currently receiving dredged material during dredging operations. Monitoring plan analytes include dissolved oxygen (both concentration and relative percent saturation), pH, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper, total phosphorus (TP), and total nitrogen (TN).

h. If a discharge to Lake Apopka from the placement cells in the LANS occurs during construction, sampling at the point of discharge to Lake Apopka shall include pH, total and dissolved metals, turbidity, Total Suspended Solids, TP and TN and shall be required monthly only for the duration of the discharge to the lake.

i. Fish sampling data that is less than five years old for each UCF placement cell within that construction phase. The analysis shall include the concentration of organochlorine pesticides and those in the U.S. Environmental Protection Agency's (EPA's) Resource Conservation and Recovery Act (RCRA-8 metals plus copper).

j. Mr. Robert Naleway P.E., Project Manager, and Ms. Susan Davis, Intergovernmental Coordinator, shall be the primary points of contact (POCs) for SJRWMD on this project. It is the responsibility of the permittee to provide updated point-of-contact information for the POCs as needed.

k. A figure illustrating the UCF sample collection locations and the analytical results from a minimum of 10 samples for the target parameters listed in Attachment B:

    i. In addition, the results will include synthetic precipitation leachate procedure (SPLP) analysis using EPA Method 1312 for the three samples that exhibit the greatest concentrations of arsenic.
    ii. All sample laboratory analysis results, chain-of-custody forms, and other supporting documentation will be provided to EPD.
    iii. Please note that if compliance with one or more of the SCTLs found in Table II, Chapter 62-777, F.A.C., is to be demonstrated, it is necessary to ensure that the method detection limits (MDL) of the analytical method(s) selected are appropriate. Please be sure that the laboratory chosen for sample analysis can achieve the appropriate MDL.

10. All field activities will be in general accordance with FDEP's Standard Operating Procedures for Field Activities, DEP-SOP-001/01, dated January 2018, effective April 16, 2018 or as amended/updated. Field sampling activities may be modified, as necessary, to facilitate collection of

the targeted UCF and assist in meeting appropriate MDLs. Details of the modified sampling protocols shall be included in the submittals for each individual construction project.

11. The permittee can plant up to 600 acres of the littoral zone of Lake Apopka with appropriate native plants.

General Conditions

12. Subject to the terms and conditions herein, the permittee is hereby authorized to perform or cause to be performed, the impacts shown on the application and approved drawings, plans, and other documents attached hereto or on file with EPD. The permittee binds itself and its successors to comply with the provisions and conditions of this permit. If EPD determines at any time that activities, including without limitation the performance of the required mitigation, are not in accordance with the conditions of the permit, work shall cease and the permit may be revoked immediately by the Environmental Protection Officer. Notice of the revocation shall be provided to the permit holder promptly thereafter.

13. The permittee shall require the contractor to maintain a copy of this conceptual SADF permit and any subsequent approved permits/construction plans, complete with all approved drawings, conditions, attachments, exhibits, and modifications in good condition at the construction staging site. The permittee shall require the contractor to review the permit prior to commencement of the activity authorized by this permit. The complete permit shall be available upon request by Orange County staff.

14. Issuance of this permit does not warrant in any way that the permittee has riparian or property rights to construct any structure permitted herein and any such construction is done at the sole risk of the permittee. In the event that any part of the structure(s) permitted herein is determined by a final adjudication issued by a court of competent jurisdiction to encroach on or interfere with adjacent property owner's riparian or other property rights, the permittee agrees to either obtain written consent or to remove the offending structure or encroachment within 60 days from the date of the adjudication. Failure to comply shall constitute a material breach of this permit and shall be grounds for its immediate revocation.

15. This permit does not release the permittee from complying with all other federal, state, and local laws, ordinances, rules and regulations. Specifically, this permit does not eliminate the necessity to obtain any required federal, state, local and special district authorizations prior to the start of any activity approved by this permit. 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 upon property which is not owned or controlled by the permittee, or convey any rights or privileges other than those specified in the permit and Chapter 15, Article VI.

16. If these permit conditions conflict with those of any other regulatory agency the permittee shall comply with the most stringent conditions. The permittee shall immediately notify EPD of any conflict between the conditions of this permit and any other permit or approval.

17. Turbidity and sediments shall be controlled to prevent violations of water quality pursuant to Rules 62-302.500, 62-302.530(70) and 62-4.242 F.A.C. BMPs, as specified in the Florida Stormwater, Erosion, and Sedimentation Control Inspector's Manual, shall be installed and maintained at all locations where the possibility of transferring suspended solids into wetlands and/or surface waters

may occur due to the permitted activity. If site-specific conditions require additional measures, then the permittee shall implement them as necessary to prevent adverse impacts to wetlands and/or surface waters.

18. The permittee is hereby advised that Section 253.77, FS, states that a person may not commence any excavation, construction, or other activity involving the use of sovereignty or other lands of the state, the title to which is vested in the Board of Trustees of the Internal Improvement Trust Fund without obtaining the required lease, license, easement or other form of consent authorizing the proposed use. Therefore, the permittee is responsible for obtaining any necessary authorizations from the Board of Trustees prior to commencing activity on sovereignty lands or other state-owned lands.

19. Should any other regulatory agency require changes to the property or permitted activities, the permittee shall provide written notification to EPD of the change prior to implementation so that a determination can be made if a permit modification is required.

20. EPD shall have final construction plan approval to ensure that no modification has been made during the construction plan process.

21. The permittee shall immediately notify EPD in writing of any previously submitted information that is later discovered to be inaccurate.

22. EPD staff, with proper identification, shall have permission to access any portion of the site to inspect, sample, or test to ensure conformity with the plans and conditions approved by the permit.

23. The permittee shall hold and save the County harmless from any and all damages, claims or liabilities which may arise by reason of the activities authorized by the permit.

24. All costs, including attorney's fees, incurred by the County in enforcing the terms and conditions of this permit shall be required to be paid by the permittee.

25. The permittee agrees that any dispute arising from matters relating to this permit shall be governed by the laws of Florida, and initiated only in Orange County.

26. Pursuant to Section 125.022, FS, issuance of this permit by the County does not in any way create any rights on the part of the applicant to obtain a permit from a state or federal agency and does not create any liability on the part of the County for issuance of the permit if the applicant fails to obtain requisite approvals or fulfill the obligations imposed by a state or federal agency or undertakes actions that result in a violation of state or federal law.

27. Pursuant to Section 125.022, FS, the applicant shall obtain all other applicable state or federal permits before commencement of the activity authorized herein.

If you should have any questions concerning this permit, please contact Karen Garrett-Kraus at 407-836-1496 or Karen.Garrett-Kraus@ocfl.net.

Project Manager:

Karen Garrett-Kraus

Karen Garrett-Kraus, Senior Environmental Specialist

Authorized for the Orange County Environmental Protection Division by:

Elizabeth R Johnson

David D. Jones, P.E., CEP, Environmental Protection Officer

KGK/~~NT~~/~~TMH~~/ERJ/DJ/gfdjr:

Attachment: Attachment B

Enclosure(s): Construction Notice
Approved Site Plans

c: Dr. Ann Shortelle, St. Johns River Water Management District, ashortelle@sjrwmd.com
Dr. Mitchell Katz, Orange County EPD, Mitchell.Katz@ocfl.net
FDEP – DEP_CD@dep.state.fl.us

Attachment B

Parameter	Analysis Method	Parameter	Analysis Method
4,4'-DDD	EPA 8081	Endrin ketone	EPA 8081
4,4'-DDE	EPA 8081	gamma-BHC (Lindane)	EPA 8081
4,4'-DDT	EPA 8081	gamma-Chlordane	EPA 8081
Aldrin	EPA 8081	Heptachlor	EPA 8081
alpha-BHC	EPA 8081	Heptachlor epoxide	EPA 8081
alpha-Chlordane	EPA 8081	Iron	EPA 6010
Aluminum	EPA 6010	Lead	EPA 6010
Arsenic	EPA 6010	Mercury	EPA 7471
Barium	EPA 6010	Methoxychlor	EPA 8081
beta-BHC	EPA 8081	Oxychlordane	EPA 8081
Cadmium	EPA 6010	Selenium	EPA 6010
Chlordane (total)	EPA 8081	Silver	EPA 6010
Chromium	EPA 6010	Toxaphene	EPA 8081
cis-nonachlor	EPA 8081	trans-Nonachlor	EPA 8081
Copper	EPA 6010	Total Organic Content	DBE SOP MVP/COE 3-73
delta-BHC	EPA 8081	Nitrogen, Ammonia	EPA 350.1
Dieldrin	EPA 8081	Nitrogen, Kjeldahl	EPA 351.2
Endosulfan I	EPA 8081	Nitrogen, Total	EPA 351.2
Endosulfan II	EPA 8081	Nitrogen (NO2 and NO3)	EPA 353.2
Endosulfan sulfate	EPA 8081	Phosphorus, Total	EPA 365.4
Endrin	EPA 8081	Percent Moisture	ASTM D2974-87
Endrin aldehyde	EPA 8081	Total Solids	ASTM D2974-87

ORANGE COUNTY GOVERNMENT FLORIDA

Construction Notice

Approximate Starting Date: ____.

Approximate Completion Date: ____.

Permit Number & Name: **SADF-19-02-002, Lake Apopka Restoration Conceptual SADF Permit** ____________________.

Remarks:

Agent/Consultant/Permittee: ____.

Date: ____.

Complete and Return to:

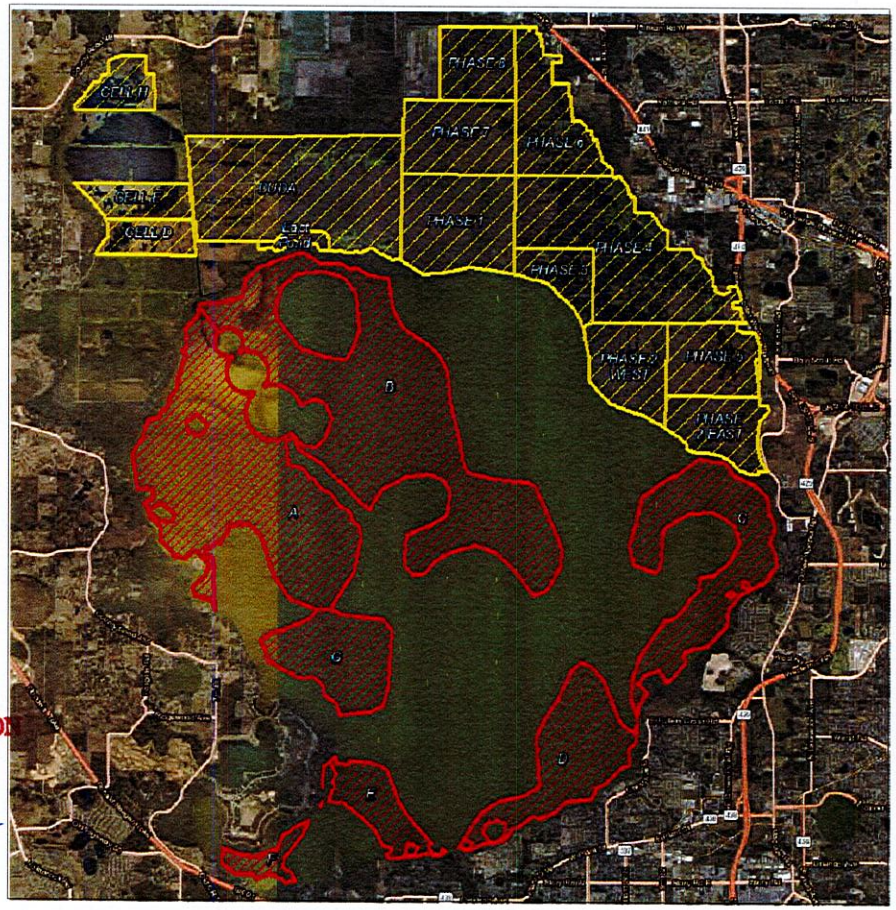
By Email: Karen.Garrett-Kraus@ocfl.net
By Fax: 407-836-1499, Attn: Karen Garrett-Kraus,
By Mail: Orange County Environmental Protection Division
3165 McCrory Place, Suite 200
Orlando, FL 32803

LAKE APOPKA DREDGE AND PLACEMENT TYPICAL PLAN ORANGE AND LAKE COUNTY, FLORIDA

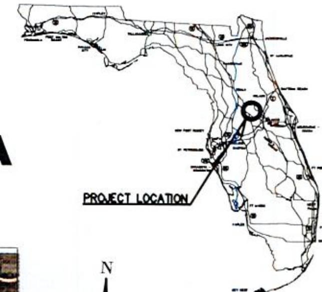
INDEX OF DRAWINGS	
SHEET NO.	SHEET TITLE
1	COVER SHEET/PROJECT LOCATION
2	LAKE APOPKA BATHYMETRY MAP
3	LAKE APOPKA UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS MAP
4	TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (1)
5	TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (2)
6	DREDGE PLACEMENT AREA MAP
7	MATERIAL PLACEMENT SITE TYPICAL CROSS-SECTIONS

RECEIVED
JUL 30 2019
BY: EPC

APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KGK
SADF-19-02-002



NOTE: CONCEPTUAL FOR PERMITTING PURPOSES



N

0 4000' 8000'

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN CHANGED IN SIZE BY REPRODUCTION. THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.

GOVERNING SPECIFICATIONS:
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (FWC);
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP);
U.S. ARMY CORPS OF ENGINEERS (USACE)
IN THE EVENT OF A CONFLICT, THE MOST RESTRICTIVE APPLIES.

PLANS PREPARED BY:

wood.

WOOD ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS, INC.
6256 GREENLAND ROAD,
JACKSONVILLE, FLORIDA 32258
TEL: (904) 396-5173
WEBSITE: WWW.WOODPLC.COM
EMAIL: Joseph.Wagner@woodplc.com
ENGINEER OR RECORD: ROBERT J. WAGNER, P.E., D.NE. (FL63028)
CERTIFICATE OF AUTHORIZATION: FL 5392

PROJECT OWNER:

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
4049 REID STREET, PALATKA, FLORIDA 32177

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
(904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

ROBERT J. WAGNER LICENSE No 63028 STATE OF FLORIDA PROFESSIONAL ENGINEER

ROBERT J. WAGNER, P.E.
FLORIDA P.E. #63028
ENGINEER OF RECORD

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

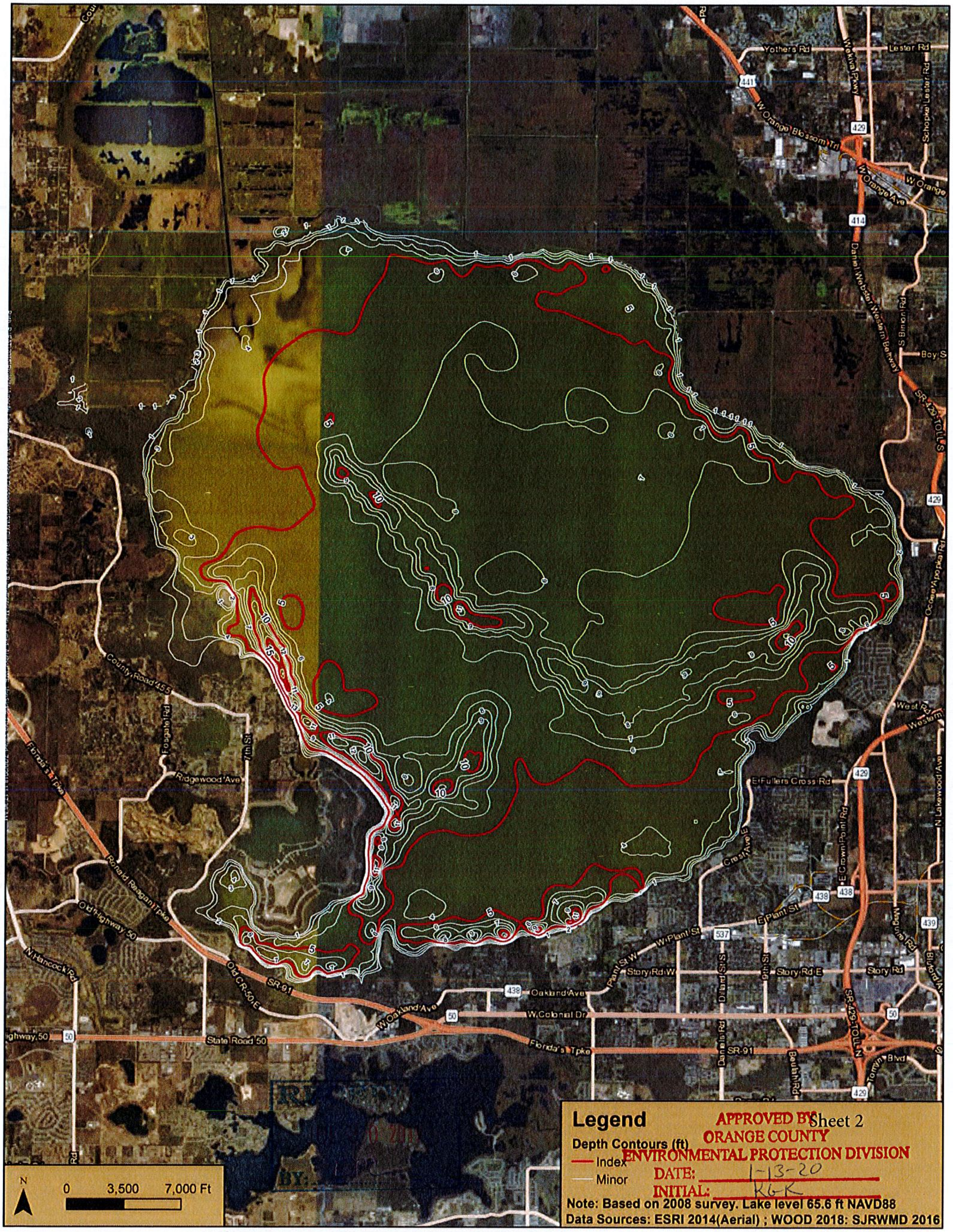
WOOD PROJECT No: 6735-17-9417

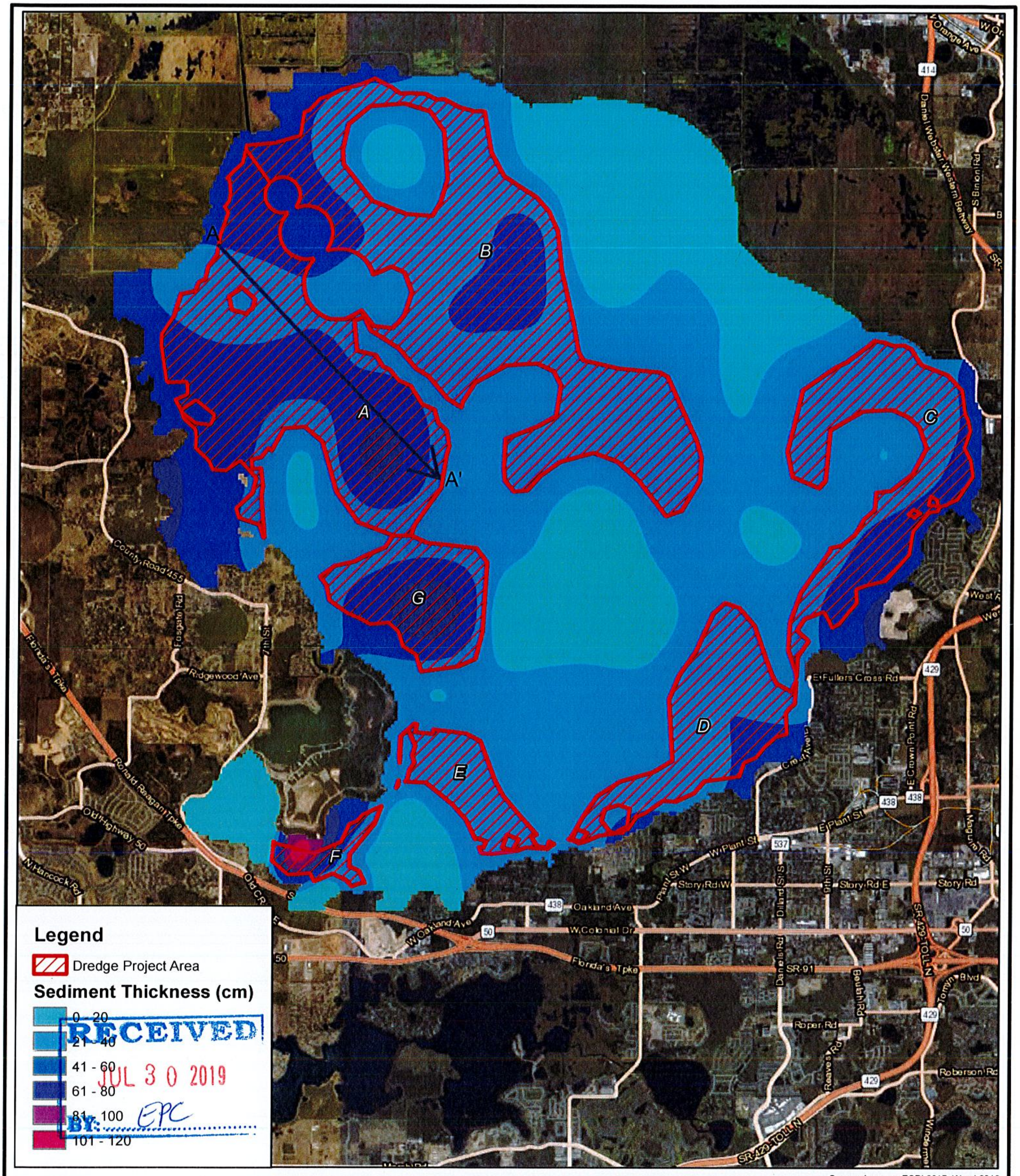
REVISIONS			
NO.	DATE	BY	APPROVED

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	TGD
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
COVER SHEET

SHEET NUMBER: 1 REV. #
SHEET 1 OF 7 SHEETS


Legend
Depth Contours (ft)
Index
Minor
Note: Based on 2008 survey. Lake level 65.6 ft NAVD88
Data Sources: ESRI 2014(Aerial) ; WOOD 2018: SJRWMD 2016
Sheet 2
APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KGK
N
0 3,500 7,000 Ft



RECEIVED
JUL 30 2019
BY: EPC

Source: Imagery, ESRI 2017; Wood 2018

APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KgK

N

0 3,500 7,000 14,000 Feet

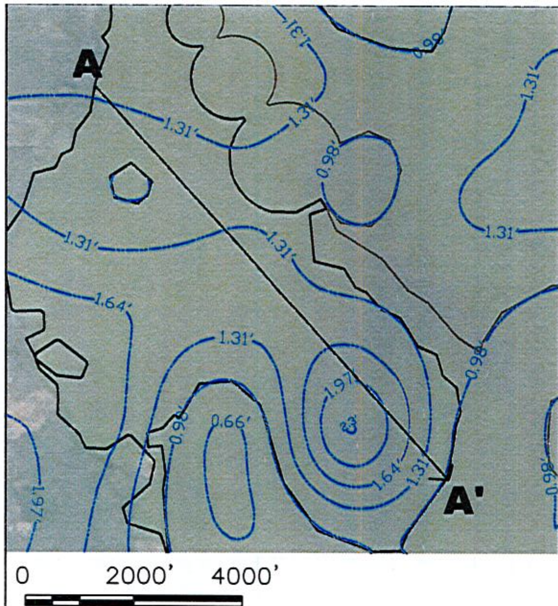
Lake Apopka Dredging Project

UCF Thickness Map

Drawn	Date	Gainesville Florida Project No. 6735179417	wood.	Sheet 3
DLA	1/15/2019			
Checked	Date			
MFC	1/15/2019			

Path: P:\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\Figure 8 UCF Thickness Map.mxd dustin.atwater Date Saved: 1/15/2019 2:20:01 PM

Lake Apopka Water Elevation - 06/16/2019 = 65.83 feet NAVD
Normal High Water Elevation = 66.89 feet NAVD

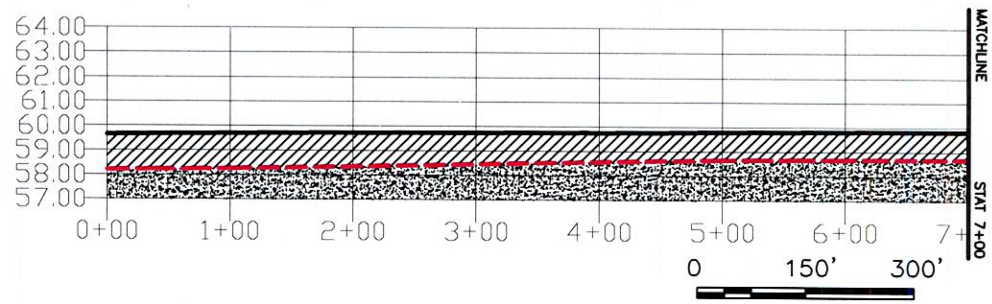


LEGEND

- CROSS-SECTIONS
- VERTICAL LIMITS OF DREDGING
- EXISTING SURFACE
- UNCONSOLIDATED FLOCCULENT (UCF)
- UNDERLYING SEDIMENT
- PROJECT AREA
- 1.31' UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

RECEIVED
JUL 3 0 2019
BY: ERC

CROSS-SECTION A-A'



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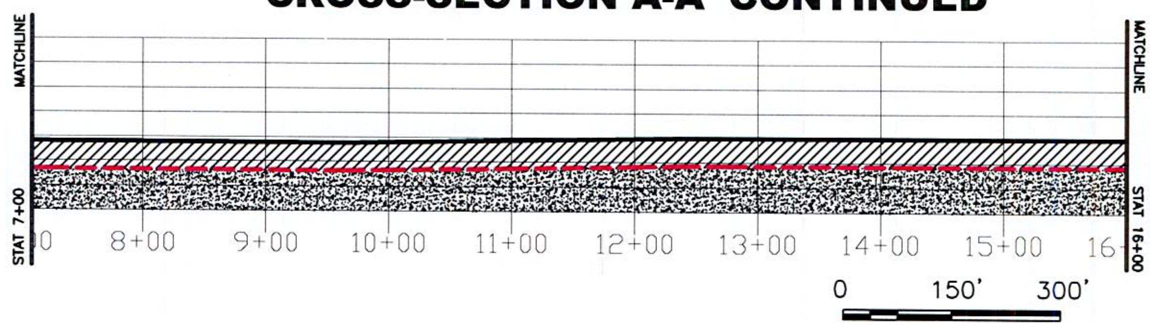

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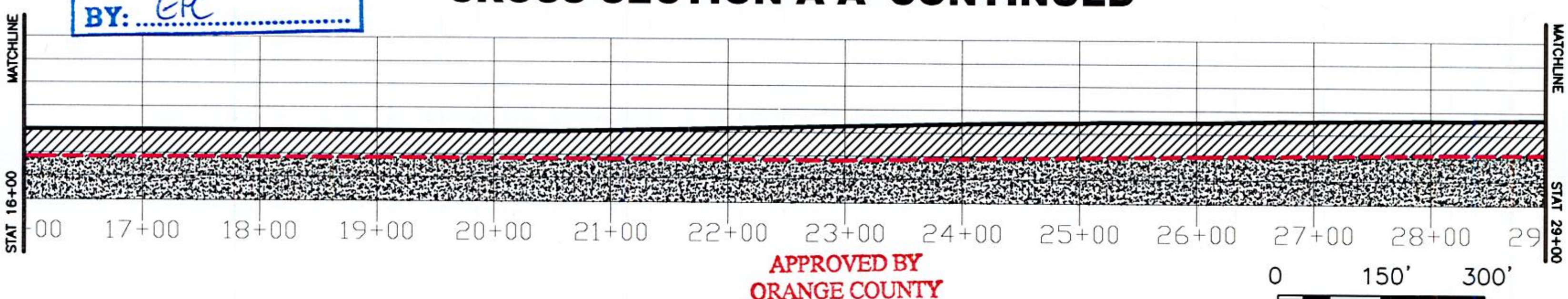


APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KgK

NOTE: CONCEPTUAL FOR PERMITTING PURPOSES

DATA SOURCE: ESRI IMAGERY, WOOD
ELEVATION: NAVD88

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
(904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

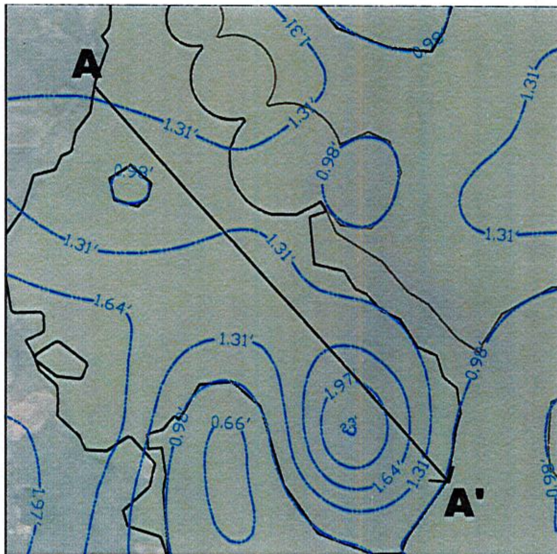
NO.	DATE	BY	APPROVED

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	TGD
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (1)

SHEET NUMBER: 4
REV. #
SHEET 4 OF 7 SHEETS

Lake Apopka Water Elevation - 06/16/2019 = 65.83 feet NAVD
Normal High Water Elevation = 66.89 feet NAVD

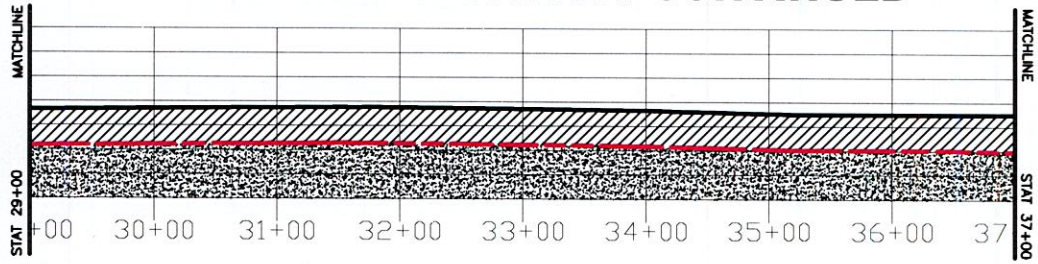


LEGEND

- CROSS-SECTIONS
- VERTICAL LIMITS OF DREDGING
- EXISTING SURFACE
- UNCONSOLIDATED FLOCCULENT (UCF)
- UNDERLYING SEDIMENT
- PROJECT AREA
- UNCONSOLIDATED FLOCCULENT (UCF) SEDIMENT THICKNESS

RECEIVED
JUL 30 2019
EPC

CROSS-SECTION A-A' CONTINUED



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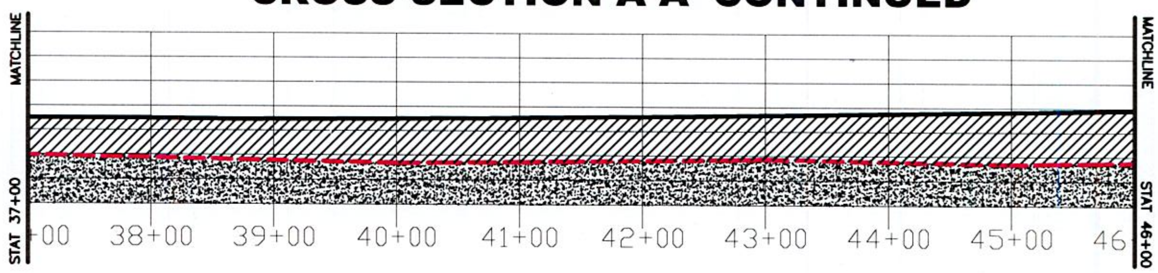
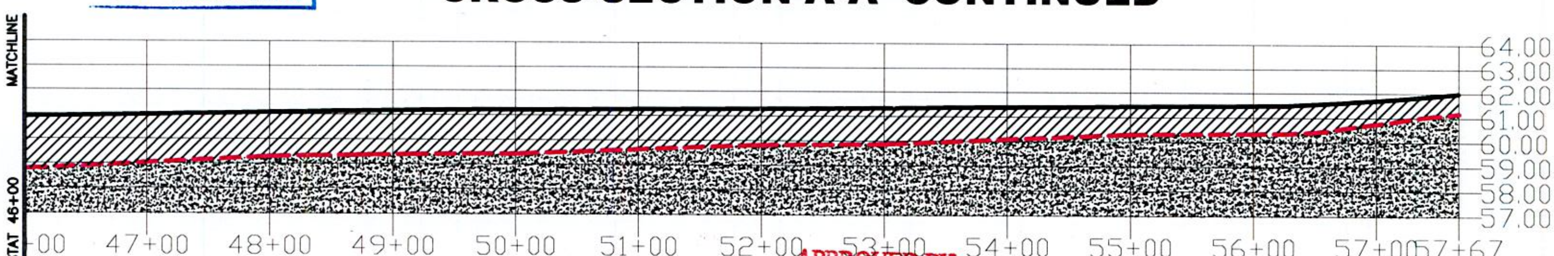


CROSS-SECTION A-A' CONTINUED



APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KGK

NOTE: CONCEPTUAL FOR PERMITTING PURPOSES

DATA SOURCE: ESRI IMAGERY, WOOD
ELEVATION: NAVD88

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
(904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

REVISIONS

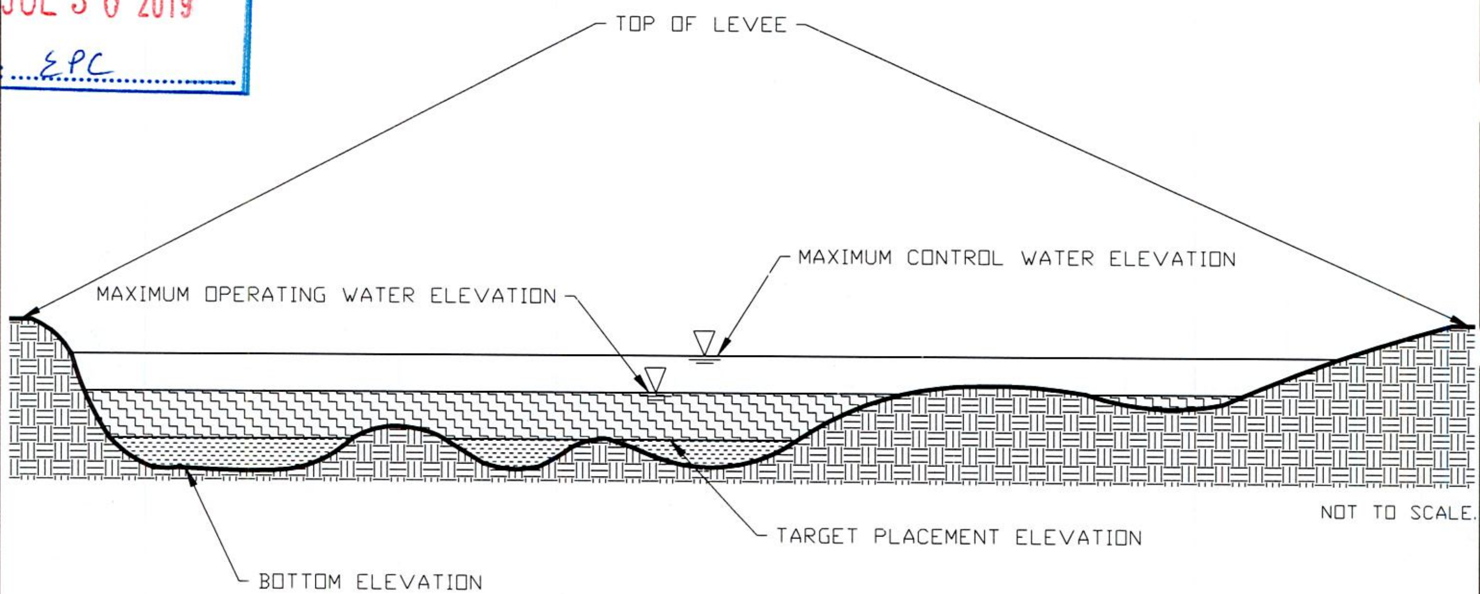
NO.	DATE	BY	APPROVED

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	TGD
APPROVED BY:	RJW
DATE:	1/21/2019

SHEET TITLE:
TYPICAL DREDGE EXISTING & PROPOSED CROSS-SECTION (2)

SHEET NUMBER:	REV. #
5	

SHEET 5 OF 7 SHEETS



NOTE:
CONCEPTUAL FOR PERMITTING PURPOSES.

MAXIMUM CONTROL WATER ELEVATION - THE LEVEL AT WHICH MANAGEMENT INFRASTRUCTURE IS THREATENED. SJRWMD DISCHARGES WATER TO THE INTERNAL WATER MANAGEMENT SYSTEM AS NEEDED TO AVOID EXCEEDING THIS ELEVATION.

MAXIMUM OPERATING WATER ELEVATION - THE MAXIMUM WATER ELEVATION THAT WILL BE ALLOWED DURING PLACEMENT OF SEDIMENT. EXISTING GROUND ELEVATIONS WILL NOT BE AFFECTED ABOVE THIS ELEVATION.

TARGET PLACEMENT ELEVATION - THE MAXIMUM ELEVATION FOR PLACEMENT OF SEDIMENT IF THE ENTER PLACEMENT CAPACITY OF THE CELL WERE USED, THIS LEVEL WOULD BE THE NEW BOTTOM ELEVATION.

BOTTOM ELEVATION - 5TH PERCENTILE OF STAGE AREA CURVE.

LEGEND

EXISTING SURFACE
GROUND
SHALLOW PLACEMENT AREA
DEEP PLACEMENT AREA

APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KGK

wood.

ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS
6256 GREENLAND ROAD
JACKSONVILLE, FL 32258
TEL: (904) 396-5173
CERTIFICATE OF AUTHORIZATION LICENSE NUMBER 5392

PROJECT:
LAKE APOPKA DREDGING AND PLACEMENT

APPLICANT:
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

WOOD PROJECT No: 6735-17-9417

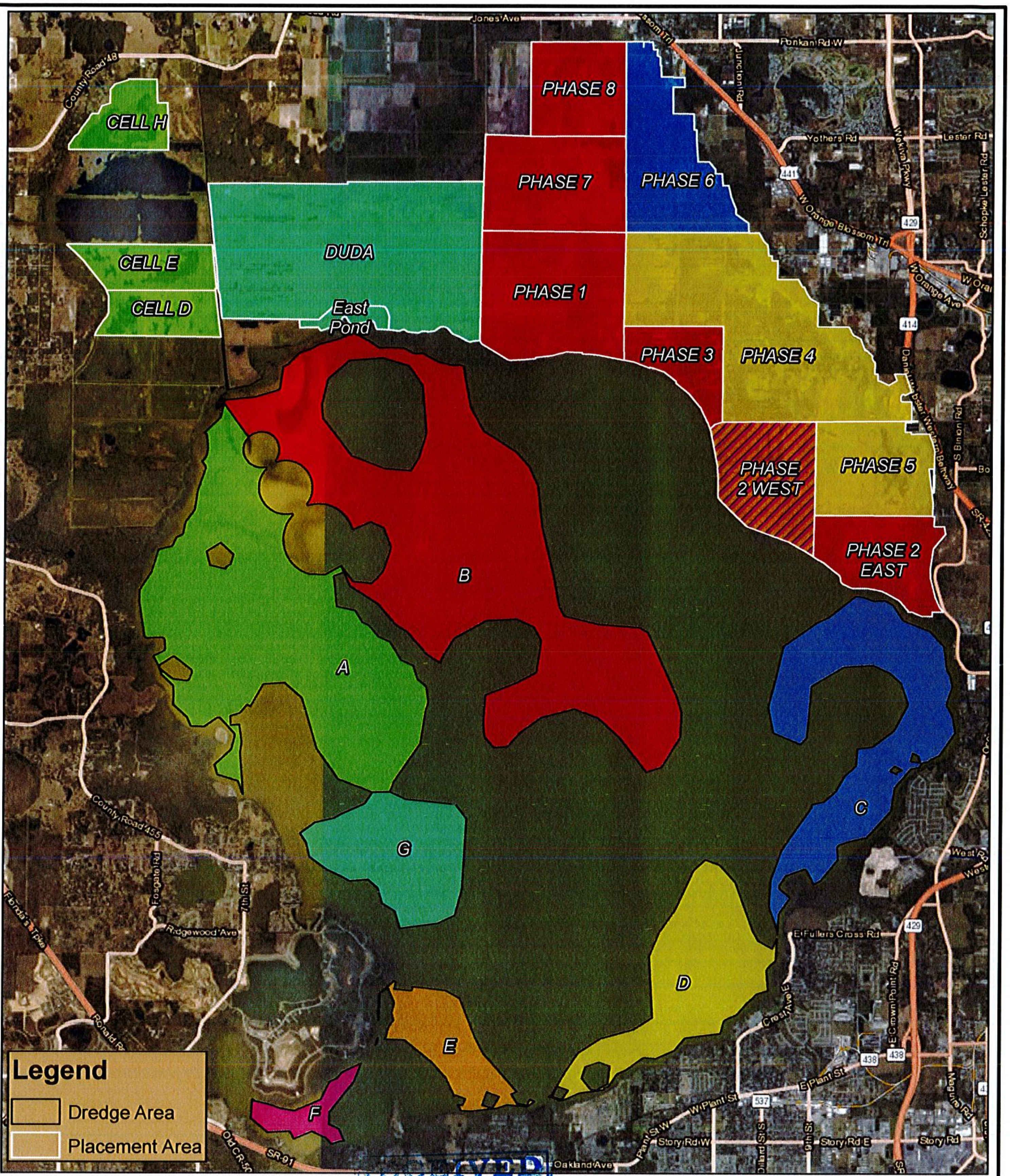
REVISIONS

NO.	DATE	BY	APPROVED

DESIGNED BY:	OTHERS
DRAWN BY:	RJL
CHECKED BY:	SEM
APPROVED BY:	RJW
DATE:	01/21/2019

SHEET TITLE:
MATERIAL PLACEMENT SITE TYPICAL CROSS-SECTIONS

SHEET NUMBER: 6
REV. #
SHEET 6 OF 7 SHEETS



Source: Imagery, ESRI 2017; NWI 2017; Wood 2018

RECEIVED
JUL 30 2019
BY: EPC

APPROVED BY
ORANGE COUNTY
ENVIRONMENTAL PROTECTION DIVISION
DATE: 1-13-20
INITIAL: KSK

N
0 3,500 7,000 14,000 Feet

Lake Apopka Dredging Project

Dredge Material Placement Map

Drawn	Date
DLA	1/4/2019
Checked	Date
MFC	1/4/2019

Gainesville Florida Project No. 6735179417

wood.

Sheet 7

Path: P:\EAT\2015\Projects\Amecfw Lakeland\Lake Apopka Dredging\GIS\MXD\Permit Figures\Figure 1 Dredge Material Placement Map.mxd dustin.atwater Date Saved: 1/4/2019 2:17:02 PM

Orange County Government

Orange County
Administration Center
201 S Rosalind Ave.
Orlando, FL 32802-1393

Decision Letter

Board of County Commissioners

Tuesday, December 17, 2019 | **2:00 PM** | **County Commission Chambers**

19-1790 Shoreline Alteration/Dredge and Fill

St. Johns River Water Management District, Lake Apopka, permit, SADF #19-02-002; District 1 and 2

Consideration: Request for a Shoreline Alteration/Dredge and Fill Permit SADF # 19-02-002 to conceptually authorize hydraulic dredging and associated restoration activities of certain portions of Lake Apopka; Orange County Code, Chapter 15, Article VI, Section 15-218(d)
Location: Districts 1 and 2; on property located adjacent to Lake Apopka, located at 3451 Lust Road, Apopka; Orange County, Florida (legal property description on file in Environmental Protection Division)

A motion was made by Commissioner Moore, seconded by Commissioner VanderLey, to accept the findings and recommendation of the Environmental Protection Division; and further, approve the Shoreline Alteration/Dredge and Fill Permit Application (SADF-19-02-002) for the St. Johns River Water Management District, subject to the conditions of approval listed in the Staff Report. The motion carried by the following vote:

Aye: 7 - Mayor Demings, Commissioner VanderLey, Commissioner Moore, Commissioner Uribe, Commissioner Gomez Cordero, Commissioner Bonilla, and Commissioner Siplin

THE FOREGOING DECISION HAS BEEN FILED WITH ME THIS 10TH DAY OF JANUARY 2020.

DEPUTY CLERK
BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA

Note: This document constitutes the final decision of the Board of County Commissioners on this matter. If, upon the Board's subsequent review and approval of its minutes, an error affecting this final decision is discovered, a corrected final decision will be prepared, filed, and distributed.
np

FLORIDA DEPARTMENT OF
Environmental Protection

CENTRAL DISTRICT OFFICE
3319 MAGUIRE BLVD., SUITE 232
ORLANDO, FLORIDA 32803

August 20, 2019

In the matter of an Application for a Permit/Water Quality Certification and Authorization to Use Sovereign Submerged Lands by:

APPLICANT:
St Johns River Water Management District
4049 Reid Street
Palatka, FL 32177
AShortelle@SJRWMD.com

FILE No.:
0374261-001-EC
COUNTY:
Orange and Lake

PROJECT NAME: Lake Apopka – Unconsolidated Flocculant Dredge and Placement

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**CONSOLIDATED NOTICE OF INTENT TO ISSUE
CONCEPTUAL ENVIRONMENTAL RESOURCE PERMIT
AND LETTER OF CONSENT TO USE SOVEREIGN SUBMERGED LANDS**

The Department of Environmental Protection (Department) gives notice of its intent to issue a Conceptual Environmental Resource Permit (ERP) in accordance with Part IV of Chapter 373, Florida Statutes (F.S.), and Chapter 62-330, Florida Administrative Code (F.A.C.) (draft copy of permit attached).

The Department of Environmental Protection (Department) also gives notice of its intent to grant a Letter of Consent to use sovereign submerged lands for the proposed activity, under Article X, Section 11 of the Florida Constitution, Chapter(s) 253, Title 18, F.A.C., and the policies of the Board of Trustees, as described, below subject to any fees, special lease, easement, or consent of use conditions in the attached Recommended Proprietary Action document. The actual terms of the Letter of Consent will be formally executed at a later date and shall include provisions for rents and such other provisions as normally are included in such letter of consent.

I. DESCRIPTION OF THE PROPOSED ACTIVITY

The applicant, St Johns River Water Management District (SJRWMD), applied on March 14, 2019 to the Department of Environmental Protection for a conceptual approval environmental resource permit, water quality certification and authorization to use sovereign submerged lands owned by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees) to perform hydraulic dredging of the Unconsolidated Flocculant layer of Lake Apopka, with dredge material placement in the Lake Apopka North Shoreline (LANS), as part of a restoration activity.

The activity is located in Astatula and Mount Dora of Lake County and in Apopka of Orange County in Lake Apopka, a Florida Waterbody in the following Section(s), Township, and Ranges:

Sections: 26, 27, 33-36	Township: 20 S	Range: 26 E
Sections: 22, 27-29, 31-35	Township: 20 S	Range: 27 E
Sections: 1-4, 22, 35	Township: 21 S	Range: 26 E
Sections: 1-15, 23, 24, 36	Township: 21 S	Range: 27 E
Sections: 7, 18, 19, 30, 31	Township: 21 S	Range: 28 E

The activity includes consideration of an application for conceptual approval for a Letter of Consent.

II. AUTHORITY FOR REVIEW

The Department is authorized to grant this permit pursuant to Part IV of Chapter 373, F.S., and Chapter 62-330, F.A.C. The activity is not exempt from the requirement to obtain an Environmental Resource Permit. Pursuant to Operating Agreements executed between the 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.

The activity also requires a proprietary authorization, as it is located on sovereign submerged lands owned by the Board of Trustees. The activity is not exempt from the need to obtain a proprietary authorization. Pursuant to Article X, Section 11 of the Florida Constitution, Sections 253.002 and 253.77, F.S., Sections 18-21.0040, 18-21.0051, 18-18, 62-330.075, F.A.C., the policies of the Board of Trustees, and the Operating Agreements executed between the 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 request for proprietary authorization.

III. BACKGROUND/BASIS FOR ISSUANCE

A. General

Lake Apopka historically has been heavily polluted by nutrient loading brought on by large-scale agricultural activity on the north shoreline originating in the 1940's. Large scale algal blooms, decrease in submerged aquatic vegetation, soil subsidence, and diminished water quality lead to legislative action towards restoration.

The 1985 Lake Apopka Restoration Act and 1987 Surface Water Improvement and Management (SWIM) Act were passed by legislation directing the St Johns River Water Management District (SJRWMD) to restore Lake Apopka to Class III water quality standards. The SJRWMD has acquired the floodplain muck farms referred to as the Lake Apopka North Shoreline (LANS) as part of the restoration strategy. Additionally, a Total Maximum Daily Load (TMDL) was adopted for Total Phosphorus for the waterbody.

Regulatory Basis of Issuance:

The applicant has provided reasonable assurance that the project will be capable, based on generally accepted engineering and scientific principles, of performing and functioning as proposed. Previous permits issued to the SJRWMD of similar practice for the purpose of restoration activities include: FDEP Permit No. 0297532-003 and FDEP Permit No. 0279439-003. The SJRWMD provided details of success on the status of the above referenced projects' goals of decreased fish tissue contamination and wetland restoration of the LANS, which would be further enhanced through permitting of the proposed project.

This approval is strictly for the conceptual approval of the proposed project to the SJRWMD to determine that the overall concept of the project is permittable. This is not a construction or operation permit. A future individual Environmental Resource Permit (ERP) will need to be applied for and issued prior to commencing any of the proposed work.

Proprietary Basis of Issuance:

The proposed dredging, vegetation planting, and potential routes of dredge material transportation occur within or on state lands. The project meets the proprietary authorization of a Letter of Consent per Chapter 18-21.005(1)(c)(16), F.A.C: habitat restoration, enhancement, or permitted mitigation activities without permanent preemption by structures or exclusion of the general public, but excluding all mitigation banks.

The material placement locations are all owned by the SJRWMD and therefore are not on state lands.

B. Specific Regulatory Basis for Issuance

The Department has determined, based on the information currently on file and the general and specific conditions included within the attached draft permit, the applicant has provided reasonable assurance that the construction, including the direct, secondary and cumulative impacts, will comply with the provisions of Part IV of Chapter 373, F.S., and the rules adopted thereunder, including the Conditions for Issuance of an environmental resource permit, as provided in Chapter 62-330, F.A.C., and Applicant's Handbook, Volumes I and II (as applicable). The construction and operations of the activity will not result in violations of the water quality standards set forth in Chapters 62-4, 62-302, 62-520, 62-522, and 62-550, F.A.C. Although the applicant is unable to meet water quality standards because existing ambient water quality does not meet standards, the applicant has demonstrated, pursuant to paragraph 373.414(1)(b), F.S., that the activity will provide for a net improvement of the water quality in the receiving body of water for those parameters which do not meet standards. The applicant has also demonstrated that the construction of the activity, including a consideration of the direct, secondary and cumulative impacts, is not contrary to the public interest, pursuant to Section 373.414(1)(a), F.S.

C. Specific Proprietary Basis for Issuance

Through the above and based on the general and/or specific conditions to the Letter of Consent, the applicant has met all applicable requirements for proprietary authorizations to use sovereign submerged lands, pursuant to Article X, Section 11 of the Florida Constitution, Chapter(s) 253, F.S., associated rule(s) 18-21 XX 18-18, F.A.C., and the policies of the Board of Trustees. The applicant has provided reasonable assurance that the activity:

(1) is "not contrary to the public interest";
(2) will maintain essentially natural conditions;
(3) will not cause adverse impacts to fish and wildlife resources or public recreation or navigation; and
(4) will not interfere with the riparian rights of adjacent property owners.

IV. PUBLICATION OF NOTICE

The Department has determined that the proposed activity, because of its size, potential effect on the environment or the public, controversial nature, or location, is likely to have a heightened public concern or likelihood of request for administrative proceedings. Therefore, pursuant to Subsection 373.413(4), F.S. and section 5.5.5.3 of Applicant's Handbook, Volume I, you (the applicant) are required to publish at your own expense this Notice of Intent to Issue. The notice is required to be published one time, in the legal ad section in a newspaper or newspapers of general circulation in the areas affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to:

Florida Department of Environmental Protection
Attn: Megan Warr
3319 Maguire Blvd, Suite 232
Orlando, FL 32803
Megan.Warr@FloridaDEP.gov

The proof of publication shall be provided to the above address within 30 days of issuance of intended agency action, or within 21 days of the date of publication, whichever occurs sooner. Failure to publish the notice and provide proof of publication within the allotted time shall be grounds for denial of the permit and letter of consent to use sovereign submerged lands.

V. RIGHTS OF AFFECTED PARTIES

The Department will issue the environmental resource permit (draft permit attached) and letter of consent to use sovereign submerged lands, unless a timely petition for an administrative proceeding (hearing) is filed under sections 120.569 and 120.57, Florida Statutes, before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the subsequent order may modify or take a different position than this action.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57, Florida Statutes. Pursuant to rule 28-106.201, Florida Administrative Code, a petition for an administrative hearing must contain the following information:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name, address, any email address, any facsimile number, and telephone number of the petitioner; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;

(c) A statement of when and how the petitioner received notice of the agency decision;

(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;

(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;

(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and

(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition

In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant and persons entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

<u>Extension of Time</u>
Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us, before the deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

<u>Mediation</u>
Mediation is not available in this proceeding.

EXECUTION AND CLERKING
Executed in Orlando, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Nathan Hess
Permitting Program Administrator

Attachment(s):
1. Draft Permit No. 0374261-001-EC

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this document and all attachments were sent on the filing date below to the following listed persons:

Megan Warr, FDEP
Leo Anglero, FDEP
Daniel Shideler, FDEP
Christine Daniel, FDEP
Robert Wagner, Joseph.Wagner@woodplc.com
Shannon McMorrow, Shannon.McMorrow@woodplc.com
Neal Thomas, Orange County, Neal.Thomas@ocfl.net
Karen Kraus, Orange County, Karen.Garrett-Kraus@ocfl.net
Robert Naleway, SJRWMD, RNaleway@sjrwmd.com

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.

August 20, 2019

Clerk **Date**

FLORIDA DEPARTMENT OF
Environmental Protection

CENTRAL DISTRICT OFFICE
3319 MAGUIRE BLVD., SUITE 232
ORLANDO, FLORIDA 32803

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

Permittee/Authorized Entity:
St Johns River Water Management District
c/o Dr. Ann Shortelle
4049 Reid Street
Palatka, Florida 32177
AShortelle@SJRWMD.com

Lake Apopka – Unconsolidated Flocculant Removal and Dredge Placement

Authorized Agent:
Wood Environment & Infrastructure Solutions, Inc.
404 SW 140th Terrace
Newberry, Florida 32669
Shannon.McMorrow@woodplc.com

Conceptual Environmental Resource Permit

State-owned Submerged Lands Authorization – Approved

U.S. Army Corps of Engineers Authorization – Separate Corps Authorization Required

Orange County and Lake County
Permit No.: 0374261-001-EC

Permit Issuance Date: XX, 2019
Permit Construction Phase Expiration Date: XX, 2039

FLORIDA DEPARTMENT OF
Environmental Protection

CENTRAL DISTRICT OFFICE
3319 MAGUIRE BLVD., SUITE 232
ORLANDO, FLORIDA 32803

Conceptual Environmental Resource Permit

Permittee: St Johns River Water Management District
Permit No: 0374261-001-EC

This Conceptual Approval Permit DOES NOT AUTHORIZE any construction activity. You must apply for and receive an Individual Environmental Resource Permit prior to undertaking any construction activities.

PROJECT LOCATION

The activities authorized by this permit are in Astatula and Mount Dora of Lake County, Florida, and in Apopka of Orange County, Florida in the following Section(s), Township, Range:

Sections: 26, 27, 33-36	Township: 20 S	Range: 26 E
Sections: 22, 27-29, 31-35	Township: 20 S	Range: 27 E
Sections: 1-4, 22, 35	Township: 21 S	Range: 26 E
Sections: 1-15, 23, 24, 36	Township: 21 S	Range: 27 E
Sections: 7, 18, 19, 30, 31	Township: 21 S	Range: 28 E

PROJECT DESCRIPTION

The permittee is conceptually authorized to perform restoration activities of Lake Apopka via dredging of the Unconsolidated Flocculent Sediment (UCF) layer, placement of the sediment in designated areas within the Lake Apopka North Shore (LANS), and planting of native vegetation. This conceptual approval covers a project area of 25,128 acres with three primary components with a goal to restore Lake Apopka to Class III water quality standards, detailed as follows:

1) **Unconsolidated flocculent sediment (UCF) Dredging (12,826 acres) -**
   Hydraulic dredging of approximately 26,666,598 cubic yards of the UCF layer from seven designated areas of Lake Apopka, depicted on the attached plans. Dredge material is approved for transportation via an existing pipe authorized under ERP File No. 0279439-003. Additional transportation pipelines for dredge material will require review and authorization under the future construction Environmental Resource Permit (ERP).

2) **Placement of UCF on former agricultural areas of the Lake Apopka North Shore (LANS) (12,003 acres) -**
   The placement of dredge material within 14 water-controlled cells of the LANS is proposed in order to achieve part of the restoration plan for the LANS to cover organochlorine pesticide (OCP) contaminated sediments. Burial of the OCP is

intended to remove the contamination from biological processes, and therefore lower fish tissue concentrations. Secondary benefits include raising the soil elevations to offset oxidation and subsidence, and to restore the cells to elevations which can support marsh vegetation.

The LANS will serve as the DMMA of this project to meet this objective. The runoff from the dredging activities will be attenuated, treated, and controlled within the existing levees and water control structures of the LANS. Existing water control structure elevations are detailed on Table 1 of the attached plans. Up to date elevation data for the berms and levees of the LANS, operating water levels, and water control structures will be required upon submittal of the construction ERP.

Water quality from the cells will be monitored and may be treated with an approved settling agent prior to discharge into adjacent cells.

3) **Aquatic and emergent vegetation plantings within the littoral zones of Lake Apopka (300 acres)**

Authorized activities are depicted on the attached exhibits.

AUTHORIZATIONS
Lake Apopka – Unconsolidated Flocculant Removal and Dredge Placement

<u>Environmental Resource Permit</u>
The Department has determined that the activity qualifies for Conceptual Approval of an Environmental Resource Permit. Therefore, the Conceptual Environmental Resource Permit is hereby granted, pursuant to Part IV of Chapter 373, Florida Statutes (F.S.), and Chapter 62-330, Florida Administrative Code (F.A.C.).

<u>Sovereignty Submerged Lands Authorization</u>
The activity is located on sovereignty submerged lands owned by the State of Florida. It therefore also requires authorization from the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Section 253.77, F.S. As staff to the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees) under Sections 253.002, F.S., the Department has determined that the activity qualifies for and requires a Letter of Consent, as long as the work performed is located within the boundaries as described and is consistent with the terms and conditions herein.

During the term of this Letter of Consent you shall maintain satisfactory evidence of sufficient upland interest as required by paragraph 18-21.004(3)(b), Florida Administrative Code. If such interest is terminated or the Board of Trustees determines that such interest did not exist on the date of issuance of this Letter of Consent, this Letter of Consent may be terminated by the Board of Trustees at its sole option. If the Board of Trustees terminates this Letter of Consent, you agree not to assert a claim or defense against the Board of Trustees arising out of this Letter of Consent.

<u>Federal Authorization</u>
Your proposed activity as outlined on your application and attached drawings **does not qualify** for Federal authorization pursuant to the State Programmatic General Permit and a **SEPARATE**

permit or authorization **shall be required** from the Corps. You must apply separately to the Corps using the federal application form (ENG 4345). More information about Corps permitting may be found online in the Jacksonville District Regulatory Division Sourcebook. **Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.**

Authority for review - an agreement with the USACOE entitled "Coordination Agreement Between the U. S. Army Corps of Engineers (Jacksonville District) and the Florida Department of Environmental Protection, or Duly Authorized Designee, State Programmatic General Permit", Section 10 of the Rivers and Harbor Act of 1899, and Section 404 of the Clean Water Act.

Water Quality Certification
This permit also constitutes a waiver of water quality certification under Section 401 of the Clean Water Act, 33 U.S.C. 1341 because the authorized activity involves "net improvement" of water quality under Section 373.414(1)(b)3, F.S.

Other Authorizations
You are advised that authorizations or permits for this activity may be required by other federal, state, regional, or local entities including but not limited to local governments or municipalities. This permit does not relieve you from the requirements to obtain all other required permits or authorizations.

The activity described may be conducted only in accordance with the terms, conditions and attachments contained in this document. Issuance and granting of the permit and authorizations herein do not infer, nor guarantee, nor imply that future permits, authorizations, or modifications will be granted by the Department.

CONCEPTUAL APPROVAL CONDITIONS
The activities described must be conducted in accordance with:

- **The Specific Conditions**
- **The General Conditions**
- **The limits, conditions and locations of work shown in the attached drawings**
- **The term limits of this authorization**

You are advised to read and understand these conditions and drawings prior to beginning the authorized activities, and to ensure the work is conducted in conformance with all the terms, conditions, and drawings herein. If you are using a contractor, the contractor also should read and understand these conditions and drawings prior to beginning any activity. Failure to comply with these conditions, including any mitigation requirements, shall be grounds for the Department to revoke the permit and authorization and to take appropriate enforcement action. Operation of the facility is not authorized except when determined to be in conformance with all applicable rules and this permit, as described.

SPECIFIC CONDITIONS

CONCEPTUAL CONDITIONS

1. This Conceptual Approval Environmental Resource Permit is issued under Chapter 62-330.056, F.A.C., and **does not authorize** any of the construction or impact to surface waters described herein. Any such authorization shall require submittal of an Individual Environmental Resource Permit (ERP) application and subsequent issuance of the appropriate ERP.

2. The Department herby conceptually approves the work shown on the approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof. This permit is binding on the issuance of future construction permits only to the extent that adequate data has been submitted for review by the applicant during the review process. Any activities that exceed the scope of activities covered herein or any deviations from the proposed design are not conceptually authorized by this permit.

2. The Department's issuance of this conceptual permit provides the conceptual permit holder with assurance that the concepts upon which the engineering and environmental designs are based are capable of providing for systems which meet Department rule criteria within the level of detail provided in the submitted plans and designs. A conceptual permit does not assure that a specific application for a construction permit will be granted. The issuance of this conceptual permit does not prevent the Department from requesting additional information during subsequent processing of construction applications. Future approval shall be authorized only to the extent they are consistent with the information and conditions of this conceptual approval permit.

3. Future applications for subsequent phases to construct, alter, operate, maintain, remove, or abandon the system conceptually approved must be consistent with this conceptual approval and shall provide reasonable assurance that the proposed activity will meet the conditions for issuance.

4. If an application for any subsequent phase activity is made that is not consistent with the terms and conditions of the conceptual approval and the conceptual approval is not modified to conform to the proposed activity, the conceptual approval will no longer be valid and the applicant can no longer rely on the conceptual approval as a basis, in part or whole, for issuance of permits for any future phase activities.

5. Prior to submittal of an Individual ERP application for the construction phase of the proposed project, the Applicant is encouraged to conduct a pre-application meeting with a representative of the Environmental Resource Permitting staff to review the application submittal.

6. This permit does not provide conceptual approval of activities, which may occur in, on, or over wetlands or other surface water not specifically described in the attached application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof.

GENERAL CONDITIONS FOR INDIVIDUAL PERMITS

The following general conditions are binding on all Individual Permits issued under this chapter, except where the conditions are not applicable to the authorized activity, or where the conditions must be modified to accommodate project-specific conditions.

1. All activities shall be implemented following the plans, specifications and performance criteria approved by this permit. Any deviations must be authorized in a permit modification in accordance with rule 62-330.315, F.A.C. Any deviations that are not so authorized may subject the permittee to enforcement action and revocation of the permit under chapter 373, F.S.

2. A complete copy of this permit shall be kept at the work site of the permitted activity during the construction phase, and shall be available for review at the work site upon request by the Agency staff. The permittee shall require the contractor to review the complete permit prior to beginning construction.

3. Activities shall be conducted in a manner that does not cause or contribute to violations of state water quality standards. Performance-based erosion and sediment control best management practices shall be installed immediately prior to, and be maintained during and after construction as needed, to prevent adverse impacts to the water resources and adjacent lands. Such practices shall be in accordance with the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (Florida Department of Environmental Protection and Florida Department of Transportation, June 2007), and the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual (Florida Department of Environmental Protection, Nonpoint Source Management Section, Tallahassee, Florida, July 2008), which are both incorporated by reference in subparagraph 62-330.050(9)(b)5., F.A.C., unless a project-specific erosion and sediment control plan is approved or other water quality control measures are required as part of the permit.

4. Unless the permit is transferred under rule 62-330.340, F.A.C., or transferred to an operating entity under rule 62-330.310, F.A.C., the permittee is liable to comply with the plans, terms, and conditions of the permit for the life of the project or activity.

5. If the final operation and maintenance entity is a third party:
   a. Prior to sales of any lot or unit served by the activity and within one year of permit issuance, or within 30 days of as-built certification, whichever comes first, the permittee shall submit, as applicable, a copy of the operation and maintenance documents (see sections 12.3 thru 12.3.4 of Volume I) as filed with the Florida Department of State, Division of Corporations, and a copy of any easement, plat, or deed restriction needed to operate or maintain the project, as recorded with the Clerk of the Court in the County in which the activity is located.
   b. Within 30 days of submittal of the as-built certification, the permittee shall submit "Request for Transfer of Environmental Resource Permit to the Perpetual Operation and Maintenance Entity" [Form 62-330.310(2)] to transfer the permit to the operation and maintenance entity, along with the documentation requested in the form. If available, an Agency website that fulfills this transfer requirement may be used in lieu of the form.

8. The permittee shall notify the Agency in writing of changes required by any other regulatory agency that require changes to the permitted activity, and any required modification of this permit must be obtained prior to implementing the changes.

9. This permit does not:
   a. Convey to the permittee any property rights or privileges, or any other rights or privileges other than those specified herein or in chapter 62-330, F.A.C.;
   b. Convey to the permittee or create in the permittee any interest in real property;

c. Relieve the permittee from the need to obtain and comply with any other required federal, state, and local authorization, law, rule, or ordinance; or
d. Authorize any entrance upon or work on property that is not owned, held in easement, or controlled by the permittee.

10. Prior to conducting any activities on state-owned submerged lands or other lands of the state, title to which is vested in the Board of Trustees of the Internal Improvement Trust Fund, 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 of the Internal Improvement Trust Fund shall not be considered received until it has been fully executed.

11. The permittee shall hold and save the Agency harmless from any and all damages, claims, or liabilities that may arise by reason of the construction, alteration, operation, maintenance, removal, abandonment or use of any project authorized by the permit.

12. The permittee shall notify the Agency in writing:
a. Immediately if any previously submitted information is discovered to be inaccurate; and
b. Within 30 days of any conveyance or division of ownership or control of the property or the system, other than conveyance via a long-term lease, and the new owner shall request transfer of the permit in accordance with rule 62-330.340, F.A.C. This does not apply to the sale of lots or units in residential or commercial subdivisions or condominiums where the stormwater management system has been completed and converted to the operation phase.

13. Upon reasonable notice to the permittee, Agency staff with proper identification shall have permission to enter, inspect, sample and test the project or activities to ensure conformity with the plans and specifications authorized in the permit.

14. If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, stone tools, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, 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 vicinity of the discovery. The permittee or other designee shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section (DHR), at (850)245-6333, as well as the appropriate permitting agency office. Project activities shall not resume without verbal or written authorization from the Division of Historical Resources. If unmarked human remains are encountered, all work shall stop immediately and the proper authorities notified in accordance with section 872.05, F.S. For project activities subject to prior consultation with the DHR and as an alternative to the above requirements, the permittee may follow procedures for unanticipated discoveries as set forth within a cultural resources assessment survey determined complete and sufficient by DHR and included as a specific permit condition herein.

15. 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 binding unless a specific condition of this permit or a formal determination under rule 62-330.201, F.A.C., provides otherwise.

16. The permittee shall provide routine maintenance of all components of the stormwater management system to remove trapped sediments and debris. Removed materials shall be disposed of in a landfill or other uplands in a manner that does not require a permit under chapter 62-330, F.A.C., or cause violations of state water quality standards.

17. This permit is issued based on the applicant's submitted information that reasonably demonstrates that adverse water resource-related impacts will not be caused by the completed permit activity. If any adverse impacts result, the Agency will require the permittee to eliminate the cause, obtain any necessary permit modification, and take any necessary corrective actions to resolve the adverse impacts.

18. A Recorded Notice of Environmental Resource Permit may be recorded in the county public records in accordance with subsection 62-330.090(7), F.A.C. Such notice is not an encumbrance upon the property.

19. In addition to those general conditions in subsection (1), above, the Agency shall impose any additional project-specific special conditions necessary to assure the permitted activities will not be harmful to the water resources, as set forth in rules 62-330.301 and 62-330.302, F.A.C., Volumes I and II, as applicable, and the rules incorporated by reference in this chapter.

NOTICE OF RIGHTS

FLAWAC Review

The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review

Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

EXECUTION AND CLERKING
Executed in Orlando, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

____
Nathan Hess
Permitting Program Administrator

Attachment(s):

1. Exhibit 1, Conceptual Project Plan & Drawings (Location, Dredge and Placement Plan, Biological Assessment), 112 pages

CERTIFICATE OF SERVICE
The undersigned duly designated deputy clerk hereby certifies that this document and all attachments were sent on the filing date below to the following listed persons:

Megan Warr, FDEP, Megan.Warr@dep.state.fl.us
Leo Anglero, FDEP, Leo.Anglero@dep.state.fl.us
Robert Wagner, Joseph.Wagner@woodplc.com
Shannon McMorrow, Shannon.McMorrow@woodplc.com
Christine Daniel, FDEP, Christine.Daniel@dep.state.fl.us

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.

____________ ____________
Clerk **Date**

ATTACHMENT B — INSURANCE REQUIREMENTS

Consultant shall acquire and maintain until completion of the Work the insurance coverage listed below, which constitutes primary coverage. Consultant shall not commence the Work until the District receives and approves Certificates of Insurance documenting required coverage. Consultant's General Liability policy shall include Endorsement CG 20 10 04 13, or equivalent, naming the St. Johns River Water Management District (the "District") as Additional Insured. All required policies shall include: (1) endorsement that waives any right of subrogation (Endorsement CG 24 04 05 09, or equivalent) against the District for any policy of insurance provided under this requirement or under any state or federal worker's compensation or employer's liability act; (2) endorsement to give the District no less than 30 days' notice in the event of cancellation or material change. Certificates of Insurance must be accompanied by copies of the requested endorsements.

Any deductibles or self-insured retentions above $100,000 must be declared to and approved by the District. Approval will not be unreasonably withheld. Consultant is responsible for any deductible or self-insured retention. Insurance must be placed with insurers having an A.M. Best rating of A-V or greater. District receipt of insurance certificates providing less than the required coverage does not waive these insurance requirements.

(a) **Workers' Compensation Insurance.** Workers' compensation and employer's liability coverage, including maritime workers' compensation, if applicable, in not less than the minimum limits required by Florida law. If Consultant claims an exemption from workers' compensation coverage, Consultant must provide a copy of the Certificate of Exemption from the Florida Division of Workers' Compensation for all officers or members of an LLC claiming exemption who will be participating in the Work. In addition, Consultant must provide a completed District "Affidavit (Non-Construction)" for non-construction contracts.

(b) **General Liability.** Commercial General Liability Insurance on an "Occurrence Basis," with limits of liability for each occurrence of not less than $1,000,000 for personal injury, bodily injury, and property damage, with a(n) project aggregate of $2,000,000. Coverage shall include: (1) contractual liability, (2) products and completed operations, (3) independent contractors, and (4) property in the care, control, or custody of the Consultant. Extensions shall be added or exclusions deleted to provide the necessary coverage.

(c) **Automobile Liability. $500,000 combined single limit.**

(d) **Professional Liability.** (Per claim) $1,000,000 single limit and $2,000,000 annual project aggregate limit. Continuous coverage shall be in place for four years after the contract is completed.

ATTACHMENT C — DISTRICT'S SUPPLEMENTAL INSTRUCTIONS (sample)

DISTRICT SUPPLEMENTAL INSTRUCTIONS #

DATE:

TO: __________
____
____
, __________

FROM: Robert Day, Project Manager

CONTRACT NUMBER: 38343

CONTRACT TITLE: Newton Park Dredging Design

The Work shall be carried out in accordance with the following supplemental instruction issued in accordance with the Contract Documents without change in the Contract Sum or Contract Time. Prior to proceeding in accordance with these instructions, indicate your acceptance of these instructions for minor adjustments to the work as consistent with the Contract Documents and return to the District's Project Manager.

1. CONSULTANT'S SUPPLEMENTAL INSTRUCTIONS:

2. DESCRIPTION OF WORK TO BE CHANGED:

3. DESCRIPTION OF SUPPLEMENTAL INSTRUCTION REQUIREMENTS: .

Consultant's approval: (choose one of the items below):

Approved: ____ Date: ______________

(It is agreed that these instructions shall not result in a change in the Total Compensation or the Completion Date.)

Approved: ____ Date: ______________

(Consultant agrees to implement the Supplemental Instructions as requested but reserves the right to seek a Change Order in accordance with the requirements of the Agreement.)

Approved: ____ Date: ______________
Robert Day, District Project Manager

Acknowledged: ____________________________________ Date: ______________
Amy Lucey, District Senior Procurement Specialist

c: Contract file
Financial Services

ATTACHMENT **D – CONTRACT PAYMENT REQUIREMENTS FOR STATE-FUNDED COST REIMBURSEMENT CONTRACTS**

Invoices for state-funded cost reimbursement contracts must be supported by an itemized listing of expenditures by category (salary, travel, expenses, etc.). Supporting documentation must be provided for each amount for which reimbursement is being claimed, indicating that the item has been paid. Check numbers may be provided in lieu of copies of actual checks. Each piece of documentation shall clearly reflect the dates of service. Only expenditures for categories in the approved contract budget will be reimbursed.

Listed below are examples of the types of documentation representing the minimum requirements by cost category:

Salaries:	Submit a payroll register or similar documentation showing gross salary charges, fringe benefits, other deductions, and net pay. If an individual is paid by the hour, a document reflecting the hours worked times the rate of pay is acceptable.
Fringe Benefits:	Fringe benefits should be supported by invoices showing the amount paid on behalf of the employee (e.g., insurance premiums paid). If the contract specifically states that fringe benefits will be based on a specified percentage, rather than the actual cost of fringe benefits, then the calculation for the fringe benefits amount must be shown.
Exception:	Governmental entities are not required to provide check numbers or copies of checks for fringe benefits.
Travel:	Reimbursement for travel must be in accordance with §112.061, Fla. Stat., which includes submission of the claim on the approved State of Florida (State) or District travel voucher.
Other direct costs:	Reimbursement is based upon paid invoices/receipts. If nonexpendable property is purchased using State funds, the contract should include a provision for the transfer of the property to the State when services are terminated. Documentation must be provided to show compliance with Department of Management Services Rule 60A-1.017, F.A.C., regarding the requirements for contracts which include services and that provide for the contractor to purchase tangible personal property as defined in §273.02, Fla. Stat., for subsequent transfer to the State.
In-house charges:	Charges which may be of an internal nature (e.g., postage, copies, etc.) may be reimbursed on a usage log which shows the units, times the rate being charged. The rates must be reasonable.
Indirect costs:	If the contract specifies that indirect costs will be paid based on a specified rate, then the calculation should be shown.

The "Reference Guide for State Expenditures" prepared by the Florida Department of Financial Services can be found at this web address: http:/www.fldfs.com/aadir/reference_guide.htm

ATTACHMENT E – CONSULTANTS COST SCHEDULE

(TO BE INSERTED AFTER CONTRACT NEGOTIATIONS/AWARD AND PRIOR TO CONTRACT EXECUTION)