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IFB NO. Y19-737-RM **ISSUED: February 7, 2019**

INVITATION FOR BIDS

FOR

POND 2 BERN REPAIRS

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PART H
TECHNICAL SPECIFICATIONS

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PART H
Volume II

Orange County Solid Waste Management Facility - Pond 2 Berm Repair
Specifications for Construction

SEQ. NO. 97160

Orange County Utilities
Solid Waste Division
5901 Young Pine Road
Orlando, FL 32829
407-836-6600

09216054.04 | January 4, 2019

SCS ENGINEERS

Florida Certificate of Authorization No. 4892
5850 S. Semoran Blvd
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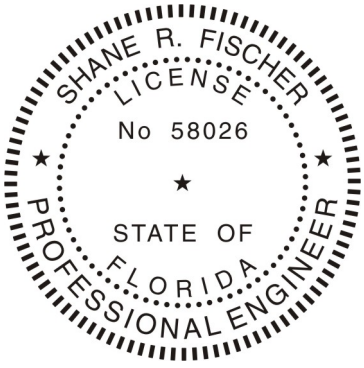
This item has been digitally signed and sealed by Shane R. Fischer, P.E. on January 7, 2019.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic documents.



DIVISION 0
BIDDING AND CONTRACT DOCUMENTS

DIVISION 1
GENERAL REQUIREMENTS

SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE AND INTENT

A. Work Included:

1. The Work to be done consists of furnishing all labor, material, equipment, and the performance of all Work included in this Contract. The Summary of Work is presented in Section 01 11 00. The Contractor shall furnish all supervision, labor, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and means of construction necessary for proper performance and completion of the Work. The Contractor shall obtain and pay for all required permits. The Contractor shall perform and complete the Work in the manner best estimated to promote rapid construction consistent with safety of life and property and to the satisfaction of the County, and in strict accordance with the Contract Documents. The Contractor shall maintain a clean working area during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. Contractor shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.

2. The cost of incidental Work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the Work and shall be included in the prices for the various Contract Items. No additional payment will be made therefore.

3. The Contractor shall provide and maintain such modern materials, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the Work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials and equipment, prior acceptance of the Engineer notwithstanding.

B. Public Utility Installations and Structures:

1. The Contract Documents may contain data relative to existing public utility installations and structures above and below the ground surface. This data is not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make investigations to fully understand the character, condition and extent of all such installations and

structures as may be encountered and as may affect the construction operations.

2. Public utility installations or structures owned or controlled by the County or other governmental body which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as a part of the general cost of doing the Work and shall be included in the prices bid for the various Contract items. No separate payment shall be made therefor.

3. Where public utility installations of structures owned or controlled by the County or other governmental body are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement or rebuilding is necessary to complete the Work under this Contract, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided in the Agreement.

4. The Contractor shall at all times in performance of the Work employ accepted methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.

5. The Contractor shall give written notice to County, other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight (48) hours in advance of breaking ground in any area or on any unit of the Work.

6. The maintenance, repair, removal, relocation or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the owners of such utilities.

7. The Contractor shall make provisions to avoid impacting existing facilities operation or maintenance activities. If an impact is anticipated, the Contractor shall propose a means to maintain existing activities, subject to approval by the County. The County will not be responsible for any costs associated with such proposed modification.

1.02 DRAWINGS AND PROJECT MANUAL

A. Drawings: When obtaining data and information from the Drawings, large to-scale drawings should be used by the Contractor.

B. Copies Furnished to Contractor:

1. After the Contract has been executed, the Contractor will be furnished two (2) sets of plans (24 inches by 36 inches), one (1) electronic copy of the plans, and one (1) copy of the Project Manual (Contract Requirements and Specifications) with all addenda.

2. The Contractor shall furnish each of the subcontractors, manufacturers, and material suppliers such copies of the Contract Documents as may be required for their work. All copies of the Contract Documents shall be printed from the reproducible sets furnished to the Contractor. All costs of reproduction and printing shall be borne by the Contractor.

C. Supplementary Drawings:

1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer and the Contractor will be furnished five (5) sets of plans and one (1) copy of the Project Manual (Contract Requirements and Specifications) with all addenda.

2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the County or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

D. Contractor to Check Drawings and Data:

1. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, schedules, Specifications or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory Work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at no additional expense to County or Engineer. The Contractor shall not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Engineer, should such errors or omissions be discovered.

2. All schedules are given for the convenience of the County and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in Work to be done under the Contract and additional Work claimed by Contractor.

E. Specifications: The Technical Specifications consist of three parts: General, Products, and Execution. The General Section contains General Requirements, which govern the Work. Products and Execution modify and supplement these by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.

F. Intent:

1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified either in the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. The names of proposed manufacturers, material suppliers, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for acceptance, prior to construction, to afford proper investigation and checking. Manufacturers for any materials under this Contract shall be of good reputation and have a plant of ample capacity. The Contractor shall, upon the request of the Engineer, be required to submit evidence that he has manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

2. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the Engineer, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the

Contractor from his full responsibility under this Contract and will not impose any liability on the County or Engineer.

3. Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery:

1. The Contractor shall deliver materials to the site in ample quantities to insure the most speedy and uninterrupted progress of the Work so as to complete the Work within the scheduled time. However, the Contractor shall not store materials on-site for more than thirty (30) days before installation.

2. The Contractor shall also coordinate deliveries in order to avoid delay in, nor impede, the progress of the Work of any related Contractor.

3. All materials and equipment shall be properly stored on site in accordance with these Specifications and the manufacturer's recommendations.

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind, or size of equipment, one complete set of suitably marked high-grade special tools and appliances, which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in accepted painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

2. Spare parts shall be furnished as specified in the specifications.

3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight, and principal rate data.

D. Service of Manufacturer's Engineer:

1. The Contract prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation, the equipment in conformity with the Contract Documents.

2. Prior to the equipment being placed in permanent operation by the County, such Engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as

may be designated by the County in the proper operation and maintenance of such equipment.

1.04 INSPECTION AND TESTING

A. General:

1. Inspection and testing of materials will be provided by the Contractor unless otherwise specified.

2. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Two (2) originally executed and five (5) copies of the reports shall be submitted and authoritative certification thereof shall be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.

3. If, in the performing of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract Documents, the Contractor will be notified thereof and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the Work and replace it with acceptable material, without cost to the County or Engineer.

4. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

5. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage, which may occur to equipment prior to the time when the County executes final acceptance of the Work.

B. Costs:

1. The cost of preliminary shop and field tests of equipment and certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the Contract price.

2. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested for compliance. The Contractor is responsible for providing sufficient information to allow Engineer to determine that the item of material or equipment proposed is equivalent to that specifically named and an acceptable substitute therefor.

If in the sole discretion of the Engineer, tests of the proposed substitute items are necessary for Engineer's review, the substitute items will be tested by the Contractor at no additional cost to the County.

C. Certificate of Manufacture:

1. The Contractor shall furnish to Engineer authoritative evidence in the form of Certificate of Manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents.

2. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product to be provided by the manufacturer. Two (2) original and five (5) copies are to be provided to the Engineer.

D. Shop Tests:

1. Testing for pressure, duty, capacity, rating, efficiency, performance, function or special requirements, which are specified, shall be tested in the shop of the manufacturer in a manner, which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.

2. No such equipment or materials shall be shipped to the Work site until the Engineer notifies the Contractor, in writing, that the results of such tests are acceptable.

3. Two signed original and five copies of the manufacturer's actual test data and interpreted results thereof, accompanied by two signed original and five copies of a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be forwarded to the Engineer for acceptance.

4. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

5. Failure of Tests:

a. Any defects in the materials or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the Contractor at no additional cost to County. The decision for the County as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive.

b. If the Contractor fails to make these corrections or if the improved materials, when tested, shall again fail to meet the guarantees or specified requirements, the County, notwithstanding its partial payment for Work, and materials, may reject the materials and may order the Contractor to remove them from the site at the Contractor's own expense.

c. In case the County rejects any materials, then the Contractor shall replace the rejected materials within a reasonable time. If the Contractor fails to do so, the County may, after the expiration of a period of thirty (30) calendar days after giving notice in writing, proceed to replace such rejected materials and the cost thereof shall be deducted from any compensation due or which may become due to the Contractor under the Contract.

E. Substantial Inspection: During the substantial completion inspection, the Work shall be clean and functional. In no case will the final estimate be prepared until the Contractor has complied with all requirements set forth and the Engineer and County have made their final inspection of the entire Work and are satisfied that the entire Work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

1.05 TEMPORARY STRUCTURES

A. Temporary Fences: If, during the course of the Work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall coordinate with the Engineer and provide a suitable temporary fence at no additional cost to County. The Engineer shall be solely responsible for the determination of the necessity for approving a temporary fence and the type of temporary fence to be used.

B. Temporary Roadway: If, during the course of the Work, it is necessary to disturb the normal traffic flow, the Contractor shall coordinate with the Engineer and County to install temporary roadways, which can maintain typical facility operations at no additional cost to County. The Engineer or County shall be responsible for determining the appropriateness of the temporary roadways.

C. Responsibility for Temporary Structures: In executing the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or Work and for any damage which may result from their failure or their improper construction, maintenance or operation and will indemnify and hold harmless the County and Engineer from all claims, suits or actions and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.06 ACCIDENT PREVENTION

A. Precautions shall be exercised at all times for the protection of person and property. The safety provisions of applicable laws, building codes, and construction codes shall be observed.

B. The Contractor shall comply with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596), and under Hours and Safety Standards Act Section 107 of the contract Work. Hours and Safety Standards Act (PL 91-54), except where state and local safety standards exceed the federal requirements and except where state safety standards have been approved by the Secretary of Labor in accordance with provisions of the Occupational Safety and Health Act, shall be complied with. Updates of the referenced regulations also shall apply.

C. First Aid: The Contractor shall keep upon the site, at each location where Work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when people are employed on the Work.

1.07 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility:

1. The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind, and appurtenances thereto met with during the progress of the Work.

2. The cost of protection, replacement in their original locations and conditions, or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Drawings, and the removal, relocation, and reconstruction of such items called for on the Drawings or specified shall be included in the various Contract Items and no separate payments will be made therefore.

3. The Contractor is expressly advised that the protection of buildings, structures, road, tanks, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility.

4. Conditional inspection of buildings or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the Contractor.

5. Contractor shall, before starting operations, make an examination of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions that might be aggravated by

open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the County and Engineer. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be provided to the County.

6. Prior to the beginning of any excavations, the Contractor shall advise the County of all structures on which he intends to perform Work or which performance of the Work will affect.

1.08 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights:

1. During the prosecution of the Work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents.

2. The Contractor shall provide suitable barricades, red lights, “danger” or “caution” or “street closed” signs and flagmen at all places where the Work causes obstructions to the normal traffic or constitutes in any way a hazard to the public.

B. Access to Public Services: Neither the materials excavated nor the materials or equipment used in the construction of the Work shall be so placed as to prevent free access to all fire hydrants, valves, or manholes.

C. Dust Prevention: The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the roads and/or construction areas dampened with water at all times.

1.09 CLEANING

A. During Construction:

1. During construction, the Contractor shall, at all times, keep the site of the Work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the County or Engineer, such material, debris, or rubbish constitutes a nuisance or is objectionable.

2. The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefore develops. Contractor shall be responsible and liable for all spillage and incur all associated costs including, but not limited to, costs related to repair and maintenance resulting from damages thereof, and fines that may be levied as a result of citations given by State or local regulatory agencies.

B. Final Cleaning:

1. At the conclusion of the Work, all erection plant, tools, temporary structures, and materials belonging to the Contractor shall be promptly removed, and the Contractor shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances at a facility permitted to manage these materials.

2. The Contractor shall thoroughly clean all equipment and materials installed and shall deliver such materials and equipment undamaged in a bright, clean, polished and new operating condition.

C. The Contractor shall be aware of the nature of the activities at a transfer station, which may restrict access to portions of the site due to general transfer station operations.

1.10 PHOTOGRAPHS AND VIDEO

A. Preconstruction: The Contractor shall provide photographs and video prior to commencement of work on the site. Comprehensive preconstruction photographs and video shall be taken at representative locations to be designated by the County that cover all elements of the Work, the laydown areas, and at any areas cleared by the contractor for access to the berm repair area. The photographs shall be high quality digital color images and shall indicate the date, name of work, and the location where the photograph was taken. Photos and videotape shall be submitted to Engineer and County for review and acceptance prior to start of work.

B. Work Progress: The Contractor shall provide construction photographs showing the progress of the work. The photographs shall be taken of such subjects as may be directed and shall indicate the date, name of work, and the location where the photograph was taken. Starting one week after the date of the preconstruction photographs and continuing as long as the work is in progress, weekly photographs shall be taken at approximately the same location as the preconstruction photographs.

C. Final Acceptance: Upon final acceptance of the work, photographs shall be made of the work where directed by the County.

1.11 MISCELLANEOUS

A. Use of Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfection, polymer, reactant, or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions. Contractor shall obtain written approval from County prior to use of

chemicals. Contractor shall maintain a file onsite of MSDS for any used chemicals.

B. Cooperation With Other Contractors and Forces:

1. The Contractor's attention is directed to the fact that Work may be conducted at the site by other contractors during the performance of the Work under this Contract. The Contractor shall conduct its operations so as to cause a minimum of interference with the Work of such other contractors, and shall cooperate fully with such contractors and the construction manager to provide continued safe access to their respective portions of the site, as required to perform their respective contracts.

2. Other Contracts: The County may allow other contractors in the vicinity of the Work site. The Contractor shall cooperate in the coordination of its Work with such other contractors in accordance with the General Conditions.

3. Interference with Work on Utilities: The Contractor shall cooperate fully with all utility forces of the County or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the Work, and shall schedule the Work so as to minimize interference with said relocation, altering, or other rearranging of facilities.

4. The Contractor shall not interfere with or disrupt the operation of employee and customer activities at the Orange County Solid Waste Management Facility (OCSWMF).

C. Fuels and oils stored on site shall have secondary containment, approved by the Engineer.

D. The Contractor shall comply with all permits granted for this Project and for the OCSWMF.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 LOCATION

A. Work included in this Contract will be conducted at the Orange County Solid Waste Management Facility (OCSWMF), 5901 Young Pine Rd, Orlando, Florida 32829. The OCSWMF is owned by the Orange County Board of County Commissioners and operated by the Solid Waste Division of Orange County Utilities (County).

1.02 REQUIREMENTS INCLUDED

A. The Work to be performed under this Contract shall consist of: furnishing all tools, equipment, materials, supplies, and manufactured articles; furnishing all transportation and services, including fuel, power, water; and, performing all labor, Work, or other operations required for the fulfillment of the Contract. Work shall be completed in strict accordance with the Specifications, Schedules, Drawings, and other Contract Documents as herein defined, all of which are made a part hereof, and including detail sketches as may be furnished by the Engineer from time to time during construction in explanation of said Contract Documents and clarifications. The Work shall be complete, and all Work, materials, and services not expressly shown or called for in the Contract Documents which may be necessary for the complete and proper construction of the Work in good faith shall be performed, furnished, and installed by the Contractor as though originally so specified or shown, at no increase in cost to the County.

B. The Work proposed under this contract described below includes restoring an approximately 60-foot breach of a wet detention pond (Pond 2) berm by construction of a sheet pile wall system. The original drawings for the improvements are available for review by the Contractor. The County and Engineer have attempted to fully define the scope of Work the Contractor must perform under this Contract; however, the Contractor should independently verify existing conditions and the Work that will be required. The Contractor's submission of a bid is confirmation that the Contractor has conducted all necessary investigations and site visits, and has reviewed drawings and background documents to fully understand the Work that is required.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work for this Project includes, but is not limited to, installation of temporary erosion control and wetland protection measures; removal of vegetation, excavation of pond bottom and sediment (as needed to complete the Work); installation of a FRP sheet pile wall system and sheet pile cap; installation of

inside and outside wale beam systems; installation of tie-rods and associated connections; installation of stabilization rock, weep hole drainage rock, structural fill, limerock road surfacing, weep holes, and guardrails; installation of sod, installation of rubble stone rip-rap, and other associated activities.

B. The Work of this Contract is located in Orange County, Florida as shown on the title sheet of the drawings. The Contractor shall be aware of the nature of the activities at a landfill, which may restrict access to the site due to the operations of the landfill.

C. Location of existing structures and utilities provided in the Contract Documents are approximate only. Any damage to existing structures or Work of any kind, or the interruption of a utility service resulting from failure to comply with the Contract Documents, shall be repaired or restored promptly by, and at the expense of the Contractor.

D. The Contractor shall complete all Work described above and all Work incidental whether specifically mentioned or not in accordance with the Drawings, Specifications, and Contract Documents.

1.04 CONTRACTOR USE OF SITE

A. Access to Site: Access to the OCSWMF is from the main landfill entrance on Young Pine Road.

B. Working Hours and Period: Work shall be conducted between the hours of 7:00 a.m. and 5:00 p.m. Monday through Saturday. No Work shall be performed on Sundays or legal holidays without written permission of the County. If the Contractor desires to Work after the hours stated or on legal holidays, it shall be requested in writing at least seven calendar days in advance.

C. The Contractor shall reimburse the County for additional construction management and/or inspection costs incurred as a result of unscheduled Work in excess of the working hours indicated in 1.04.B. The Contractor will be reimburse the County $125/hour when the Contractor's Work exceeds 50 hours per week. Such billings shall be deducted from Payment due the Contractor on a monthly basis.

D. Construction Operations: Limited to the areas as noted on Drawings.

E. Limited Use of Property: Construction shall not obstruct the County normal access to, and use of the roadways during all facility hours of operation.

1.05 WORK SEQUENCING AND SCHEDULING CONSTRAINTS

A. The Contractor shall schedule and perform the Work in such a manner as to result in the least possible disruption to the public's use of roadways, driveways, and

utilities. Utilities shall include but not be limited to, landfill gas, leachate collection, drainage structures, ditches and canals, gas, and electric. Prior to commencing with the Work, the Contractor shall perform a location investigation of existing underground utilities and facilities and shall have obtained all required permits and permissions. The Contractor shall also deliver notice to the County and Engineer of all planned disruption to roadways and utilities seven days in advance of the disruption.

B. The Contractor may propose construction sequences to meet the time requirements and submit to the Engineer for review and approval. Upon completion of the Work, the County will conduct a substantial completion inspection and, upon written notification to the Contractor of meeting the requirements for substantial completion, the County will assume control of operation and maintenance for the County's use, notwithstanding any outstanding punch list items as may be developed and other provisions of the Contract Documents which require the Contractor to protect the County's property and facilities.

C. Contractor shall use average commercial dump trucks to transfer soil, rock, etc. to the project area as needed, large off road trucks shall not be permitted on the berm. Also, for the sheet pile installation, large cranes shall not be permitted on the berm. It is the Contractor's responsibility to notify the Engineer and County in regards to equipment to be used for the project.

1.06 STORAGE

A. All arrangements and costs for storage facilities shall be paid by the Contractor, unless specifically designated in the Contract Documents to be furnished by the County.

1.07 NOTICES TO COUNTY AND AUTHORITIES

A. Utilities and other concerned agencies shall be contacted at least seven days prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

B. The Contractor shall review with the various utility companies the construction methods and Work to be done in the vicinity of utilities. When temporary relocation is necessary the Contractor shall give sufficient advance notice to the utility involved.

1.08 AVAILABILITY OF LAND

A. The land available for the Contractor's use during the performance of the Work is limited to the areas within the limits of construction or Contractor storage and staging area as shown on the Contract Drawings.

B. The Contractor shall employ an area within the limits of construction or Contractor storage and staging area for location of office facilities and staging area. The specific location shall be subject to approval of the County/Engineer and shall be coordinated to minimize interference with the operation of the existing facilities located therein and any other construction contracts containing Work to be performed at this site. The Contractor shall submit a sketch of the proposed facilities and areas to the Engineer for consideration and approval prior to use of said areas.

C. All land shall be returned to the specified condition upon completion of the Work. The Contractor shall also comply with the General Terms and Conditions and Supplemental Terms and Conditions of the Contract Documents.

D. Nothing in the Contract Documents shall imply that the Contractor has exclusive use of roadways or public and/or private land employed to perform the Work.

E. All other land deemed necessary by the Contractor for the storage of materials and equipment and other facilities or required for the performance of the Work shall be arranged for by the Contractor at no additional cost to the County.

1.09 VERIFY EXISTING ELEVATION

A. The Contractor understands and agrees that existing elevations and contours, which may be shown on the drawings, are solely for the Engineer's information. Actual quantities of soils and other materials required to complete the Work are the Contractor's responsibility. The Contractor shall determine existing elevations for the purpose of determining earthwork quantities. Surveying shall be performed by a Licensed Land Surveyor registered in the State of Florida, within the limits of construction and shall be completed and submitted to the Engineer prior to beginning any Work on site. The Contractor is responsible to notify in writing the County and the Engineer of any and all discrepancies prior to beginning construction. The survey shall be in accordance with Section 01 32 23 – Survey and Layout Data of these Specifications.

1.10 AVAILABLE INVESTIGATION REPORTS

A. The following report is included in Attachment A of the Contract Documents. This report is made available for the convenience of the Contractor. The County does not guarantee the depth, extent, or character of the material present. The Contractor shall make such examination of the site of the Work, and any material sources, as may be necessary to inform himself of the conditions under which the Work is to be performed.

1. "Report, Geotechnical Engineering Services, Orange County Landfill – Pond 2 Berm Failure", Professional Services, Inc. (PSI), dated March 7, 2018.

2. Water Quality Sampling Results from Various Reports. Available by Request.

1.11 ENGINEER AS THE COUNTY'S REPRESENTATIVE

A. The duties and responsibilities and the limitations of authority of the Engineer during construction are set forth in the Contract Documents and shall not be extended without written consent of the County and the Engineer.

1.12 VISITS TO SITE

A. The Engineer will make visits to the site at intervals appropriate to the various states of construction as the Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of the Contractor's executed the Work. Based on information obtained during such visits and observations, the Engineer will endeavor for the benefit of the County to determine, in general, if the Work is proceeding in accordance with the Contract Documents. The Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Engineer's efforts will be directed toward providing for the County a degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, the Engineer will keep the County informed of the progress of the Work and will endeavor to guard the County against defective Work. The Engineer's visits and on-site observations are subject to all the limitations on Engineer's authority and responsibility set forth in paragraph 1.15, and particularly, but without limitation, during or as a result of Engineer's on-site visits or observations of the Contractor's Work. The Engineer will not supervise, direct, control or have authority over or be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the Contractor to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

1.13 PROJECT REPRESENTATIVE

A. If the County and the Engineer agree, the Engineer will furnish a Resident Project Representative to assist the Engineer in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in the General Terms and Conditions and Supplemental Terms and Conditions. If the County designates another representative or agent to represent the County at the site who is not the Engineer's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other person will be as provided under this section.

1.14 CLARIFICATIONS AND INTERPRETATIONS

A. The Engineer will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as the Engineer may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on the County and Contractor. If the County or Contractor believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree as to the amount or extent thereof, the County or Contractor may make a written claim therefor as provided in the General Conditions.

1.15 REJECTING DEFECTIVE WORK

A. The Engineer will have authority to disapprove or reject Work which the Engineer believes to be defective, or that the Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. The Engineer will also have authority to require special inspection or testing of the Work as provided in the Contract Documents, whether or not the Work is fabricated, installed or completed.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 20 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 GENERAL

A. Payments to the Contractor shall be made on the basis of the Bid Items as full and complete payment for furnishing all material, labor, tools and equipment, and for performing all operations necessary to complete the Work included in the Contract Documents. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the Work or from any discrepancies between the actual quantities of Work and those shown in the Contract Documents, or from any unforeseen difficulties which may be encountered during the prosecution of the Work until final acceptance by the County and Engineer. This is a lump sum contract.

B. The prices stated in the Bid Form include all costs and expenses for taxes, labor, equipment, material, commissions, transportation charges and expenses, patent fees and royalties, labor for handling material during inspection, together with any and all other costs and expenses for performing and completing the Work, as shown on the Drawings and specified herein. The basis of payment for Bid Items at the price shown in the Bid Form shall be in accordance with its description of the item in this section and as related to the Work specified and shown on the Drawings.

C. No separate payment shall be made for any Bid Item that is not specifically set forth on the Contractor's Bid Form and all costs therefore shall be included in the prices named on the Contractor's Bid Form for the various appurtenant Items of Work.

D. The Contractor's attention is called to the fact that the quotations for the various items of Work are intended to establish a total price for completing the Work in its entirety. The cost of Work for which there is not a separate Bid Item shall be included in a related Bid Item, or shall be distributed over all Bid Items, such that the bid for the project reflects the total price for completing the Work in its entirety.

E. Payment of any bid item in part or in full, prior to Final Payment, shall not be regarded as acceptance of that item.

F. The Contractor's attention is called to the fact that if shown, the estimated quantities appearing in the Bid Form consists of the Engineer's opinion of what will be required to complete the Work as designed. Neither the County nor the Engineer guarantees the accuracy or exactness of the figures. The actual quantities will be determined during and after construction, based upon the

measurements herein described. The estimated quantities are not a guarantee of the magnitude of Work. The County reserves the right to authorize additional amounts of any or all of the Bid Items, and to reduce or totally eliminate any of the Bid Items, without affecting any other Bid Items.

G. All existing elevations and dimensions shown on the Drawings are approximate and the Contractor is responsible to field verify all elevations and dimensions, as needed.

H. All estimated quantities stipulated on the Contractor's Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work and (b) for the purpose of comparing the Bids submitted for the Work. The actual amount of Work done and materials under Unit Price Items may differ from the estimated quantities. The basis of payment for Work and materials shall be the actual amount of Work done and materials furnished. Contractor agrees that he shall make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of Work actually performed and materials actually furnished and the estimated amounts thereof, as described in the supplementary conditions.

I. The Contractor shall immediately report overpayment on any item.

J. The County will have the right to deduct for overpayment of any item, when discovery of overpayment is made, and to adjust the amounts due the Contractor accordingly.

K. The County will have the right to require the Contractor to expose any item which was covered after installation (unless previously inspected and tested by Engineer) for the purpose of measuring, testing, or inspecting the item; and the Contractor shall comply with such request. No separate or additional payment will be made for such extra work. The Contractor shall, when accepted or directed to by the County, restore and repair the Work in conformance to the Contract Documents.

L. Work performed beyond the Contract requirements shall be approved and accepted before payment may be made. Mere knowledge by the County or the Engineer that the Contractor has performed a task shall not constitute acceptance of the task for the purpose of payment, and the County will not be under obligation to pay for the task.

M. The County reserves the right to request of the Contractor a breakdown of any Bid Items, which the Contractor shall promptly provide. The breakdown shall consist of labor, equipment, and the cost of material for the Bid Item or the various components included within the Bid Item.

N. Lump Sum items have been established for all portions of the Work except as previously noted. The term "Lump Sum" shall mean complete payment for the

unit of Work described. Where the unit measurement is described as "Lump Sum", the unit shall include all necessary appurtenances and incidentals required to complete the unit of Work in its entirety. Measurement of the Lump Sum Work will be estimated by the values in the Schedule of Values as applied to the completed portion of Work for purposes of monthly payment estimates.

1.02 COMPUTATION OF QUANTITIES

A. Measurement of quantities expressed as area shall be based upon a horizontal, planimetric projection to the Work limits as determined by survey Record Drawings prepared by a surveyor licensed in the State of Florida. Cost of surveying shall be paid by Contractor, and incorporated into Bid Items, as appropriate.

B. Measurement of linear Items shall be for quantities actually field installed to the specified Work limits, based upon surveyed stations recorded along the straight or curved centerline of each respective Item. Measurement conducted by survey is to be conducted by the Contractor's approved surveyor licensed in the State of Florida.

C. Measurement of quantities expressed as volume shall be based upon a neat plan line projection to the Work limits (planimetric measure) as determined by survey Record Drawings for each Item, with no additional allowances for shrinkage, swelling, or creep. Quantities expressed as volume shall be in-place volumes to the dimensions indicated on the Contract Drawings.

1.03 MEASUREMENTS

A. Progress payments for Bid Items will be considered on a percent completed basis. The Schedule of Values prepared as per the General Conditions will be used as the basis of the percent complete. The Contractor shall estimate the value of the Work performed, subject to the review and acceptance by the Engineer.

B. The Engineer and County will review installed quantities prior to making payments. The Contractor shall give the Engineer and County access to all field data, calculations, and computations. In the event of discrepancies or the need for additional field data to confirm quantities, the Contractor shall be responsible for the additional field measurement cost.

C. Prior to submitting the first requisition for payment, the Contractor shall secure the Engineer's and County's concurrence on the methods and procedures for making field measurements and the manner in which calculations will be performed in preparation of progress and final payment estimates.

D. Quantity estimates, field measurements, certifications, and related backup information that are submitted in support of payment request will be considered

by the County as having been prepared by the Contractor, even when prepared by or submitted on behalf of the Contractor by others.

E. The value of furnished materials, for which partial progress or full payment is made during the course of the Work that remain unused at the closing of the Contract, shall be deducted from the amounts due the Contractor in the Final Payment.

1.04 MEASUREMENT AND PAYMENT

A. Bid Item No. 1 - Mobilization/De-Mobilization (Lump Sum)

Description: The Work specified in this Bid Item consists of the preparatory Work and operations in mobilizing for beginning Work on the Project and operations of demobilizing from the site. The Work includes but is not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to and from the Project site and for the establishment of temporary office(s), establishment of the Contractor's storage and staging area, safety equipment and first aid supplies, sanitary and other facilities as required by these Specifications and State and local laws and regulations. This item includes the costs any other pre-construction expense necessary for the start of the Work, excluding the cost of construction materials. This Bid Item shall include mobilization and demobilization for all parts or phases of the total Project.

Measurement: The quantity of mobilization to be paid for under this Bid Item shall be measured as one Lump Sum (LS) quantity. Partial payments shall be made therefore in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item
5	20
10	50
25	60
50	80
100	100

Payment: The quantities as determined above shall be paid for at the contract Lump Sum (LS) price set out in the Bid, which price and payment constitutes full compensation for all the Work described herein.

B. Bid Item No. 2 - Temporary Sediment and Erosion Control (Linear Foot)

Measurement: Measurement for silt fence will be based on the linear feet of installed silt fence as shown on the Drawings.

Payment: Payment will be made at the Contract Unit Price per linear foot which

shall be full compensation for purchasing, trenching, installation, and maintenance of silt fence. No additional payment will be made for replacement or repair of silt fence.

C. Bid Item No. 3 - Floating Turbidity Barrier (Linear Foot)

Measurement: Measurement for floating turbidity barrier will be based on the linear feet of installed barrier as shown on the Drawings.

Payment: Payment will be made at the Contract Unit Price per linear foot which shall be full compensation for purchasing, installation, and maintenance of the floating turbidity barrier. No additional payment will be made for replacement or repair of the floating turbidity barrier.

D. Bid Item No. 4 - Surveying and Control (Each)

Measurement: Measurement for surveys shall be based on an approved preconstruction survey and approved as-built survey for payment and all items related to survey Work shall be included in the Contract Unit Price.

Payment: Payment for surveying shall be made at the Contract Unit Price per survey (pre-construction and as-built). Payment shall be full compensation for the preparatory Work, establishment of construction controls, record keeping, and preparation of required survey record documents for the Project. Payment shall not be made until survey deliverables are submitted and accepted by the Engineer.

E. Bid Item No. 5 - Bid Item - Clearing, Grubbing, and Debris Removal (Ton)

Description: The Work specified in this Bid Item shall be for clearing and grubbing in accordance with the requirements of the Contract Documents and the Contractor's means and methods and shall include the areas of ground that were cleared (i.e., removal and disposal of materials found on the surface of the ground such as trees, brush, waste materials, rock, debris, and minimal sediment deposited into Pond 2 if required for Project Work) and grubbed (i.e., removal of materials at or protruding from the surface of the ground such as grass, stumps, roots, etc.) which are understood by generally accepted practice not to be suitable for the Project.

Measurement: This item shall be measured based on weight on the OCSWMF inbound/outbound scales. The Contractor shall not rely on the estimated quantities given, but shall instead estimate all quantities for this item independently for the basis of their bid. No claim shall be made by the Contractor for deviations between the Contractor's estimated quantity and the estimated Engineer's quantity including the quantity required to complete the Work. The Contractor shall base the bid solely on the Contractor's independently estimated quantity.

Payment: Payment will be made at the Contract Unit Price per ton based on the OCSWMF inbound/outbound scales which price shall be full compensation for excavation, loading, hauling and all other incidentals necessary to remove these materials from the Project area. The County will not charge the Contractor a tip fee for onsite disposal of the material.

F. Bid Item No. 6 - Composite Sheet Pile Wall (Square Feet)

Measurement: Measurement of the Sheet Pile Wall shall be the total square feet (SF) of Composite Sheet Pile Wall installed per the Contract Documents. The length of each pile driven shall be measured to the nearest tenth of a foot and converted to square feet for payment purposes. The square footage shall be determined by multiplying the measured length of sheet pile acceptably driven to the elevation shown on the Contract Drawings times the theoretical width of the pile. No payment shall be authorized for bowing or compression altering the width of the sheet pile installed. The portion of any sheet pile driven below the tip elevation shown on the Contract Drawings shall not be measured for payment unless over driving is directed and approved by the Engineer and County. No payment will be made for damaged material. Any material damaged during the storage or installation will be replaced at the Contractor's expense.

Payment: Payment per square foot (SF) of acceptably installed Composite Sheet Pile Wall shall be based on the measured quantity times the Contract Unit Price for the Composite Sheet Pile Wall. The Contract Unit Price shall constitute full compensation for Work covered under this Bid Item including supplying all materials, equipment, products, manpower, tools, and Work associated with installing the Composite Sheet Pile Wall. Work shall also include removing possible subsurface obstructions if encountered, and any other incidentals necessary for complete installation of the Composite Sheet Pile Wall and shall include all Work related to the installation including, quality control, utility coordination, installation of hydrophilic sealant, and all other associated activities not covered by another Bid Item.

G. Bid Item No. 7 - Outside Wale Beam System (Linear Feet)

Measurement: This Bid Item shall be the number of in-place linear feet (LF) of Wale Beam System satisfactorily installed in compliance with the Contract Documents and accepted by the Engineer. The Outside Wale Beam System consists of two 4x7.5 wale beams and associated hardware as shown on the Contract Drawings. Hardware incidental to the installation of the Outside Wale Beam System includes, but is not limited to, saddle bearing plates, splice plates, bolts, washers, nuts, etc.

Payment: Payment for this Bid Item shall be at the Contract Unit Price per linear foot (LF) installed. The Contract Unit Price for this item shall be payment in full for the Contractor to provide all labor, materials, hardware, and equipment necessary to install wales and all associated hardware and accessories as required

for proper installation.

H. Bid Item No. 8 - Inside Wale Beam System (Linear Feet)

Measurement: This Bid Item shall be the number of in-place linear feet (LF) of Wale Beam System satisfactorily installed in compliance with the Contract Documents and accepted by the Engineer. The Inside Wale Beam System consists of one 4x6 wale beam and associated hardware as shown on the Contract Drawings. Hardware incidental to the installation of the Inside Wale Beam System includes, but is not limited to, saddle bearing plates, splice plates, bolts, washers, nuts, etc.

Payment: Payment for this Bid Item shall be at the Contract Unit Price per linear foot (LF) installed. The Contract Unit Price for this item shall be payment in full for the Contractor to provide all labor, materials, hardware, and equipment necessary to install wales and all associated hardware and accessories as required for proper installation.

I. Bid Item No. 9 - Sheet Pile Cap (Linear Feet)

Measurement: This Bid Item shall be the number of in-place linear feet (LF) of sheet pile cap satisfactorily installed in compliance with the Contract Documents and accepted by the Engineer. The Sheet Pile Cap shall be installed on top of the Composite Sheet Pile to the dimensions shown on the Contract Drawings. Hardware incidental to the installation of the Sheet Pile Cap includes, but is not limited to, bolts, washers, nuts, epoxy, etc.

Payment: Payment for this Bid Item shall be at the Contract Unit Price per linear foot (LF) installed. The Contract Unit Price for this item shall be payment in full for the Contractor to provide all labor, materials, and equipment necessary to install the sheet pile cap and all associated hardware and accessories as required for proper installation.

J. Bid Item No. 10 - Tie-Rods 1.5 inch Diameter 20 Feet Long (Each)

Measurement: Measurement shall be the number of each in-place 1.5-inch diameter tie-rods installed in compliance with the Contract Documents and Specifications and accepted by the Engineer. The estimated length of each tie-rod is 20 feet for bidding purposes, however, the actual length of each tie-rod may vary based on field conditions and installation of the sheet piles and will be the responsibility of the Contractor to confirm the final required length for proper installation per the Contract Drawings. Hardware incidental to the installation of the tie-rods includes, but is not limited to, bolts, washers, nuts, etc.

Payment: Payment for this Bid Item shall be at the Contract Unit Price per tie-rod installed. The Contract Unit Price shall constitute full compensation for Work covered under this Bid Item including supplying all materials, equipment,

products, manpower, tools, and any other incidentals necessary for complete installation of the tie-rod system and shall include all Work related to the installation including, quality control, utility coordination, and all other associated activities not covered by another Bid Item.

K. Bid Item No. 11 - Weep Holes 2 inch Diameter (Each)

Measurement: Measurement for the Work specified in this Bid Item shall be a Contract Unit Price basis on a per installed weep hole. The weep holes shall be 2-inch diameter Everdrain or equal and installed per the Contract Drawings.

Payment: Payment for this Bid Item shall be the Contract Unit Price per weep hole to provide all labor, materials, supplies, and equipment necessary to install weep holes in accordance with the Contract Documents.

L. Bid Item No. 12 - Stabilization Rock Layer (Cubic Yard)

Measurement: Measurement for this Bid Item shall be on a cubic yard basis of No. 57 stone installed within the sheet pile system to the lines and grades shown on the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item will be made at the Contract Unit Price per cubic yard basis to provide all labor, materials, supplies, and equipment necessary to complete the Stabilization Rock Layer in accordance with the requirements of the Contract Documents. Payment shall be full compensation for the material, transportation, and placement of the Stabilization Rock Layer.

M. Bid Item No. 13 - Sheet Pile Wall Backfill (Cubic Yard)

Measurement: Measurement for this Bid Item shall be based on a cubic yard (CY) basis of installed Sheet Pile Wall Backfill according to the lines and grades shown on the Contract Documents, compacted, tested, and accepted by the Engineer.

Payment: Payment for this Bid Item shall be the Contract Unit Price per Cubic Yard (CY) of Backfill which shall be payment to provide all labor, materials, supplies, and equipment necessary to complete the soil backfilling of the Sheet Pile Wall in accordance with the requirements of the Contract Documents. Payment shall be full compensation for the material, transportation, finishing, compaction, testing, and maintenance of the Sheet Pile Wall Backfill.

N. Bid Item No. 14 - Weep Hole Drainage Rock Layer (Cubic Yard)

Measurement: Measurement for this Bid Item shall be on a cubic yard basis of No. 57 stone installed within the sheet pile system to the lines and grades shown on the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item will be made at the Contract per cubic yard basis to provide all labor, materials, supplies, and equipment necessary to complete the Weep Hole Drainage Rock Layer in accordance with the requirements of the Contract Documents. Payment shall be full compensation for the material, transportation, and placement of the Weep Hole Drainage Rock Layer.

O. Bid Item No. 15 - Geotextile (Square Foot)

Measurement: Measurement for this Bid Item shall be on a square foot basis of Geotextile installed below the Stabilization Rock Layer, above and below the Weep Hole Drainage Rock Layer within the Sheet Pile Wall System, and below the Rubble-Stone Riprap layer as shown on the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item will be made at the Contract per Square Foot basis to provide all labor, materials, supplies, and equipment necessary to complete the installation of Geotextile in accordance with the requirements of the Contract Documents. Payment shall be full compensation for the material, transportation, and placement of the woven geotextile.

P. Bid Item No. 16 - Rubble-Stone Riprap (Ton)

Measurement: Measurement for this Bid Item shall be on a tonnage basis of Rubble-Stone Riprap material installed to the lines and grades shown on the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item will be made at the Contract per ton basis to provide all labor, materials, supplies, and equipment necessary to complete the Rubble-Stone Riprap in accordance with the requirements of the Contract Documents. Payment shall be full compensation for the material, transportation, and placement of the Rubble-Stone Riprap.

Q. Bid Item No. 17 - Guardrail (Linear Feet)

Measurement: This Bid Item shall be the number of in-place linear feet of new guardrail satisfactorily installed in compliance with the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item shall be at the Contract Unit Price per linear foot (LF) installed and accepted by the Engineer. The Contract Unit Price for this item shall be payment in full for the Contractor to provide all labor, materials, and equipment necessary to install post, guardrail and all required associated hardware and accessories.

R. Bid Item No. 18 - Limestone Road Surface (Square Yard)

Measurement for this Bid Item shall be the acceptance of Limestone Road Surface installed on a square yard basis in accordance with the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item will be made at the Contract Unit Price per square yard (SY) which price and payment shall be full compensation for all costs associated with the roadway surface including material, transportation, testing, placement, compaction, finishing, and maintenance.

S. Bid Item No. 19 - Final Grading Berm Sideslopes (Square Yard)

Measurement for this Bid Item shall be the acceptance of Final Grading Berm Sideslopes installed on a square yard basis in accordance with the Contract Documents and accepted by the Engineer.

Payment: Payment for this Bid Item will be made at the Contract Unit Price per square yard (SY) which price and payment shall be full compensation for all costs associated with grading the Berm Sideslopes including material, transportation, testing, placement, compaction, finishing, and maintenance.

T. Bid Item No. 20 - Sodding (Square Yard)

Measurement: Sodding shall be the measured square yards of sod installed, maintained, and accepted in accordance with the Contract Documents. Measurements shall be obtained by certified surveyor and confirmed by the Engineer.

Payment: Payment shall be made based on the measured square yards (SY) of sod times the Contract Unit Price for this Bid Item. Payment shall represent full and complete compensation for furnishing all material, equipment, manpower, supplies, maintenance and other incidentals required to establish a healthy stand of grass within the limits of construction accepted by the Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 PAY REQUEST SUBMISSION

A. Submit applications for payment to the Engineer in accordance with schedule established by General Conditions of the Contract and the Contract between County and Contractor.

1.02 FORMAT AND DATA REQUIRED

A. Submit payment applications following the Contractor's Narrative Report Outline and the County's standard application form in accordance with Article 18, Payment and Completion, of the General Conditions.

B. Provide itemized percent completed items according to Work items listed in the schedule of values accepted by the Engineer.

C. Provide from each subcontractor/supplier, a Subcontractor's/Supplier's Certification in accordance with Article 18 of the General Conditions.

D. Provide Sales Tax Report. This report shall include a list of sales tax paid during one pay period lagging the period described in the application for payment.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information including that for Change Orders executed prior to date of submittal of application.

2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.

3. Execute certification with signature of a responsible officer of Contractor.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.

2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.

3. List each Change Order executed prior to date of submission or the pay request, at the end of the Schedule of Values. List by Change Order Number, and description, as though an original component item of Work.

4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices with the application for payment. Any materials stored on site that are included in the pay request must be installed prior to the next pay request submitted.

5. As provided for in the "Certification of Contractor" form, the Contractor shall certify, for each current pay request, that all previous progress payment received from the County, under this Contract, have been applied by the Contractor to discharge in full all obligations of the Contractor in connection with Work covered by prior Applications for Payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest and encumbrances.

   Contractor shall attach to each Application for Payment like affidavits by all Subcontractors.

6. Contractor will complete the sales tax form with each pay request and will maintain records of the sales taxes should the County need receipts for confirmation of the information.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the County or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:

   1. Project.

   2. Application number and date.

   3. Detailed list of enclosures.

   4. For stored products:

      a. Item number and identification as shown on application.

      b. Description of specific material.

B. Submit one copy of data and cover letter for each copy of application.

C. The Contractor is to maintain an updated set of drawings to be used as Record Drawings in accordance with Section 01 33 23. As a prerequisite for monthly progress payments, the Contractor is to exhibit the updated record drawings for review by the County and the Engineer.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. As a prerequisite for final payment, Contractor is to submit a "Consent of Surety" acknowledgement of final payment request letter showing amount of payment which the Contractor is requesting.

1.06 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to the Engineer for review at the time stipulated during the pre-construction meeting.

B. Number of copies for each Application for Payment:

1. Engineer: Two copies

2. Contractor: As required for his needs

3. County: Seven copies

C. When the Engineer finds the payment application properly completed and correct, the Contractor will proceed with submittal in accordance with the General Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

ORANGE COUNTY GOVERNMENT FLORIDA

ESTIMATE FOR PROGRESS PAYMENT

ORANGE COUNTY UTILITIES DEPARTMENT
9150 CURRY FORD ROAD, ORLANDO, FL, 32825

CONTRACT NO.:

PROJECT:

CONTRACTOR: CONTRACTOR ADDRESS:

PROJECT NO:

DATE: **3/21/2018** FINAL COMPLETION DATE: NTP DATE:

ESTIMATE NO: **1** FOR PERIOD FROM: PERIOD TO:

CONTRACT CHANGE ORDER				
NO.	DATE	DESCRIPTION (DO NOT INCLUDE UNTIL BOARD OF COUNTY COMMISSIONERS APPROVES)	COST OF ITEMS ADDED BY C.O.	COST OF ITEMS DELETED BY C.O.
			$ -	$ -

ANALYSIS OF ADJUSTED CONTRACT AMOUNT TO DATE

A. ORIGINAL CONTRACT AMOUNT	$ -
B. PLUS: ADDITIONS SCHEDULED IN COLUMN ABOVE	$ -
C. LESS: DEDUCTIONS SCHEDULED IN COLUMN ABOVE	$ -
D. ADJUSTED CONTRACT AMOUNT TO DATE	$ -

ANALYSIS OF WORK PERFORMED

A. COST OF ORIGINAL CONTRACT WORK PERFORMED TO DATE	$ -
B. EXTRA WORK PERFORMED TO DATE	$ -
C. TOTAL COST OF WORK PERFORMED TO DATE	$ -
D. LESS: AMOUNT RETAINED **10%** TOTAL CONTRACT WORK	$ -
E. NET AMOUNT EARNED ON CONTRACT WORK TO DATE	$ -
F. ADD: MATERIALS STORED AT CLOSE OF PERIC **90%** **OF** **$0.00**	$ -
G. SUBTOTAL OF E. AND F.	$ -
H. LESS AMOUNT OF PREVIOUS ESTIMATES FOR PAYMENT	$ -
I. BALANCE DUE THIS PAYMENT	**$** -

I certify that all work and /or materials under the contract has been inspected by me and that it has been performed and/or supplied in full accordance with the requirements of the contract.

UTILITIES INSPECTOR DATE

CERTIFICATION OF CONTRACTOR

According to the best of my knowledge and belief, I certify that all items and amounts shown on the face of this Periodic Estimate for Partial Payment are correct; that all work has been performed and/or material supplied in full accordance with the requirements of the referenced Contract, and/or duly authorized deviations, substitutions, alterations, and/or additions; that the foregoing is a true and correct statement of the contract account up to and including the last day of the period covered by this Periodic Estimate; that no part of the "Balance Due This Payment" has been received, and that the undersigned and his subcontractors have - (check applicable line)

☐ a. Complied with all the labor provisions of said contract.

☐ b. Complied with all the labor provisions of said contract except in those instances where an honest dispute exists with respect to said labor provisions. (If (b) is checked, describe briefly the nature of the dispute.)

(CONTRACTOR & NAME OF AUTHORIZED REPRESENTATIVE) DATE

(SIGNATURE of AUTHORIZED REPRESENTATIVE) TITLE

CERTIFICATION OF ORANGE COUNTY UTILITIES CONSTRUCTION

I certify that I have checked and verified the above and foregoing Periodic Estimate for Partial Payment; that to the best of my knowledge and belief it is a true and correct statement of work performed and/or material supplied by the contractor; that all work and/or material included in this Periodic Estimate has been inspected by me and/or my duly authorized representative or assistants and supplied in full accordance with requirements of the referenced contract; and that partial payment claimed and requested by the contractor is correctly computed on the basis of work performed and/or material supplied to date.

SIGNED: APPROVED:

(CHIEF INSPECTOR) (MANAGER UTILITIES DEPARTMENT)

DATE: DATE:

APPROVED: DATE:

SCHEDULE OF VALUES

PROJECT NAME: -

CONTRACTOR NAME: -

PROJECT NO. -

CONTRACT NO. -

PAY REQUEST NO. 1

FROM - TO -

CONTRACT QUANTITIES						WORK PERFORMED (previous payment)		WORK PERFORMED THIS (current payment)		WORK PERFORMED TO DATE (total to date)		
ACTIVITY NO.	DESCRIPTION	QUAN	UNIT	COST PER UNIT	TOTAL COST OF ITEM	QUAN	TOTAL COST OF ITEM	QUAN	TOTAL COST OF ITEM	QUAN	TOTAL COST OF ITEM	% COMP.
					$ -		$ -		$ -		$ -	
TOTAL COST OF COLUMNS:					$ -		$ -		$ -		$ -	

CHANGE ORDER ____01____ - CONTRACT QUANTITIES						WORK PERFORMED (previous payment)		WORK PERFORMED THIS (current payment)		WORK PERFORMED TO DATE (total to date)		
ACTIVITY NO.	DESCRIPTION	QUAN	UNIT	COST PER UNIT	TOTAL COST OF ITEM	QUAN	TOTAL COST OF ITEM	QUAN	TOTAL COST OF ITEM	QUAN	TOTAL COST OF ITEM	% COMP.
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TOTAL COST CONTRACT TO DATE:	$ -		$ -		$ -		$ -	

MATERIALS STORED ON SITE

PROJECT: -

CONTRACTOR: -

FOR PERIOD ENDING: -

PAY REQUEST NO: 1

DATE PREPARED: 3/21/2018

ITEM NO.	DESCRIPTION	SOV ACTIVITY NO.	VALUE OF STORED MATERIAL LAST PERIOD			(-) VALUE OF MATERIAL INSTALLED			(+) VALUE OF MATERIAL DELIVERED			(=) VALUE OF STORED MATERIAL THIS PERIOD			VENDOR INVOICE NUMBER
			QUAN.	UNIT PRICE	INVOICE AMOUNT	QUAN.	UNIT PRICE	INVOICE AMOUNT	QUAN.	UNIT PRICE	INVOICE AMOUNT	QUAN.	UNIT PRICE	INVOICE AMOUNT	
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DRAW SCHEDULE

PROJECT NAME: -

CONTRACTOR NAME: -

CONTRACT NO.: -

PROJECT NO. -

CONTRACT AMOUNT: $ -

PAY REQUEST NO. 1

FOR PERIOD ENDING: -

PAY REQUEST #	PERIOD FROM (Date)	PERIOD TO (Date)	ACTUALS (Previous Paid / Approved Pay Request Balance Due)	ESTIMATED DRAWS (Estimated Total Work Performed + Estimated Stored Materials + Retainage)	BALANCE TO FINISH
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RELEASE OF LIENS

PROJECT: -

CONTRACT: -

PAY REQUEST NO: 1

CONTRACTOR: -

FOR PERIOD ENDING: -

DATE PREPARED: 3/21/2018

NO.	**SUBCONTRACTORS/SUPPLIERS/LIENORS** (Maintain running list of Subcontractors, Vendors, Suppliers, etc. for entire project) (Company Name)	**NOTICE TO OWNER** (Date if provided to Contractor / OCU) (Date)	**FINAL RELEASE OF LIENS** (Date provided to Contractor. Provide additional copy for Final PR) (Date)	**NOTICE OF NONPAYMENT RECEIVED** (Date)	**DESCRIPTION OF WORK** (Trade & Type of Work performed this pay period) (Trade, Type, Description)	**SOV ACTIVITY NO.** (Work performed this Pay Period) (Activity ID)	**Partial Release of Lien** (Included for Work Performed During Previous Pay Period) (Yes or Blank)
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SECTION 01 29 73

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. The Contractor shall submit to the Engineer a Schedule of Values allocated to the various lump sum portions of the Work at the Pre-Construction Conference and in accordance with the successful bidder's bid schedule/cost estimating worksheet.

B. Upon request of the Engineer, the Contractor shall support the values with data that will substantiate their correctness.

C. The Schedule of Values, unless objected to by the Engineer, shall be used only as the basis for the Contractor's Applications for Payment.

1.02 RELATED REQUIREMENTS

A. General Conditions and Requirements of the Contract.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Type schedule on an 8-1/2" x 11" white paper; Contractor's standard forms and computer printout will be considered for approval by the Engineer upon Contractor's request. Identify schedule with:

1. Title of project and location.
2. County and purchase order number.
3. Engineer and project number.
4. Name and address of Contractor.
5. Contract designation.
6. Date of submission.

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing unit values for progress payments during construction.

C. Identify each line item with the number and title of the respective major section of the specifications.

D. For each line item which has installed value of more than $20,000, breakdown costs to list major products or operations under each item.

E. For the various portions of the Work:

1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.

2. Total installed cost, with overhead and profit.

F. Round off figures to nearest dollar.

G. Make sum of total costs of all items listed in schedule equal to total Contract Sum.

1.04 PREPARING SCHEDULE OF UNIT MATERIAL VALUES

A. Submit a separate schedule of unit prices for materials to be stored on which progress payment will be made.

B. Make form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.

C. Include in unit prices only:

1. Cost of the material.

2. Delivery and unloading at site.

3. Sales taxes.

D. Make sure that unit prices multiplied by quantities given, equal material cost of that item in Schedule of Values.

1.05 REVIEW AND RESUBMITTAL

A. After review by Engineer and County, revise and resubmit Schedule of Values and Schedule of Material Values as required.

B. Resubmit revised Schedules in same manner

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION CONFERENCE

A. Prior to the commencement of Work at the Project site, a preconstruction conference will be held at a mutually agreed time and place. The preconstruction conference may be attended by:

1. Responsible officer of the Contractor and superintendent assigned to the Project.

2. Principal subcontractors.

3. Representatives of principal suppliers and manufacturers as appropriate.

4. Representatives of the Engineer.

5. Representatives of the County.

6. Others as requested by Contractor, County, or Engineer.

B. Unless previously submitted to the Engineer, the Contractor shall bring to the preconstruction conference the following or a schedule for submittal of the following.

1. Detailed CPM construction schedule.

2. Subcontractor list.

3. Schedule of Values for progress payment purposes.

4. Shop drawing submittals as needed.

5. Quality Control Plan.

6. Erosion and Pollution Control Plan.

7. Preconstruction surveys.

8. Submittal log.

9. Quality control testing log.

C. The purpose of the preconstruction conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include at a minimum:

1. Lines of communication.

2. Contractor's schedules.

3. Transmittal, distribution, review, and approval of Contractor's submittals.

4. Processing applications for payment.

5. Maintaining record documents.

6. Critical Work sequencing.

7. Field decisions and change orders.

8. Use of premises, office and storage areas, security, housekeeping, and County's needs.

9. Major equipment deliveries and priorities.

10. Contractor's assignments for health and safety.

D. The Engineer will preside at the preconstruction conference and the Engineer will arrange for keeping the minutes and distributing them to all persons in attendance.

1.02 PROGRESS MEETINGS

A. The Engineer shall schedule and conduct regular progress meetings and at other times as required by progress of the Work. The Contractor and all subcontractors active on the site shall be represented at each progress meeting. The Contractor may, at his discretion, request attendance by representatives of his suppliers, manufacturers, and other subcontractors.

B. The Engineer will keep minutes of the progress meetings and distribute the minutes to the Contractor, County, and others as required. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve problems which may develop.

C. For the weekly progress meeting, the Contractor shall submit a three-week look-ahead schedule showing all activities in progress, uncompleted or scheduled to be

worked during the three weeks. The three weeks include the current week plus the following two. The three-week schedule shall list all activities from the approved baseline schedule for Work during the period, which are currently planned to be worked even if out of sequence, and Work which is unfinished but scheduled to be finished.

1.03 CONTRACTOR PROGRESS REPORTS

A. A progress report shall be furnished by the Contractor to the Engineer with each Application for Payment. If the Work falls behind schedule, the Contractor shall submit additional progress reports at such intervals as the Engineer may request.

B. Each progress report shall include sufficient narrative to describe any current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to the Engineer must be substantiated with satisfactory evidence.

C. Each progress report shall include a list of the activities completed with their actual start and completion dates, a list of the activities currently in progress, and the number of working days required to complete each activity.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 REQUIREMENTS

A. Construction shall be coordinated to assure that the Work is completed within the Contract Times as provided in the Contract Documents. The Contractor shall coordinate his activities with any Subcontractors to allow the orderly and timely completion of all the Work.

B. All construction schedules shall be of the critical path method (CPM), bar chart type, and shall be prepared using Microsoft Project or equal.

C. Construction schedules shall show all relationships and critical paths. Backup data shall be provided as requested by the Engineer. This data shall include, as a minimum, relationships and float.

D. The construction schedule shall be comprehensive, covering both activities at the site of the Work and offsite activities such as design, procurement, and fabrication. The Contractor shall promptly advise the Engineer and County of any occurrence that may impact the construction schedule. No revision to the approved baseline construction schedule shall be made without the review and acceptance by the Engineer and County.

1.02 SUBMITTAL PROCEDURES

A. Submittal Requirements.

1. Time phased logic network, computer generated.

2. Computerized network analysis

   a. Activity sort by early start, organized by related elements

   b. Activity sort by float, organized by related elements

   c. Activity sort by predecessor/successor

3. Narrative description of the logic and reasoning of the schedule.

4. Resource allocation by activity.

B. Time of Submittals: Within 7 calendar days after Notice to Proceed, the Contractor shall submit a network diagram describing the activities to be accomplished in the project and their dependency relationships,

(predecessor/successor) as well as a tabulated schedule as herein defined. The schedule produced and submitted shall indicate milestone and completion dates identical to the milestone and completion dates specified elsewhere herein. The Engineer shall review the proposed plan and schedule within 7 calendar days and state his acceptance or rejection of the schedule.

1. Within 10 working days after the conclusion of the Engineer's review, the Contractor shall revise the network diagram as required and resubmit the network diagram and a tabulated schedule produced therefrom. The revised network diagram and tabulated schedule shall be reviewed and accepted or rejected by the Engineer within seven calendar days after receipt. The network diagram and tabulated schedule when accepted by the Engineer shall constitute the project Work schedule unless a revised schedule is required due to substantial changes in the work or a change in contract time, delinquency by the Contractor requiring a recovery schedule, or as otherwise provided for herein below. Activities not occurring as scheduled are delinquent if they begin after early start or they finish after early finish.

C. Acceptance: The finalized schedule will be acceptable to the Engineer when it provides an orderly progression of the Work to completion in accordance with the contract requirements, adequately defines the Contractor's work plan, provides a workable arrangement for processing the submittals in accordance with the requirements, and properly allocates resources (manpower, equipment and costs) to each activity (free of unbalances in resources). When the network diagram and tabulated schedule have been accepted, the Contractor shall submit to the Engineer five copies of the time-scaled network diagram.

D. The County's review and acceptance of the Contractor's project schedule is for conformance to the requirements of the Contract Documents only. Review and acceptance by the County of the Contractor's project schedule does not relieve the Contractor of any of its responsibility whatsoever for the accuracy or feasibility of the project schedule, or of the Contractor's ability to meet the interim milestone date(s) and the contract completion date, nor does such review and acceptance expressly or implied warrant, acknowledge or admit the reasonableness of the logic, durations, manpower or equipment loading of the Contractor's project schedule.

E. Revised Work Schedules: the Contractor, if requested by the Engineer, shall provide a revised Work schedule if, at any time, the Engineer considers the completion date to be in jeopardy because of "activities behind schedule." "Activities behind schedule" are all activities behind the accepted work plan regardless of the existence of positive float on the activity. The revised Work schedule shall include a new diagram and tabulated schedule conforming to the requirements of Part 1.04, "CPM Standards," designed to show how the Contractor intends to accomplish the Work to meet the completion date or

milestones. The form and method employed by Contractor shall be the same as for the original Work schedule.

F. Schedule Revisions: The Engineer may require the Contractor to modify any portions of the Work schedule that become unfeasible because of "activities behind schedule" or for any other valid reason. An activity that cannot be completed by its original or latest completion date shall be deemed to be behind schedule. No change may be made to the sequence, duration or relationships of any activity without the express written acceptance of the Engineer.

1.03 CHANGE ORDERS

A. Upon approval of a change order, the approved change shall be reflected in the next schedule submittal by the Contractor.

1.04 CPM STANDARDS

A. Definition: CPM, as required by this Section, shall comply with the standards outlined in the Associated General Contractors' publication, "The Use of CPM in Construction" unless specifically changed by this Section.

B. Work Schedules: Work schedules shall include a graphic network and computerized, tabulated schedules as described below. To be acceptable the schedule must demonstrate the following:

1. A logical succession of Work from start to finish. This logical succession when accepted is the Contractor's work plan and is only designed as early start to accommodate standard computerized systems.

2. Definition of each activity.

3. A logical flow of work crews/equipment (crews are to be defined by manpower category and manhours; equipment by type and hours).

4. Show all Work activities and interfaces including all submittals and major material, and equipment deliveries.

C. Networks

1. The CPM network, or diagram, shall be in the form of a time-scaled diagram of the customary activity-on-type and may be divided into a number of separate pages with suitable notation relating the interface points among the pages. Individual pages shall not exceed 11 inch by 17 inch. Notation on each activity line shall include a brief Work description, and duration estimate, and cost of activity.

2. All construction activities and procurement including shop drawing review shall be indicated in a time-scaled format, and a calendar shall be

shown on all sheets along the entire sheet length. Each activity arrow shall be plotted so the beginning and completion dates of said activity can be determined graphically by comparison with the calendar scale. All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical activities, and float for each non-critical activity. All non-critical path activities shall show estimated performance time and float time in scaled form.

D. Duration: The duration indicated for each activity shall be in calendar days and shall represent the single best time considering the scope of the Work and resources planned for the activity including time for inclement weather.

E. Tabulated Schedules: The initial schedule shall include the following minimum data for each activity.

1. Activity numbers
2. Estimated duration
3. Activity description
4. Early start date (calendar dated)
5. Early finish date (calendar dated)
6. Status (whether critical)
7. Float
8. Cost of activity
9. Other resources including equipment hours by type, manpower by craft or crew, and materials by units.

F. Project Information: Each tabulation shall be prefaced with the following summary data.

1. Project name
2. Contractor
3. Type of tabulation (initial or updated)
4. Project duration
5. Project schedule completion date
6. Projected completion date

7. Variance analysis per activity

1.05 PROGRESS MEETINGS

A. For the periodic progress meeting, the Contractor shall submit a three week look-ahead schedule showing all activities in progress, uncompleted or schedule to be worked during the three weeks. All activities shall indicate percent complete. The schedule shall also show the planned resources and any deviations from that plan. Supervisors and general labor not assigned to specific activities may be shown as an "additional labor" line so that the total resources equal the manpower on site.

B. The updated schedule shall be submitted in the form, sequence, and number of copies requested for the initial schedule.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 23

SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall perform, or obtain other professional subcontractors to complete topographic surveys that meet the minimum standards of Chapter 61-G17 of the Florida Administrative Code (FAC) to document elevations, grades, locations, maintain survey control during construction, and perform related field engineering as specified in the Contract Documents.

1.02 MEASUREMENT AND PAYMENT

A. See Section 01 20 00 – Measurement and Payment.

1.03 SURVEY REFERENCE POINTS

A. The Contractor shall locate survey reference points prior to starting work and the Contractor shall protect and preserve all permanent survey reference points during construction.

1. The Contractor shall make no changes or relocate any survey reference point without prior written notice to the Engineer.

2. The Contractor shall report to the Engineer when any survey reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

3. The Contractor, at no additional cost to the County, shall replace and re-survey reference points that have been lost or destroyed by the Contractor. The replaced survey reference point shall be surveyed by a registered professional land surveyor licensed in the State of Florida. Replacement will be based on original survey control.

B. Prior to any work, the Contractor shall immediately notify the Engineer of any discrepancies with the survey reference points from the coordinates and elevations provided.

1.04 RECORD DRAWINGS (AS-BUILT DRAWINGS)

A. All survey record documents, submitted for approval by the Engineer, shall be signed and sealed by a professional land surveyor licensed in the State of Florida.

B. Submitted record documents shall include the following:

1. As stages of the Work are completed, Contractor will submit a site survey, signed and sealed by a professional land surveyor licensed in the State of Florida. The Record Drawing information shall be submitted on 24 inch by 36 inch sheets, as well as AutoCAD Drawing files (compatible with AutoCAD 2016) on CD-ROM. Eight original signed and sealed hard copies (by a professional land surveyor licensed in the state of Florida) and eight CD-ROM's with the AutoCAD drawing files, shall be submitted.

2. AutoCAD Drawing files requirements:

    a. Contour lines shall be continuous, unbroken polylines with a width of zero and an elevation (z-coordinate) assigned according to the elevation of the contour line.

    b. All spot elevations shall have horizontal controls with vertical z-coordinates.

    c. Contours shall be at one foot intervals, with index contours at every fifth interval.

    d. Objects in the Record Drawings shall be drawn to scale.

    e. Unless otherwise stated, all surveys shall be at a scale of 1" = 20'.

3. All survey information submitted shall be on the State Plane Coordinate System. Survey information is referenced to the East Zone of the Florida State Plane Coordinate System, NAD 83, 2007 Adjustment. The elevations are to the National Geodetic Vertical Datum (NGVD29).

4. All submitted Record Drawings shall have survey control monuments shown on the Record Drawings for the purposes of orientation, both horizontally and vertically.

5. If multiple sheets are required for the Record Drawings, each sheet shall include match lines as required.

6. All electrical, stormwater, water, sanitary sewer, and underground piping shall be surveyed.

C. The Contractor understands and agrees that existing elevations and contours, which may be shown on the Contract Drawings, are solely for the Engineer's information. Actual quantities of soils and other materials required to complete the Work are the Contractor's responsibility. The Contractor shall determine existing elevations for the purpose of conducting the Work as required by the Contract Documents. The Contractor is responsible to notify the County and the Engineer in writing of any and all discrepancies prior to beginning Work.

1.05 SUBMITTALS

A. The Contractor shall submit the name and address of the registered professional land surveyor licensed in the State of Florida to the Engineer.

B. Upon request of the Engineer, the Contractor shall submit documentation signed by the licensed surveyor in the State of Florida, certifying that elevations and locations of improvements are in conformance with the Contract Documents, or if not in conformance, certify as to variances from the Contract Documents.

C. Record Drawings - The Contractor shall provide and submit to the Engineer, for approval, signed and sealed Record Drawing surveys for all work (to include any areas outside the limits of construction disturbed by the Contractor) as follows:

1. Pre-construction: A pre-construction survey of the limits of construction and 50 feet beyond the limits of construction as defined in the Contract Documents will be prepared by a registered land surveyor licensed in the State of Florida. The pre-construction survey shall meet the minimum standards of Chapter 61-G17 of the Florida Administrative Code.

    a. Prior to performing any earthwork, a pre-construction survey of the Work within and 50 feet beyond the limits of construction as defined in the Contract Documents.

    b. The pre-construction topographic information shall be collected on a 10 foot by 10 foot grid, at a minimum, and as necessary (i.e., spot elevations, grade breaks, ditches, mounds, structure locations, piping, pipe inverts, other permanent structures as required, etc.) so as to provide an accurate representation of the contour topography.

    c. The pre-construction survey shall include water levels in the wetlands and in Pond 2.

    d. The elevation and grades for the pre-construction survey shall be within an accuracy of 0.1 feet vertical and 0.5 feet horizontal as shown on the Contract Drawings.

2. Final Survey: A survey representing all features of the completed Project including but not limited to:

    a. Horizontal alignment of the wall,

    b. Topographic survey of new limerock surface,

    c. Locations of sheet pile,

    d. Location of guardrail,

e. Pond 2 bottom in areas where soil was removed,

f. Topography that depicts the revised grading of the Pond 2 berm and maintenance road,

g. Water levels in Pond 2 and wetlands, and

h. Other installed features.

D. All partial field surveys are to include photocopies of the field surveyor's log which have been signed and dated by the surveyor performing the survey.

E. The Contractor shall submit a Record Survey signed by the identified registered professional land surveyor licensed in the State of Florida once completed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall retain the services of a registered land surveyor licensed in the State of Florida to identify existing control points and maintain survey control during construction.

B. The Contractor shall identify survey reference points.

C. The Contractor shall provide civil, structural or other professional engineering services specified or required to execute the Contractor's construction methods.

D. The Contractor shall be responsible for the preservation of all benchmarks, stakes, and marks. If any benchmarks, stakes, or marks are disturbed by the Contractor, the Contractor shall not proceed with any work until such points, marks, lines and elevations as may be necessary for the prosecution of the Work have been established.

1. The accuracy of any method of staking shall be the responsibility of the Contractor. All engineering for vertical and horizontal control shall be the responsibility of the Contractor.

E. The surveyor shall maintain a complete, accurate log of all control and survey work as it progresses. This log shall be available for periodic review by the Engineer.

F. Grade elevations and locations will be required periodically during the prosecution of the Work. The Contractor's Florida licensed land surveyor will provide and maintain as-built notes and a finished Record Drawing updated as construction is completed. Record Drawings reflecting elevations and location information shall be submitted to the Engineer.

G. All surveys shall be topographic surveys that meet the minimum standards of Chapter 61-G17 of the Florida Administrative Code. Surveys shall include (but are not limited to) grading, elevations, structure locations, pipe inverts, piping, and other permanent structures.

H. The elevation and grades shall be within an accuracy of 0.1 feet vertical and horizontal as shown in the Contract Documents. Unless otherwise stated, all surveys shall be at a scale of 1" = 20', with contours at one foot intervals. However, any measurement noted in the specifications on the drawing as "Minimum" requires the minimum dimension noted.

I. The final topographic information shall be collected on a 10-foot by 10-foot grid, at a minimum, and as necessary (i.e., structures, spot elevations, grade breaks, ditches, mounds, etc.) so as to provide an accurate representation of the contour topography. For ditches, spot elevations shall be taken, at a minimum, every 10 linear feet to include, at a minimum, the centerline of the roadways, the toe and top of ditch slopes, and any grade breaks.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall submit to the Engineer for review and exception, if any, such working drawings, shop drawings, test reports and data on materials and equipment (hereinafter in this article called data), material samples (hereinafter in this article called samples), material lists, certificates, and affidavits as are required for the proper control of Work, including but not limited to those working drawings, shop drawings, data and samples for materials, and equipment specified elsewhere in the Specifications and in the Contract Drawings.

2. Within fourteen calendar days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer a complete materials list of preliminary data on items for which shop drawings are to be submitted. Included in this materials list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way expressed or implied relieve the Contractor from submitting complete shop drawings and providing materials, equipment, etc., fully in accordance with the Specifications. This procedure is required in order to expedite final review of shop drawings.

3. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the County and the Engineer. This log should include the following items:

   a. Submittal-description and number assigned.

   b. Date to Engineer.

   c. Date returned to Contractor (from Engineer).

   d. Status of submittal (reviewed no comments, reviewed comments as noted, rejected, revise and resubmit, and not reviewed).

   e. Date of resubmittal and return (as applicable).

   f. Date material release (for fabrication).

   g. Projected date of fabrication.

h. Projected date of delivery to site.

i. Specification section.

j. Drawings sheet number.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.

2. Project Record Documents: Section 01 78 39.

1.02 CONTRACTOR'S RESPONSIBILITY

A. **It is the duty of the Contractor to check all drawings, data, and samples before submitting them to the Engineer for review.** Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents. If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer.

B. Determine and verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Conformance with Specifications.

C. The Contractor shall furnish the Engineer a schedule of shop drawing submittals indicating the respective dates for the submission of shop and working drawings, the beginning of manufacture, and installation of materials. This schedule shall indicate those that are critical to the progress schedule.

D. The Contractor shall not begin any of the Work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with approval.

E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than seven calendar days for checking and appropriate action from the time the Engineer receives them.

F. Each submittal shall be for an individual material. All submittals shall be accompanied with a transmittal letter prepared in duplicate containing the following information:

1. Shop drawing cover page per paragraph 1.04.D of this Section.

2. Date.

3. Project title and number.

4. Contractor's name and address.

5. The number of each shop drawing, project data, and sample submitted.

6. Notification of deviations from Contract Documents.

7. Submittal log number conforming to Specification section numbers.

G. The Contractor shall submit four copies of descriptive or product data to complement shop drawings for the Engineer. The Engineer will retain one set. All shop drawings shall be submitted with one reproducible Portable Document Format (PDF) file and two sets of prints. The Engineer will review the hard copies and return to the Contractor the additional set(s) marked-up with appropriate review comments. All shop drawings shall be sized appropriately and legible for review.

H. The Contractor shall be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of Work prior to the completion of the review by Engineer of the necessary shop drawings.

I. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposed to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of drawings and specifications.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS

A. The Engineer's review of drawings, data and samples submitted by the Contractor will cover only general conformity to the Specifications, external connections, and dimensions which affect the installation. The Engineer will have five work days to review these documents. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, quantities, and details of the material, equipment, device, or item shown.

B. The review of drawings and schedules will be general, and shall not be construed:

1. As permitting any departure from the Contract requirements;

2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

C. If the drawings or schedules as submitted describe variations per paragraph 1.04.E., and show a departure from the Contract requirements which Engineer finds to be in the interest of the County and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting an exception.

D. When reviewed by the Engineer, each of the shop drawings will be identified as having received such review being so stamped and dated. Shop drawings stamped "REVISE AND RESUBMIT" and with required corrections shown will be returned to the Contractor for correction and resubmittal.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted shop drawings, to revisions other than the corrections requested by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.

F. If the Contractor considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.

G. Shop drawings and submittal data shall be reviewed by the Engineer for each original submittal and first and second resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor in accordance with the terms of the Engineer's Agreement with the County.

H. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

I. Partial submittals will not be reviewed. Submittals not complete will be returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:

1. Systems.

2. Processes.

3. As indicated in specific specifications sections.

J. All drawings, schematics, manufacturer's product data, certifications, and other shop drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interface checking.

1.04 SHOP DRAWINGS

A. When used in the Contract Documents, the term "shop drawings" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the project. These drawings shall be complete and detailed. Shop drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data, shall be considered only as supportive to required shop drawings as defined above. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements.

B. Manufacturer's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.

C. Drawings and schedules shall be checked and coordinated with the Work of all trades involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

D. Each shop drawing shall have a blank area located adjacent to the title block that display the following:

1. Project Title and Number.
2. Name of project building or structure.
3. Number and title of the shop drawing.
4. Date of shop drawing or revision.
5. Name of Contractor and subcontractor submitting drawing.
6. Supplier/manufacturer.
7. Separate details when pertinent.
8. Specification title and number.
9. Specification section.

10. Application Contract Drawing Number.

E. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.

F. Data on materials and equipment include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

G. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.

H. All manufacturers or equipment suppliers who proposed to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least one (1) year.

I. Only the Engineer will utilize the color “red” in marking Shop Drawing submittals.

1.05 WORKING DRAWINGS

A. When used in the Contract Documents, the term “working drawings” shall be considered to mean the Contractor’s plan for temporary structures such as temporary bulkheads, support of utilities, ground water control systems, forming and falsework; for underpinning; and, for such other Work as may be required for construction but does not become an integral part of the project.

B. Copies of working drawings shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer, and shall be submitted at least seven (7) calendar days (unless otherwise specified by the Engineer) in advance of their being required for Work.

C. Working drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior

to commencing such Work, working drawings must have been reviewed without specific exceptions by the Engineer, which review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error are assumed by the Contractor; the County and Engineer shall have no responsibility therefor.

1.06 SAMPLES

A. The Contractor shall furnish, for review by the Engineer, samples required by the Contract Documents or requested by the Engineer or County. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until accepted by the Engineer.

B. Samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product, with integrally related parts and attachment devices.

2. Full range of color, texture and pattern.

3. A minimum of two samples of each item shall be submitted.

C. Each sample shall have a label indicating:

1. Name of project.

2. Name of Contractor and Subcontractor.

3. Material or equipment represented.

4. Place of origin.

5. Name of producer and brand (if any).

6. Location in project.

(Samples of finished materials shall have additional marking that will identify them under the finished schedules).

D. The Contractor shall prepare a transmittal letter for each shipment of samples containing the information required in paragraph 1.06 C. above. He shall enclose a copy of this letter with the shipment and send a copy of this letter to the Engineer. Review of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

E. Accepted samples not destroyed in testing shall be sent to the Engineer or stored at the site of the Work. Accepted samples of the hardware in good condition will be marked for identification and may be used in the Work. Materials and equipment incorporated in Work shall match the accepted samples. Samples which failed testing or were not accepted will be returned to the Contractor at his expense, if so requested at time of submission.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

Sample Shop Drawing/Submittal Form
Orange County Solid Waste Division
5901 Young Pine Road ● Orlando, Florida 32829 ● (407) 836-6600

SHOP DRAWING/SUBMITTAL CONTROL FORM #_____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

ENGINEER: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT NAME: _____

CONTRACTOR INFORMATION

SUBMITTAL DATE: _____ NUMBER: _____ NO. OF COPIES SENT: _____

☐ ORIGINAL SUBMITTAL ☐ RESUBMITTAL ☐ SUPPLEMENT ☐ INFORMATION ONLY

NOTE: If other than original then include: Date of Original _____ Submittal No. of Original _____

A. SPECIFICATION SECTION AND SUB-SECTION NUMBER: _____

B. DESCRIPTION: _____

C. SUPPLIER/VENDOR: _____

D. INSTALLATION BY: _____

THE GENERAL CONTRACTOR HAS REVIEWED THE SHOP DRAWING, SAMPLE OR SUBSTITUTION SUBMITTED HEREWITH AND HAS DETERMINED AND HEREBY CERTIFIES THAT IN ALL RESPECTS THIS SUBMITTAL IS IN FULL COMPLIANCE AND CONFORMANCE WITH THE CONTRACT SPECIFICATIONS, DRAWINGS AND ALL OTHER CONTRACT REQUIREMENTS PERTAINING THERETO.

ENGINEER INFORMATION

NO. OF COPIES RECEIVED _____ NO. OF COPIES RETURNED _____

ACTIVITY	DATE	PERSON	COMMENT
RECEIVED			
RETURNED			

STATUS:

☐ NO EXCEPTIONS TAKEN ☐ MAKE CORRECTIONS AS NOTED

☐ AMEND AND RESUBMIT ☐ REJECTED SEE REMARKS

COMMENTS:

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 QUALITY CONTROL PLAN

A. The Contractor shall prepare and submit a Quality Control Plan for the Work contained in the Contract Documents prior to beginning the Work. The Quality Control Plan will indicate the actions, documentation, and responsible party or parties that will assure compliance with the Technical Specifications and Contract Documents and those quality requirements for inspections and testing are implemented. The Quality Control Plan will contain a checklist of quality related activities applicable to various construction activities for scheduling and implementation purposes.

B. The Contractor shall submit for approval a Quality Control Testing Log which lists all of the required quality control tests and which has columns for when the test is performed and if the test result is satisfactory. The Contractor will submit monthly updated Quality Control Testing Logs with each Application for Payment.

C. The Contractor shall submit the Quality Control Representative's resume to the Engineer prior to the preconstruction meeting.

D. The Contractor shall submit to the County and Engineer a Daily Force Report. The Daily Force Report shall be delivered no later than 8 a.m. of the work day following the report date and shall include the following at a minimum:

1. Day of week, date, Contractor name, CIP number, and report number.

2. Summary of Work in process (segregated by Contractor and subcontractor).

3. Details of Work accomplished including quantities of Work installed.

4. Summary of equipment working and where working.

5. Summary of manpower by Work element and subcontractor.

6. Receipt of major equipment or materials.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 GENERAL

A. Required testing services are to assist in determination of compliance of the Work. Required services do not relieve the Contractor of its responsibility for compliance with requirements of the Contract Documents.

B. Required services are not intended to limit the Contractor's own quality control procedures, but to establish minimum testing level necessary to monitor compliance of construction materials and methods with Contract Requirements.

1.02 SUBMITTALS

A. Submit two copies of the following information within fourteen calendar days of the Notice to Proceed:

1. Independent Testing Laboratory

    a. Name, address, and telephone number.
    b. Name of Registered Engineer and responsible officer.
    c. Certification of testing laboratory.
    d. Qualifications.

2. Schedule of tests

    a. Reference to Specification section.
    b. Description of test and applicable standards.

3. Submit two copies of each report

1.03 LIMITATIONS OF AUTHORITY OF INDEPENDENT LABORATORY

A. Independent laboratory is not authorized to:

1. Approve or accept any portion of the Work.
2. Assume or perform duties of the Contractor.
3. Stop Work.

1.04 CONTRACTOR RESPONSIBILITIES

A. Inspections, tests, and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent laboratory and not directly by the Contractor.

B. Employ and pay an independent laboratory or other qualified agency to perform quality control services specified.

C. Cooperate with independent laboratory (ies) performing required inspections, tests, and similar services. Notify the independent laboratory no less than 24 hours in advance of scheduling of tests.

D. Provide such auxiliary services as requested. These auxiliary services include, but not limited to:

1. Providing access to the Work.
2. Taking samples or assistance with taking samples.
3. Delivery of samples to test laboratories.
4. Security and protection of samples and test equipment at the project site.

E. Contractor and each independent laboratory shall coordinate the sequence of their activities to minimize delay in progress of the Work.

F. Contractor and each independent laboratory shall coordinate their Work to avoid removing or replacing work to accommodate inspections and tests. Contractor shall be responsible for scheduling times for inspections, tests, taking samples, and similar activities.

G. Inspections and tests required by codes or ordinances, or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor.

1.05 RETEST RESPONSIBILITIES AND CONVENIENCE TESTING

A. Where results of inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with requirements of the Contract Documents, repeats of the inspections, tests, or similar services shall be conducted following revision or replacement of the affected Work.

B. Cost of repeat inspections, tests, or similar services shall be the Contractor's responsibility, regardless of responsibility or original inspection, test, or similar service.

C. Cost of inspections, tests, or similar services performed exclusively for the Contractor's convenience, shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 TEMPORARY ELECTRICITY

A. The Contractor shall provide and pay for required power service from the utility source, if required.

B. The Contractor shall provide a temporary electric feeder from an existing electrical service. Power consumption shall not disrupt County's need for continuous service.

C. The Contractor shall provide power outlets for construction operations, with branch wiring and distribution boxes, as required.

1.02 TEMPORARY SANITARY FACILITIES

A. The Contractor shall provide portable facilities for Work force on site and comply with federal, state, and local codes.

B. Fixed or portable chemical toilets shall be provided wherever needed for the use of Contractor employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.

1.03 PROGRESS CLEANING

A. The Contractor shall keep temporary services and facilities clean and neat in appearance, operate in a safe and efficient manner and take necessary fire prevention measures. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the site.

B. The Contractor shall remove waste materials, debris, and rubbish from the Project site and dispose on-site in areas designated by the County at no cost to the Contractor.

1.04 TEMPORARY SECURITY

A. The Contractor shall provide the security to protect Work, existing facilities and operations from unauthorized entry, vandalism, and theft.

1.05 TEMPORARY PETROLEUM STORAGE CONTAINMENT

A. The Contractor shall be responsible for abiding by and obtaining all necessary local, state, and federal codes and permits regarding storage of petroleum products as needed for the completion of the Work.

B. The Contractor shall provide a spill/leak containment vessel or lined containment area for above ground petroleum storage tanks used for completion of the Work in an area designated by the County. The containment vessel or area shall have a spill/leak proof storage capacity exceeding 125 percent of the volume of the petroleum storage tank.

C. The Contractor shall provide tie down anchors for the petroleum storage tank to prevent the flotation of an empty tank due to rain water filling the containment vessel or area.

D. The Contractor shall provide operating fire extinguishers and no smoking signs. Fire extinguishers shall be accessible to personnel operating on or near the containment vessel or area.

E. The Contractor shall provide a raintarp or cover and shall cover the containment vessel or area to prevent accumulation of stormwater within the containment vessel or area. If the Contractor does not elect to cover the containment vessel or area, then the Contractor shall submit a proposed plan to the Engineer for approval, describing disposal methods of the collected stormwater.

F. In the event of spills/leaks outside of the containment vessel or area and upon completion of the Work, the Contractor shall collect and dispose of all contaminated soils and containment liners properly at no cost to the County.

G. Any and all costs associated with testing of water or soils contaminated by petroleum from the Contractor's petroleum storage containment area shall be the responsibility of the Contractor.

1.06 TEMPORARY EQUIPMENT MAINTENANCE AREA

A. The Contractor shall designate an equipment maintenance and repair area for completion of the Work in an area designated by the County. Maintenance and repair of equipment shall be conducted within this area. Petroleum and equipment fluids spilled or leaking on the soil shall be collected and disposed of properly by the Contractor at no cost to the County.

B. Non-repairable equipment, leaks or spills of petroleum or equipment fluids outside the maintenance repair area shall be completely removed by the Contractor and disposed of properly at no cost to the County.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 57 13

EROSION, SEDIMENTATION, AND DUST CONTROL

PART 1 - GENERAL

1.01 GENERAL

A. The Work specified in this Section shall include installing, maintaining and removing temporary erosion and pollution controls as necessary or as indicated on the Drawings. All temporary erosion and pollution controls shall be installed and approved by the Engineer prior to beginning construction of each phase or sequence of the Work. All existing and foreseeable conditions that affect the Work both inside and outside the construction limits shall be Contractor's responsibility.

B. Temporary erosion controls shall include but not limited to:

1. Silt dams, silt fence, traps, barriers installed in drainage ways (i.e. swales or surface drainage courses), floating turbidity barriers, grassing, mulching, sodding, netting, watering and reseeding on-site surfaces and soil and borrow area surfaces.

2. Providing interceptor ditches or temporary drainage pipes at those locations, which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits of applicable laws and regulations, and as approved by the Engineer.

C. Temporary pollution controls shall include, but are not limited to:

1. Silt dams, silt fences, traps, barriers, and appurtenances at the foot of sloped surfaces.

2. Silt dams, traps, or barriers installed in drainage ways (i.e., swales or surface drainage courses), and other areas of stormwater discharge.

D. The Contractor shall provide effective temporary erosion and sediment control measures during construction and until final controls become effective, or until the Work is accepted by Engineer. The Contractor may, with approval from Engineer, perform Work outside the construction limits to establish, maintain or enhance the erosion control systems.

E. At no time will runoff that has contacted excavated waste be allowed to discharge off-site. The Contractor shall plan waste activities to assure that off-site discharge does not occur.

F. The Contractor shall be solely responsible for all costs (including investigation, sampling, testing, analysis, engineering, and remedial construction) related to off-

site discharge of leachate or contaminated stormwater resulting from ineffective control of leachate or stormwater discharge by Contractor.

G. The Contractor shall install additional erosion and pollution control measures deemed necessary by the Engineer as a result of variations in the Contractor's operations, or shall perform repairs to existing system as directed by the Engineer. Additional controls or repairs shall be installed at no additional cost to the County.

H. Fill material stockpiles shall be protected at all times by on-site drainage controls which prevent erosion of the stockpile material. Control of dust from such stockpiles may be required, depending upon their location and the expected length of time the stockpiles will be present.

I. All erosion and siltation control devices shall be checked regularly by the Contractor, especially after each rainfall event and will be cleaned out and/or repaired as required.

1.02 REFERENCES AND STANDARDS

A. Florida Erosion and Sediment Control Planning Handbook, current edition.

B. Florida Department of Transportation Standard Specifications for Roads and Structures Construction, Latest edition

1.03 SUBMITTALS

A. At least 14 days prior to starting the work of this section, Contractor shall submit the following to Engineer:

1. Samples of proposed materials.

2. Manufacturer's product data and recommended methods of installation.

3. Contractor's proposed erosion and sedimentation control plan, based on Contractor's proposed Work staging and sequencing plan. Such plan shall include all temporary measures proposed to ensure sufficient measures to control stormwater run on, runoff, erosion, and sedimentation to protect the Work and the property. Contractor's proposed erosion and sedimentation control plan shall include, at a minimum, all erosion and sedimentation control measures described and illustrated in the Contract Documents, plus such additional measures to control erosion and sedimentation based on the Contractor's means, methods, staging and sequencing of construction.

B. At the end of each work week from the Notice to Proceed until substantial completion, the Contractor's lead representative at the Work site shall complete an inspection of erosion and sedimentation control measures. The inspection form

shall be submitted seven days after the Notice to Proceed for review by the Engineer. The weekly inspection forms shall be submitted at a maximum three days after the inspection date. The inspection form should be similar to the form contained in the State of Florida "Erosion and Sediment Control Designer and Reviewer Manual, June 2007". At a minimum, the following items shall be inspected:

1. Ponds

2. Drainage inlets, culverts, and other drainage structures in the laydown area

3. Installed erosion protection measures

4. Disturbed, un-vegetated areas and measures to minimize and contain erosion

5. Actions items

6. Update on action items undertaken from previous inspections

PART 2 - PRODUCTS

2.01 EROSION CONTROL

A. Netting Grade 1800 - Miramat, as manufactured by Mirafi or approved equal.

B. For the embankment areas and other areas where sodding is installed on 3H:1V or steeper slopes, erosion mat shall be degradable permanent North American Green SC250, or approved equivalent. Table 02290-1 provides the required minimum material property values.

TABLE 02290-1 EROSION MAT MATERIAL PROPERTY VALUES

Net Type	Matrix	Shear Stress (lb/ft^2)	Permissible Velocity (unvegetated) (ft/s)	Slope
Synthetic/Organic	Straw/Coconut	3.0*	9	> 1H:1V

*Shear stress is given for bare soil at 0.5 hr duration.

2.02 SEDIMENTATION CONTROL

A. Bales:

1. Bales shall be clean, seed free cereal hay type bales.

B. Silt Fence:

1. Envirofence, as manufactured by Mirafi or approved equal.

C. Floating Turbidity Barrier:

1. Type 1 as described per FDOT Design Standards.

D. Filter Stone:

1. Grade No. 57 crushed stone, as described in FDOT Standard Specifications.

E. Concrete Block:

1. Hollow, non-load bearing type concrete blocks.

F. Stakes:

1. Commercial grade, relatively free of knots or irregularities, durable.

PART 3 - EXECUTION

3.01 EROSION CONTROL

A. Erosion control grassing installation procedures:

1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots and debris.

2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.

3. Apply mulch loosely and to a thickness of between ¾ inch and 1½ inches.

4. Apply netting over mulched areas on sloped surfaces, if necessary.

5. Roll and water seeded areas in a manner, which will encourage sprouting of seeds and growing of grass. Reseed areas that exhibit unsatisfactory growth. Backfill and seed eroded areas.

B. Erosion control matting installation procedures:

1. The mat shall be placed on a smooth surface that is free of trash, ruts, and rocks.

2. Placement on Slopes:

a. Anchor trenches shall be located at the crest and the toe of the terrace. Anchor trenches shall be a minimum of 12 in. deep. The anchor trench at the crest shall be located at 1 ft from the edge of

the slope. The geometry of the anchor trench, type of fastener, fastener spacing, and method of construction of the anchor trenches shall be in accordance with the Manufacturer's instructions.

b. Erosion mat shall be unrolled as directed by the Manufacturer. Adjacent panels of erosion mat shall be installed with a minimum overlap of 4 in. Fastening of the erosion mat shall begin in the toe anchor trench and shall progress upslope to the crest anchor trench. Spacing of fasteners shall be in intervals of 3 to 5 ft vertically upslope. Horizontal spacing of fasteners shall be in accordance with the Manufacturer's instructions. Backfill shall be placed in anchor trenches over fasteners as installation proceeds, and sod over anchor trench after backfill has been placed.

3. Contractor shall install silt fence on a level grade downslope of all disturbed areas as shown on the Drawings and at locations where stockpiles and temporary measures not shown on Drawings need silt fence to prevent sedimentation. Both ends of the silt fence section must extend at least 8 feet upslope at 45 degrees to the main fence alignment. Sediment accumulated against the silt fence shall be removed when it reaches one half of the above-ground height of the fence and stockpiled as directed by the Owner.

4. Contractor shall re-vegetate all disturbed areas within 14 days of termination of earthwork activities per the contract specifications.

5. Contractor shall construct all stone check dams, erosion control mats, riprap and silt fence as shown on the Drawings.

3.02 SEDIMENTATION CONTROL

A. The Contractor shall install and maintain silt dams, traps, barriers, and appurtenances as required.

B. The Contractor shall control systems that deteriorate and filter stone that is dislodged shall be replaced or repaired at no additional cost to the County.

3.03 PERFORMANCE

A. During construction, stripped areas are to be covered immediately by mulch (such as straw, hay, synthetic fiber) or by sod or seed and mulch with temporary or permanent vegetation.

B. Areas to be developed may require temporary sediment basins and may be used by Contractor as a positive remedy against downstream siltation. Prior to final

inspection, accumulated silt and debris shall be removed from the stormwater management system or temporary sedimentation basins.

C. Floating and/or staked silt barriers will be anchored in place to protect against accumulation of silt and sediment upstream and downstream of the Work. Silt barriers will be placed so as to effectively control silt and sediment dispersion under the conditions present at site. Silt fences also shall be installed, where necessary, outside limits of construction.

D. Floating turbidity barriers shall be installed per Manufacturer recommendations.

E. All swales, ditches, channels, retention ponds and detention areas will be sodded as required as soon as possible.

F. Should any of the temporary erosion and sediment control measures employed by Contractor fail to produce results which comply with the requirements of the State of Florida, County or Engineer; Contractor shall immediately take whatever steps necessary to correct the deficiency at no additional cost to the County.

3.04 DUST CONTROL

A. The Contractor shall provide for adequate protection against raising objectionable dust clouds caused by moving construction equipment, high winds, or any other cause.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. General provisions of Contract, including General and Supplementary Conditions.

1.02 SECTION INCLUDES

A. Administrative and procedural requirements governing the Contractor's selection of products for use in the project.

B. Administrative and procedural requirements for handling requests for substitutions.

C. Requirements for product list submittal.

1.03 SUBSTITUTION REQUESTS

A. Submit a separate request for each proposed substitution; original signature sets in accordance with shop drawings Section 01 33 23, each on form bound into Project Manual. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

1. Designate Specification section and Article number.

2. Identify manufacturer by name and address, trade name, model number or catalog number.

3. List product description, performance and test data, applicable reference standards, availability of maintenance service and source of replacement materials.

4. Give itemized comparison of qualities of proposed substitution with specified product, changes required in other elements of the Work due to substitution and effect on progress schedule.

5. Give name and address of similar projects on which product was used and date of installation.

6. Provide cost data comparing proposed substitution with specified product and state the amount of net change to Contract Price.

B. During Bidding period, times for submittal of substitution requests are stated in the Instructions to Bidders.

C. After Bidding period, up to 30 days after date of Notice to Proceed, Engineer will consider written requests from Contractor for proposed substitutions of products. Subsequent requests will be considered only in case of product unavailability or other condition beyond control of the Contractor.

D. Do not order or install substitute products without written acceptance from the Engineer. Do not imply or indicate substitutions on shop drawings or product data submittals without a separate formal request.

E. Engineer will determine acceptability of substitution. The burden of proof of acceptability of a proposed substitution is upon the Contractor; information submitted must demonstrate that characteristics of the proposed substitution are equal to or better than those of the specified product. Only one request for substitution for each product will be considered. If not accepted, Contractor shall provide specified product.

F. Request for substitution constitutes a representation that the Contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to the specified product.

2. Will provide same or greater warranties for proposed product as for the specified product.

3. Will coordinate installation of substitution accepted into the Work and make other changes and adjustments as may be required to make the Work complete in all respects.

4. Waives all claims for additional costs due to substitution which may later become apparent.

5. Agrees to reimburse the County for the additional service charges of the Engineer and their Engineer's for evaluation and review of the proposed substitution.

1.04 PRODUCT LIST

A. Prepare the product listing schedule with information on each item tabulated under the following column headings:

1. Related Specification section number.

2. Generic name used in Contract Documents.

3. Proprietary name, model number and similar designations.

4. Manufacturer's name and address.

5. Supplier's name and address.

6. Installer's name and address.

7. Projected delivery date, or time span of delivery period.

B. Within fifteen days after date of Notice to Proceed, submit five copies of product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.

C. The Engineer will respond in writing to the Contractor, within 30 days of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents.

1.05 QUALITY ASSURANCE

A. To the fullest extent possible, provide products of the same kind, from a single source.

B. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Except for required labels and operating data, do not attach or imprint Manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.

b. Model and serial number.

c. Capacity.

d. Speed.

e. Ratings.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

B. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

C. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

D. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

E. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

F. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

A. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Where available, provide standard products, which meet the specified requirements, of types that have been produced and used successfully in similar situations on other projects.

B. Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:

1. Where only a single source product or manufacturer is named, provide the product indicated or submit a request for substitution for any product or manufacturer not named.

2. Where two or more sources of products or manufacturers are named, provide one of the products indicated or submit a request for substitution for any product or manufacturer not named.

3. Where Specifications describe a product or assembly, listing exact characteristics required, without use of a brand or trade name, provide any product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Where Specifications require compliance with performance requirements, provide any products that comply with the specified requirements.

5. Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

6. Where Specifications require matching an established Sample, the Engineer's decision will be final on whether a proposed product matches satisfactorily.

7. Where specified product requirements are indicated to be selected from manufacturer's standard colors, patterns, textures, or similar condition, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color, pattern and texture from the product line selected.

8. The description of specific qualities takes precedence over specified reference standards. The description of specific qualities and specified reference standards together take precedence over the named products of designated manufacturers.

C. Source Manufacturers:

1. Primary source products and manufacturers named in a Specification section are listed as standards of quality to which other products will be compared.

2. Additional source manufacturers named in a specification are those manufacturers considered by the Engineer as generally capable of

manufacturing products which may conform to the specified requirements. However, their being listed does not guarantee or imply that any or all of their products will be considered as equal to the specified requirements.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTALLATION INSTRUCTIONS

A. When Contract Documents require installation of Work to comply with manufacturer's printed instructions, obtain and distribute copies of such instructions in accordance with Section 01 33 23.

B. Handle, install, connect, condition, clean, and adjust products in accordance with such instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, notify Engineer for additional instructions.

C. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by Contract Documents.

D. Do not proceed with work without clear instructions.

SUBSTITUTION REQUEST

PROJECT:_____DATE:_____
TO: SCS ENGINEERS
5850 South Semoran Blvd.
Orlando FL 32803

FROM:__CONTRACTOR __BIDDER __SUPPLIER __MANUFACTURER

HEREBY REQUESTS ACCEPTANCE OF THE FOLLOWING PRODUCT OR SYSTEMS AS A SUBSTITUTION IN ACCORD WITH PROVISIONS OF DIVISION ONE OF THE SPECIFICATIONS:

1. SPECIFIED PRODUCT OR SYSTEM:
   Generic Description: _____ Specification Section No. _____ Art. ___ Para._

2. SUPPORTING DATA:
   ____Product data for proposed substitution is attached (description of product, reference standards, performance and test data).

   ____Sample attached. __Sample will be sent if requested.

3. PRODUCT OR SYSTEM QUALITY COMPARISON:

	Specified Product	Substitution
Name, brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant variations:	_____	_____

   _____Maintenance Service Available Locally: __Yes __No
   Spare Parts Source:_____

4. EFFECT OF SUBSTITUTION:
   Affects other parts of work: __No__Yes
   Explain:_____
   Substitution changes Contract Time: Add/Deduct ___days.
   Saving or credit to Owner if accepted: $_____.
   Extra cost to Owner if accepted: $_____.

5. PREVIOUS INSTALLATIONS:
   Attach list of local similar projects on which proposed substitution was used and dates of installations.

6. STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT: I/we have investigated the proposed substitution and:
   a. believe that it is equal or superior in all respects to specified product, except as stated above; and
   b. will provide the same warranty as specified for specified product; and

c. have included complete cost data and implications of the substitution; and
d. will pay redesign and special inspection costs caused by the use of this product; and
e. will pay additional costs to other contractors caused by the substitution; and
f. will coordinate the incorporation of the proposed substitution in the Work; and
g. will modify other parts of the work as may be needed, to make all parts of the Work complete and functioning; and
h. waive future claims for added cost to Contract caused by the substitution; and
i. agree to pay to the Owner or Engineer the hourly rate of One Hundred Fifty Eight Dollars ($158.00) per hour for cost of Engineer to evaluate and review the proposed substitution.

Name and Title:_____Date_____

Signature:_____

ENGINEER'S REVIEW AND ACTION:

__Substitution not accepted:
__Resubmit with additional information:
__Substitution is accepted.
__Substitution is accepted, with the following comments:

By: _____Date:_____

OWNER'S ACCEPTANCE:

__Substitution is accepted.
__Substitution is accepted, with the following comments:

By:_____ Date:_____

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.01 COMPLETION PROCEDURES

A. Substantial Completion shall be considered achieved when the Contractor has demonstrated that all final grades are met, all areas are stabilized, seeded and sodded as specified, the Contractors'staging, storage, and temporary pond entryway are restored to preconstruction conditions, and the Pond 2 Berm Repair is fully constructed as specified.

B. When the Contractor believes Substantial Completion has been achieved, Contractor shall request in writing to the Engineer, that Substantial Completion be recognized as having been achieved and request that the County issue a letter of Substantial Completion. Prior to making such a request, the Contractor must have:

1. Completed all Work that in the opinion of the Engineer is necessary for the safe, proper and complete use and operation of the facility as intended.

2. Submitted and received acceptance of accurate Record Drawings for all Work completed to date.

3. Submitted and received acceptance of all specified warranties and guarantees.

C. Upon receipt of the request from the Contractor, the Engineer and designated representatives shall review the request, the Work and the above requirements to determine whether the Contractor has achieved Substantial Completion. If this review fails to support Substantial Completion, the Engineer shall so notify the Contractor in writing citing the reasons for rejection. If the Engineer determines the Contractor has reached Substantial Completion, the following procedures will be followed:

1. The Engineer and County will review the Work and the punch list to assure all remaining deficiencies are noted on a final punch list.

2. The Engineer will schedule and conduct a pre-final walk-through of the system with the County's representatives, the Contractor, and others, for the purpose of formally reviewing the Work and the final punch list. A copy of the final punch list will be provided to all participants and any additional items noted during the walk-through will be added to the list.

3. Upon completion of the pre-final walk-through, the Engineer shall prepare a request to the County that they establish the date for Substantial Completion as the date of the walk-through, provided the walk-through has verified that the construction is in fact substantially complete. Upon approval of this request by the County, the construction will be considered Substantially Complete and shall issue to the Contractor a letter of Substantial Completion.

D. Final Completion will be deemed to have occurred when all Work is completed in accordance with the Contract Documents including the following:

1. All final punch list items have been corrected, signed off by the Contractor and the Engineer, and demonstrated to the County during the final walk-through.

2. All updates to the Record Drawings have been made.

3. Demobilization and site clean up are complete.

4. All facilities have been properly demonstrated to be functioning as required.

5. The Engineer has issued a Certificate of Final Completion.

6. Seeded and sodded areas are established and growing.

1.02 CLOSE-OUT PROCEDURE

A. The Engineer and Contractor shall meet and resolve all outstanding issues including, but not limited to:

1. Claims and adjustments for time or costs.

2. Procedures for handling warranty issues.

B. A Final Change Order shall be processed if required. Final payment and close out procedures shall comply with the General Conditions and all other requirements of the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain at the site for the County one record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications of the Contract Documents.
5. Engineer's Field Orders or written instructions.
6. Approved shop drawings, working drawings and samples.
7. Field test records.
8. Construction photographs.

B. Related Requirements Described Elsewhere:

1. Shop Drawings, Working Drawings, And Samples: Section 01 33 23

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store and maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

B. Make documents and samples available at all times for inspection by the Engineer.

C. As a prerequisite for monthly progress payments, the Contractor is to exhibit the currently updated "Record Documents" for review by the Engineer and County.

1.03 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress.

1. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:

1. Depths of various elements in relation to datum.

2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made by Field Order or by Change Order.

6. Details not on original contract drawings.

7. Structure and piping relocations.

D. Specifications and Addenda: Legibly mark each section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.

2. Changes made by Field Order or by Change Order.

E. Shop Drawings (after final review and approval): Provide two (2) sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

1.05 SUBMITTAL

A. At Contract closeout, deliver record documents to the Engineer for the County.

B. Accompany submittal with transmittal letter in duplicate, containing:

1. Date.

2. Project title and number.

3. Contractor's name and address.

4. Title and number of each record document.

5. Signature of Contractor or his authorized representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 80 00

HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall comply with all federal, state, and local safety codes, ordinances, and regulations, including the requirements of the United States Occupational Safety and Health Administration (OSHA), Orange County, and other such safety measures as may be required by the above-mentioned regulatory agencies as required for Work being performed.

B. The Contractor shall comply with the requirements of 29 CFR 1910.132 for worker personal protection equipment requirements.

C. All Work shall be performed in strict accordance with the Contractor's Health and Safety Plan, as described below in Part 1.02.

D. The Contractor will use a Health and Safety Officer for construction oversight that is currently trained in accordance with OSHA regulations 29 CFR 1910.120. The Health and Safety Officer must have completed the 8-hour Management and Supervisor Training, 40-hour Health and Safety Training course and necessary refresher courses, and Medical Monitoring. Copies of current training certificates will be provided to the Engineer for the Health and Safety Officer prior to the start of the Work. The Health and Safety Officer shall be on-site during all intrusive activities and shall inspect ongoing activities on a daily basis. The Health and Safety Officer shall conduct a weekly site safety meeting for all on-site personnel.

E. No smoking will be allowed anywhere on County property.

F. Actions that potentially endanger workers should be stopped immediately and brought to the County or Engineer's attention. Health and Safety is the responsibility of the Contractor.

1.02 DESCRIPTION OF HEALTH AND SAFETY PLAN

A. The Contractor shall submit a Health and Safety Plan to the Engineer. The Health and Safety Plan shall include descriptions of the methods, equipment and safety procedures to be used during construction activities, including dewatering, excavating, trenching, backfilling, sheet pile installation, shoreline management, crane, barge, and other heavy equipment usage, and other construction activities.

B. At a minimum, the Health and Safety Plan shall address the following:

1. Site description and history.

2. Project activities and coordination with other Contractors and site operations.

3. Hazard evaluation.

4. On-site safety responsibilities, including supervisory responsibilities.

5. Personnel training.

6. Work zones.

7. Atmospheric and work-space monitoring.

8. Personnel protection, clothing and equipment.

9. Emergency procedures, including maps and phone numbers for emergency response.

10. Trench and excavation safety.

11. Confined space entry and ladder safety.

C. The Health and Safety Plan shall address issues including trench safety, operations adjacent to heavy equipment, traffic safety, first aid, heat stress and environmental monitoring, site security (including security of open excavations), and other Project specific topics.

D. The review of the Health and Safety Plan by the Engineer shall be for method and content only, and to inform the Engineer of the health and safety procedures which must be followed by the Engineer and County. The Contractor shall retain responsibility and liability for the application, adequacy and safety of the methods and monitoring. However, the Work shall not begin until the Health and Safety Plan has been submitted and reviewed by the Engineer.

E. The Contractor's duties and responsibilities for safety in connection with the Work shall continue until such a time Work is complete and the County has released the Contractor from the Project.

1.03 SAFETY EQUIPMENT

A. At a minimum, the Contractor shall have the following equipment on site:

1. Hard hats, work gloves, reflective work vests, and hard toe shoes for all personnel.

2. First aid kit.

3. Fire extinguishers, two 50-pound dry chemical type.

4. Barricades.

5. Ladders.

1.04 GENERAL SAFETY REQUIREMENTS

A. One person, to be present at all times during the construction, shall be designated to assure observance of the safety procedures. This person shall be trained in the use of all of the recommended safety equipment.

B. Open flame shall be prohibited within 50 feet of the construction area or as directed by the Engineer.

C. No worker shall be allowed to work alone at any time in or immediately near an excavation and/or construction area. Another worker shall be present outside the area.

D. Site operations will take place in conditions of adequate light only.

E. No workers will be allowed in any trench or excavation while excavation of the area is in progress. Entry into the excavation shall be made only after the Contractor has determined the appropriate level of personal protection required for entry into the excavation. Site workers in excavations must be supervised at all times.

F. Start-up and shutdown of equipment shall not be done in areas of exposed refuse.

G. The Contractor shall comply with all provisions of state, federal, or local codes regarding Work in confined spaces, including the need for monitoring, safety harnesses, and documentation of confined space activity. The atmospheric condition within confined spaces shall be monitored for oxygen, combustible gas, and hydrogen sulfide before entry. No confined spaces shall be entered without first verifying the safety of the environment.

H. When construction and/or working in a manhole, vault, or other subgrade enclosure in and/or adjacent to the landfill site, the interior atmosphere shall be tested for the presence of oxygen, hydrogen sulfide, and combustible gas before entry and continuously when occupied. The person entering should wear a parachute-type safety harness with attached tether secured to the surface. A SCBA (self-contained breathing apparatus) shall be available for use if needed. Forced air ventilation fans shall be used to provide a fresh air stream.

I. The Contractor shall demonstrate to the Engineer on a daily basis that all safety equipment is functioning properly, that all monitoring instruments are calibrated, and that the instrument operators are sufficiently knowledgeable in the use of the safety equipment.

1.05 ACCIDENT PREVENTION

A. Precaution shall be exercised by the Contractor at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws and of building and construction codes shall be observed. Machinery, equipment, and other hazards shall be guarded or eliminated. First aid kits shall be provided in a readily accessible location or locations.

B. The Contractor shall make all reports as are, or may be, required by any authority having jurisdiction, and permit all safety inspections of the Work being performed under this Contract. Before proceeding with any construction Work, the Contractor shall take the necessary action to comply with all provisions for safety and accident prevention.

1.06 PAYMENT FOR SAFETY REQUIREMENTS

A. Payment for complying with the safety requirements for construction on the Project site shall be included in the contract price paid for the various items of Work wherein it is required and no separate payment will be made therefore.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

DIVISION 31
EARTHWORK

SECTION 31 23 34

EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. The Work specified in this section includes excavating, shoring, transporting, stockpiling, placing, backfilling, compacting, grading, field testing, and quality control/quality assurance laboratory services required for the construction as shown on the Drawings and in the Specifications.

B. Excavation, backfilling, sample collection, and testing shall be performed by the Contractor when the County's representative is present. A minimum of 24-hours prior notice shall be given to the County and Engineer.

C. Upon identification, the Contractor shall notify the Engineer in writing if the site conditions encountered during construction differ from that indicated on the Drawings. Notification shall include an explicit description of the differences.

D. Soil, vegetation, and other materials removed for the Project shall be disposed of by the Contractor in the Orange County Class III Landfill. The Contractor shall be responsible for excavation, loading, hauling, transporting over the OCSWMF inbound/outbound scales, and all other incidentals necessary to remove these materials from the Project area.

E. All earthwork material excavated from the Project area, shall go over the OCSWMF scales in order to track items for unit cost payment.

1.02 CONSTRUCTION QUALITY ASSURANCE

A. Construction Quality Assurance (CQA) will be performed by an independent geotechnical consultant retained by the County in accordance with Section 01 45 00. The CQA Engineer shall oversee all geotechnical activities and the quality control testing as specified herein. The CQA Engineer shall prepare a final report certifying the geotechnical activities performed on this Project are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional Engineer licensed in the State of Florida.

1.03 SUBMITTALS

A. Health and Safety Plan:

1. The Contractor shall submit to the Engineer for review a Health and Safety Plan as described in Section 01 80 00 - Health and Safety.

2. The review of the Health and Safety Plan by the Engineer shall be for method only. The Contractor shall retain responsibility for the application, adequacy and safety of the methods. However, construction shall not begin until the Health and Safety Plan has been submitted and reviewed by the Engineer.

B. For all borrow sources, the Contractor shall notify the Engineer in writing of the material source for each soil type specified within Part 2 of this Section at least 15 calendar days prior to the date of anticipated use of such material. Notification shall include:

1. Supplier's name.

2. Borrow location.

3. Documentation confirming adequate quantities are available to complete the Work.

1.04 NOTIFICATION

A. Upon identification, the Contractor shall notify the Engineer in writing if the site conditions encountered during construction differ from that indicated on the Drawings. Notification shall include an explicit description of the differences.

PART 2 - PRODUCTS

2.01 GENERAL FILL SOIL MATERIALS

A. Soil material (except material from Pond 2) may be reused for general fill provided it is free of sticks, roots, organic matter, refuse, and stones larger than 1-inch in any dimension. Remove any material that cannot be made to compact readily and replace with suitable material. The material will be disposed of by the Contractor in the Orange County Class III Landfill.

B. Material shall be well-graded (SW), poorly graded (SP) or clayey sands (SC) as classified by the Unified Soil Classification System (USCS), or other soil as approved by the Engineer.

2.02 STRUCTURAL FILL

A. Soil for structural fill use shall be well-drained, free of sticks, roots, organic matter, refuse, stones larger than 1-inch in any dimension, and should have a uniform composition. Acceptable soil types, as classified by the Unified Soil Classification System (ASTM D 2487), well-graded (SW), poorly graded (SP) or clayey sands (SC), or Engineer approved. For soils with Atterberg limits, Liquid Limit shall be less than 30 with a Plasticity index greater than 10.

2.03 TOPSOIL

A. Material shall be fertile, natural soil, typical of the locality, free from refuse, stones (exceeding 2-inch in any dimension), roots or sticks (exceeding 1-inch diameter), clay, and weeds, and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth. The material shall comply with the requirements of FDOT's Standard Specifications for Road and Bridge Construction, latest edition, for Topsoil.

2.04 WEEP HOLE DRAINAGE ROCK LAYER

A. Drainage stone shall be crushed rock meeting FDOT requirements for No. 57 large aggregate as indicated in Section 901 of FDOT Standard Specifications for Road and Bridge Construction. Drainage stone shall consist of hard, strong, durable material free of any metal, roots, concrete, debris, organics, or other deleterious materials and coatings. The maximum loss for aggregate shall be 30% when tested in accordance with ASTM C535. It shall not contain any soapstone, shale, or other material that easily disintegrates.

2.05 STABILIZATION ROCK LAYER

A. Stabilization stone shall be crushed rock meeting FDOT requirements for No. 57 large aggregate as indicated in Section 901 of FDOT Standard Specifications for Road and Bridge Construction. Stabilization stone shall consist of hard, strong, durable material free of any metal, roots, concrete, debris, organics, or other deleterious materials and coatings. The maximum loss for aggregate shall be 30% when tested in accordance with ASTM C535. It shall not contain any soapstone, shale, or other material that easily disintegrates.

2.06 QUALIFICATION TESTS

A. Prior to placement, soils shall be tested in accordance with Table 31 23 34-1 by the County's independent soil laboratory in accordance with Section 01 45 00 - Quality Control and Part 1.02 of this Section.

B. Composite soil samples are not allowed.

C. Testing shall be repeated every 1,000 cubic yards (in-place) or one every change in borrow source or material or upon direction of the Engineer.

TABLE 31 23 34-1 SOIL QUALIFICATION TESTING

Material	Test	ASTM No.
General Fill	Standard Proctor	D698
	Soil Classification	D2487
	Sieve Analysis	D422
	Atterberg Limits	D4318
	Moisture Content	D2216

Material	Test	ASTM No.
Structural Fill	Standard Proctor	D698
	Soil Classification	D2487
	Sieve Analysis	D422
	Atterberg Limits	D4318
	Moisture Content	D2216
Topsoil	Soil Classification	D2487
Weep Hole Drainage Rock Layer and Stabilization Rock Layer	Classification	D448
	Sieve Analysis	C136
	Resistance to Degradation (LA Abrasion)	D535

TABLE 31 23 34-2 - COMPACTION CRITERIA

Location	Minimum Compaction	Minimum Testing Frequency
General Fill	90% of maximum dry density within 3 percent of optimum moisture content (ASTM D 698).	1 test per 12 inch compacted thickness.
Structural Fill	12 inches in place material compacted to a minimum of 90% of its standard proctor maximum dry density (ASTM D 698).	1 nuclear densiometer test per every lift (12 inch compacted thickness) (ASTM D 2922 & D 3017).

PART 3 - EXECUTION

3.01 EXCAVATION

A. The Contractor shall conduct excavation activities according to the requirements below:

1. Layout all excavations and establish grades as shown on the Drawings. Replace existing survey markers at original location if disturbed or destroyed. Layout work shall be performed by a licensed land surveyor registered in the State of Florida.

2. Excavation and backfilling shall be performed by the Contractor only when the County's representative is present. A minimum of 24-hours prior notice shall be given to the Engineer.

3. Provide drainage at all times during construction by shaping excavated areas and maintaining ditches and drains. Protect graded areas against action of elements. Re-establish grade where settlement, washouts, or erosion damage occurs. Damaged areas shall be repaired at no additional cost to the County.

4. When excavation has reached prescribed depths, the Engineer shall be notified that an inspection of the excavation may be performed.

5. If the bottom of any excavation is removed below the limits shown on the Drawings or as directed by the Engineer, it shall be backfilled at the Contractor's expense with material approved by the Engineer.

6. The Contractor shall not leave any excavations or trenches open at the completion of work each day. All open holes shall be backfilled flush with existing grade, or covered at the Engineer's direction, with acceptable material prior to the Contractor leaving the site.

7. All excavations shall conform to the Health and Safety Plan or submitted as described in Section 01 80 00 - Health and Safety Requirements.

3.02 STOCKPILE OF MATERIALS

A. Excavated materials shall be transported to a stockpile area designated by the County or transported to the Orange County Class III Landfill as required. Excavated materials may be segregated during excavation and the County shall direct locations for segregated materials.

B. Stockpiles shall be graded to allow for stormwater run-off. Areas around the stockpiles shall be graded to divert stormwater run-on from the stockpile areas. Silt fences shall be installed and maintained around the perimeter of all stockpiles.

C. The Contractor shall be responsible for vehicle traffic safety and shall coordinate with the Engineer to determine site-specific safety concerns.

D. The Contractor shall sweep or wash paved roadways that become covered with soil. The Contractor shall provide all equipment, water, and personnel necessary to clear the paved roads. This activity shall be performed at a minimum of once per week or as the Engineer directs.

3.03 PLACEMENT OF GENERAL FILL

A. Place fill materials, and backfill to the lines and grades shown on Drawings.

B. Materials excessively wet or dry are unsuitable. Allow such material to dry, or

moisten, as required, to bring material into a workable condition.

C. The Contractor shall comply with minimum compaction criteria as contained within Table 31 23 34-2 of this Section.

D. In cuts, all loose or protruding rocks on the excavated side-slopes shall be loosened and removed to line or finished grade of slope. All cut and fill slopes shall be as shown on the Drawings or as directed by Engineer.

E. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc. or as a result of movement, consolidation or settlement of the ground. Repair shall be performed at no additional cost to the County.

3.04 PLACEMENT OF STABILIZATION ROCK LAYER

A. Prior to placement of the stabilization rock layer within the sheet pile system, the existing subgrade shall be cleared of vegetation, stumps, roots, etc. which are understood by generally accepted practice not to be suitable for the Project. Following removal of the unacceptable material, a geotextile will be placed on the surface followed by the stabilization rock layer.

3.05 PLACEMENT OF STRUCTURAL FILL

A. Following placement of the stabilization rock layer, approved structural fill will be placed, in the dry, and compacted as required.

B. After placement of the stabilization rock layer, and acceptance by the Engineer, approved structural fill shall be placed in loose lift thicknesses no greater than 12 inches as needed. Compaction shall be accomplished by mechanically compacting each 12 inch lift. Care shall be taken when selecting compaction construction equipment sizes and the amount of traffic on the material. Excess surface moisture can cause pumping and deterioration of the near surface soils or damage to the sheet pile wall system.

C. The Contractor shall comply with minimum compaction criteria for each 12 inch structural fill lift as contained within Table 31 23 34-2 of this Section.

D. Each compacted structural fill layer should be compacted to at least 90% of the standard proctor maximum dry density (ASTM D 698) and shall be accepted by the Engineer for the appropriate specified density prior to beginning the next layer. The filling and compaction operations should continue in 12 inch lifts of fill soils until the desired elevation is achieved.

E. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the County.

F. Materials excessively wet or dry are considered unsuitable and shall be removed and replaced with approved material per this Section at no additional cost to the County.

G. Soils which yield or exhibit pumping due to excessive moisture under this operation shall be removed and replaced with approved material per this Section at no additional cost to the County.

3.06 DEWATERING

A. Water in excavations shall be discharged into Pond 2 as approved in advance by the County.

B. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove water entering excavations and conduct dewatering activities as needed to successfully complete the Project. The Contractor shall keep such excavations dry so as to obtain a satisfactory foundation condition for all work.

C. The Contractor shall not allow water to accumulate in the sheetpile wall system. Remove water to prevent softening of foundation bottom and soil changes detrimental to stability of subgrades and foundations. Soils which become soft, loose, “quick”, or otherwise unsatisfactory as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the Engineer at the Contractor’s expense. Each lift of structural fill shall be firm and without standing water before the next lift is placed. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components as necessary.

3.07 PLACEMENT OF TOPSOIL FINAL GRADING

A. Grading in preparation of topsoil application shall be performed to the lines, grades, and elevations shown in the Drawings.

B. Materials excessively wet or dry are unsuitable. Allow such material to dry, or moisten, as required, to bring material into a workable condition.

C. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials that may be lost or displaced as a result of natural causes such as storms, squalls, etc.

D. The Engineer reserves the right to make adjustments or revisions to plans as the work progresses to achieve the intent of the design.

E. All backfilled and/or regraded slopes shall be uniformly dressed to the grades shown on the Contract Drawings.

3.08 TESTING REQUIREMENTS DURING PLACMENT

A. The Contractor shall place backfill and fill materials to achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the Work; however, in no case shall the degree of compaction fall below minimum compaction specified in Table 31 23 34-2 of this Section.

B. The location of field moisture-density tests for this Section shall be selected and approved by the CQA.

C. Composite soil samples are not allowed.

3.09 TOLERANCES

A. The Contractor shall bring final grading to within the tolerance specified in Section 01 32 23 – Survey and Layout Data.

3.10 DUST CONTROL

A. The Contractor shall limit airborne dust by spraying water over the construction area, or as directed by the Engineer.

END OF SECTION

SECTION 31 41 16

FIBER REINFORCED POLYMER (FRP) SHEET PILE

PART 1 - GENERAL

1.01 GENERAL

A. The Work covered by this Section consists of furnishing all labor, materials, tools, supervision, transportation, installation equipment, and incidentals necessary to complete all operations in connection with the installation of the Fiber Reinforced Polymer (FRP) sheet pile in accordance with these Specifications and the Contract Drawings. Incidentals include, but are not limited to, hardware, fittings, joint sealant, etc.

1.02 CONSTRUCTION QUALITY ASSURANCE

A. A Construction Quality Assurance Representative (CQAR) will observe each pile installation and the Contractor's related Construction Quality Control (CQC) activities. CQA activities shall, at a minimum, include review of Contractor's CQC activities and manufacturer's written certification for the proposed sheet pile product.

1.03 CONSTRUCTION QUALITY CONTROL

A. General

1. CQC is the responsibility of the Contractor. The Contractor shall provide a full time Construction Quality Control Manager (CQCM) who shall establish and maintain quality control for the installation of every sheet pile to assure compliance with the Contract Documents, Specifications and manufacturer's specifications. The Contractor may use a qualified Project Superintendent to conduct the duties specified in lieu of a separate CQCM. The CQCM shall maintain records of quality control for all construction operations including, but not limited to, the following:

    a. Accurate location, alignment and plumbness of sheet piles.

    b. Full and proper engagement of sheet pile interlocks.

    c. Sheet pile driving (installation) rate.

    d. Final position; depth of penetration; bottom and top elevations of sheet piles.

e. Location and elevation of any obstruction encountered and action directed by the Engineer.

f. Pulled sheet piles and redriving.

g. Sheet pile cutoffs in excess of six (6) inches in length.

h. Stockpiling and storage of sheet piles.

i. Removal and disposal of damaged of sheet piles.

j. Application of joint sealant.

k. Use of sheet pile mandrel.

l. Use of pre-punch mandrel, if needed.

m. Patches and holes.

B. Quality Control Activities

1. At a minimum the Contractor's CQCM shall record the pile number, date, time, and location of each sheet pile installed on a Sheet Pile Installation Log. The sheet pile number shall be marked on the north or south side of the top of each completed pile with an indelible marker. The Contractor shall supervise and record the method used to monitor plumbness of the pile. At a minimum, electronic survey equipment shall be used to document compliance with the installation criteria specified herein.

2. Upon completion of the installation of each sheet pile, the CQAR shall review the documentation and the CQCM and CQAR shall sign the Sheet Pile Installation Log. Each party shall retain a copy of each Sheet Pile Installation Log on the day the installation of each pile is completed.

C. Reporting

1. The original and two copies of these records, as well as the records of any required corrective action taken by the Contractor, shall be furnished to the CQAR daily.

1.04 SUBMITTALS

A. The Contractor shall submit with his Bid, the manufacturer and manufacturer's material model number of the proposed sheet pile.

B. The Contractor shall submit a listing of the sheet pile manufacturer, model number, and properties stated in Table 31 41 16-1 Minimum Average Sheet Pile

Properties, descriptions of sheet piling driving equipment to be used, sheet pile driving records and other associated submittals to the Engineer for approval, prior to the commencement of Work. Submittals, associated Work and materials not satisfactorily provided to the Engineer shall be rejected.

C. The Contractor shall submit the qualifications of the manufacturer of the sheet pile prior to the commencement of Work. The qualification submittal shall provide a minimum of five example projects of 500 linear feet each for which the manufacturer provided sheet pile products similar to those specified herein.

D. Installation Equipment Descriptions

1. The Contractor shall submit for approval by the Engineer, prior to commencement of Work, a written statement addressing the appropriate installation equipment, tools, and driving method as dictated by the soil conditions and designed depths of the sheet pile installation. This shall include a complete description of sheet pile driving equipment including hammers, extractors, protection caps, sheet pile mandrel, pre-punch mandrel (if needed), and other installation appurtenances as deemed necessary by the Contractor for proper installation of the sheet piles.

E. Pile Driving Plan

1. The Contractor's Pile Driving Plan for the sheet piling shall be submitted for approval by the Engineer, prior to commencement of Work, and shall show a typical detail and proposed driving sequence. The Contractor shall provide a description of the method for handling the sheet piles to prevent permanent deflection, distortion or damage to piling interlocks, plus the type of transportation vehicle for bringing sheet piles to the point of installation.

2. The Pile Driving Plan shall outline the detailed procedures for pile placement and survey methods to measure and achieve verticality within the specified criteria. The Contractor shall provide a sheet pile numbering system for tracking Quality Control and Quality Assurance activities which will be documented in the Sheet Pile Installation Log as previously discussed in Part 1.03.B of this Section.

3. The Contractor shall describe the methods to be used to protect utilities and how utilities shall be installed through the sheet pile where applicable. This description shall include the method for sealing penetrations required through the sheet pile for utilities or sheet pile wall system materials.

F. Material Characteristics Documentation

1. The Contractor shall submit to the Engineer a manufacturer's Letter of Certification that the finished sheet pile material for the Project shall meet or exceed the properties listed in Table 31 41 16-1 Minimum Average Sheet Pile Properties.

G. Health and Safety Plan

1. The Contractor shall create and submit to the Engineer a Health and Safety Plan as described in Section 01 80 00 Health and Safety Requirements.

2. The review of the Contractor's Health and Safety Plan by the Engineer shall be for method only. The Contractor shall retain responsibility for the application, adequacy and safety of the methods indicated within the Plan. However, construction shall not begin until the Health and Safety Plan has been submitted to the Engineer.

H. Driving Records

1. Records of the sheet pile driving operations shall be submitted to the CQAR after driving is completed daily. These records shall provide a system of identification which shows the disposition of approved piling in the Work, driving equipment performance data, piling dimensions and top and bottom elevations of the installed sheet piles.

I. The Contractor shall submit the manufacturer and model number for the hydrophilic seal to be used for the sheet pile interlocks including the product properties and the manufacturer's recommendations for storage, handling, installation, and quality testing.

J. The Contractor shall submit shop drawings of the sheet pile wall cap, wale beam splice plates, saddle bearing plates, wale tie rod connections, front/back wale beam connection systems, etc. for the entire sheet pile system.

1.05 DELIVERY, STORAGE AND HANDLING

A. The Contractor is responsible for all costs, approvals, and permits necessary to transport all material from the point of manufacture to the Project.

B. The Contractor shall comply with manufacturer's ordering instructions and lead time requirements.

C. Materials delivered to the site shall be new and undamaged and shall be accompanied by certified reports from the manufacturer as to meeting the Project specifications.

D. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling shall also facilitate inspection by the CQAR.

E. Upon delivery of materials to the site, the Contractor shall visually inspect all materials for defects or damage. If serious defect or damage is detected, the Contractor shall immediately notify the CQAR.

F. Store bundled sheet piling on a relatively level surface with a slight pitch to allow water to drain. The Contractor should not break bundled sheets until ready for immediate installation.

1.06 UTILITIES

A. The Contractor shall be responsible for locating all utilities that cross the path of the sheet pile wall and associated Work. All utilities shall be maintained and the sheet pile wall shall be constructed around the utility, by temporarily removing then re-installing the utility, if required.

B. All utility locations shown on the Contract Drawings shall be considered approximate and should not be used in lieu of official utility surveys. Utility hazards should be assumed to be both above ground and below ground.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The Fiber Reinforced Polymer (FRP) sheet pile profile shall be manufactured with an interlocking feature that ensures adjacent panels maintain alignment. All sheet piling shall meet or exceed the characteristics listed in this Specification. The sheet pile shall be free from visible cracks, flaws, foreign inclusions or other injurious defects. All sheet pile shall be provided with no splices, as required to meet the requirements of the Project. The sheeting shall be uniform in physical properties.

B. Acceptable composite sheet pile materials for the Project are the following:

1. EverComp 80.5 manufactured by Everlast Synthetic Products, LLC, 1000 Wyngate Parkway, Suite 100, Woodstock, GA 30189, phone 1-800-687-0036 and fax 1-800-687-0048.

2. CMI sheet pile Model UC-75 manufactured by Crane Materials International, 1165 Northchase Parkway Marietta, GA 30067, phone 800-256-8857.
3. Or Engineer approved equal.

C. Resin System - Shall be a high performance resin, which exhibits low water absorption, ultraviolet (UV) stabilizers to provide sufficient resistance to UV light, high heat distortion temperature, high elongation and high impact strength.

D. The finished sheet pile material for the Project shall meet or exceed the properties listed in Table 31 41 16-1 Minimum Average Sheet Pile Properties.

1. The Contractor shall submit a three foot long sample of the finished sheet pile material to the Engineer for approval, prior to delivery.

E. Alternate finished sheet pile material must be pre-approved by the Engineer.

1. The Contractor shall submit a three foot long sample of the alternate finished sheet pile material to the Engineer for approval, prior to delivery.

F. The Contractor shall supply a suitable number of approved sheet pile of the required lengths to the Project site such that if a sheet is damaged or otherwise rejected, a backup sheet pile will be available. The County shall not be responsible for delays in Project completion due to a shortage of suitable length sheet piles.

TABLE 31 41 16-1 MINIMUM AVERAGE SHEET PILE PROPERTIES

CHARACTERISTIC	UNITS	VALUE
Moment of Inertia	In^4/ft	260
Section Modulus	In^3/ft	38
Thickness (Min.)	Inches	0.43
Section Depth	Inches	14.0
Panel Width	Inches	24.0
Panel Length	Feet	34
Modulus of Elasticity	psi	3,800,000

G. Wale Beams for support of the composite sheet piling shall be per Section 35 31 16 Wale Beam and as noted on the Contract Drawings.

H. The components of the saddle bearing plate, front/rear wale connection, wale/tie-rod connections, wale beam splice systems, plates, bolts, nuts, washers, etc. shall consist of the following materials unless otherwise noted on the Contract Drawings.

1. All steel shall be either all stainless steel (SS304 or SS316) or all hot dip galvanized (A153) steel (A36 or 572). This includes tie rods, all-threads, couplers, washers, nuts, carriage bolts, lag screws, splice plates, saddle bearing plates, etc. No mixing of steel types will be allowed.

I. Weep holes within the sheet pile shall be 2-inch diameter Everdrain manufactured by Everlast or an approved equivalent.

J. The sheet pile wall system shall be capped using a fabricated FRP, UV-stabilized synthetic, corrosion-resistant cap, manufactured by Evercomp or approved equivalent, as noted on the Contract Drawings.

K. The sheet pile wall joints shall be sealed with a single component hydrophilic waterstop material such as Swell Seal manufactured by Grace Construction Products or approved equivalent. The product should cure in both dry and wet environment. The minimum properties are shown in Table 31 41 16-2:

TABLE 31 41 16-2 MINIMUM AVERAGE SEALANT PROPERTIES

PROPERTY	VALUE	TEST
Solids		
Solids	100%	
Uncured		
Vertical Slump	1/8”	14.0
Skins Over	6 – 10 hours	
Flash Point	> 266°F	ASTM D93
Cured 7 Days at 77°F (22°F) 3/8” thick		
Elongation at break	525%	ASTM D3574
Tensile Strength	312 psi	ASTM D412
Resistance to hydro-static pressure	>330 feet of head	DNCC
Swelling capacity in contact with water	200%	DNCC
Coverage		
	Bead	Coverage
10.5 oz.	3/8”	Approx. 10 ft.
20 oz.	3/8”	Approx. 20 ft.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Project Layout

1. The Contractor shall provide survey control and field staking of the sheet pile wall alignment as shown on the Contract Drawings. Field survey stakes shall be clearly labeled and shall be provided at a minimum of 20 foot intervals and at every change in direction.

2. Field staking shall be reviewed by the CQAR prior to placing the sheet piles.

B. Placing and Driving

1. Equipment

a. The Contractor shall supply and use equipment appropriate for the installation of the sheet piles as indicted on the Contract Drawings and Specifications.

2. Placing

a. Sheet piles shall be located along the alignment as shown on the Contract Drawings. Sheet piles shall be placed as true to the line to within ± 0.25 feet.

b. Suitable temporary templates or guide structures shall be provided by the Contractor to insure that the sheet piles are placed and driven to the correct alignment both straight and plumb.

c. Pilings properly placed and driven shall be interlocked throughout their entire length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

3. Driving

a. If the Contractor encounters unforeseen buried debris along the sheet pile wall alignment the Contractor shall determine and use the proper equipment to counteract difficult driving conditions. All sheet piles shall be driven to the depth shown on the Contract Drawings. Under no circumstances shall the Contractor cutoff or install shorter sheet piles without written authorization from the Engineer or the County. Pilings damaged during driving or driven out of interlock or plumbness shall be removed and replaced at the Contractor's expense.

b. The Contractor shall take adequate precautions to ensure that sheet piles are driven vertically and horizontally plumb. The plumbness shall be checked during initial driving to ensure the sheet piling is not driven out-of-plumb in the plane of the wall or out-of-plumb perpendicular to the plane of the wall. Install driving guide, template or wale system to aid in driving a straight and plump wall. A "two level" template as well as front and rear wale/bracing system is strongly suggested for tough and/or deep driving situations. If at any time the forward or leading edge of the sheet pile wall is found to be out-of-plumb in the plane of the wall or perpendicular to the plane of the wall, the assembled sheet pile shall be pulled and re-driven at the Contractor's expense.

c. Drive sheet piling (preferably in pairs) by "Driving in Steps" or "Gang Driving". Direction of installation should be with the male

side of the sheet when possible. Mandrel, helmet or drive shoes may be required if driving through hard soil strata or obstructions. Water jet by displacement of soil shall only be used with non-cohesive soils (sands & gravels). Water jet shall not be used if driving through clay, silts or immediately adjacent to an existing structure without the written approval from the engineer. Water may be introduced to induce lubrication and liquefaction during installation. It is very important that the Contractor drives sheets to required embedment depth. Under no circumstances shall the Contractor cut-off or install shorter sheets without written authorization from Engineer or the County. Adequate precautions shall be taken to ensure that piles are driven plumb. Sheet piling shall not be driven more than 1/8 inch per foot out of plumb in the plane of the wall, nor more than 1/16 inch per foot "out" of plumb perpendicular to the plane of the wall, nor more than 1/4 inch per foot "in" of plumb perpendicular to the plane of the wall.

d. Piles driven out of interlock with adjacent piles or otherwise damaged shall be removed and replaced by new piles at the Contractor's expense.

e. On each day of sheet pile driving, the Contractor shall stab only the number of piles that can be driven to grade by the end of the Work day, and all piling stabbed shall be driven to grade by the end of each Work day except the last two piles may remain tapered up to receive the next day's piles.

f. In the case of an obstruction, sheet piles will be allowed to remain above final grade until the obstruction is identified by the Contractor and a remedy is provided by the County. The Contractor may be required to excavate to the obstruction, remove the obstruction and backfill to match adjacent ground with uncompacted fill obtained from the excavation of the obstruction. If the obstruction restricts driving operations and cannot be removed by excavation because of the depth of the obstruction, the Contractor shall be provided with an alignment change that by-passes the obstruction by the County.

4. Hardware Installation

a. Install wale beams, tie-rods, and associated connection systems as noted on the Contract Drawings.

b. Wale beam installation includes all hardware such as saddle beam plates, splice plates, bolts, washers, nuts, etc. Additional information is included in Section 35 31 16 – Wale Beams.

5. Inspection of Driven Piling

   a. The Contractor shall provide Quality Control monitoring of each sheet pile driven as specified herein.

   b. The Contractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be damaged during driving, driven out of interlock with adjacent piles, driven out-of-plumb, or otherwise damaged shall be removed and replaced by new piles at no additional cost to the County.

6. Cleanup and Backfilling

   a. Upon acceptance of the sheet pile installation, the wall shall be backfilled with material meeting the Specifications and the finished grade shall be as shown on the Contract Drawings.

   b. Structural fill material placed within the sheet pile wall system shall be placed in 12-inch lifts maximum compacted to 90% of the Standard Proctor density as defined by ASTM D698 with a mechanical compaction device as determined appropriate by the Contractor.

3.02 WEEP HOLES

A. The weep holes shall be Everdrain or an approved equivalent. The product shall be installed and fastened to the sheet pile wall according to the manufacturer's recommendation.

B. Voids around the weep holes through the sheet pile wall shall be filled per the manufacturer's recommendations, if required due to installation by the Engineer or County, an epoxy sealant is acceptable. Materials such as "Great Stuff" or similar foam applications will not be acceptable due to deterioration of product.

3.03 HYDROPHILIC SEAL

A. Wet Drive Method

1. Lay sheets out with the female side of the pile accessible. Clean all foreign material and surface of oxidation from the knuckle by OSHA approved chemical, flame, or abrasion. Immediately before applying sealant, blow the knuckle clean with compressed air. Compressed air must be free of oil and water. Install hydrophilic seal on dust and dirt free surface.

2. Utilize a heavy duty caulking gun and apply in an uninterrupted band a minimum 3/8" bead gunned in the middle of the joint. Drive the sheet pile within 24 hours unless otherwise recommended by the manufacturer.

3. If the hydrophilic seal fully cures before driving the sheet pile, remove the cured seal, clean, and re-apply a new seal.

B. Cure and Drive Method

1. Lay sheets out with the female side of the pile accessible. Clean all foreign material and surface of oxidation from the knuckle by OSHA approved chemical, flame, or abrasion. Immediately before applying sealant, solvent wipe the knuckle.

2. After the solvent flashes off, apply an 3/8" bead into the female knuckle.

3. Tool the material in the knuckle to roughly the shape of the male interlocking member of the sheet pile.

4. Store sheet piles in such a way that they will not get standing water in the knuckle prior to installation.

END OF SECTION

DIVISION 32
EXTERIOR IMPROVEMENTS

SECTION 32 92 01

SEEDING AND SODDING

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall furnish all labor, materials and equipment necessary to complete the Work specified in this section to include soil preparation, liming, fertilizing, temporary grass seeding and mulching, sodding and maintenance of all areas requiring vegetation as shown on the Contract Drawings and as specified herein.

B. The Contractor shall construct grassing operations in strict conformity with the Contract Documents and in accordance with the most recent edition of the Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction.

1.02 REFERENCES

A. The 2010 edition of the FDOT Standard Specifications for Road Bridge Construction (Standard Specifications) shall be referred to for both specific and general standards for materials, construction, workmanship, and quality control as specified herein with exceptions, as noted herein.

B. The latest edition of FDOT Roadway and Traffic Design Standards.

1.03 SUBMITTALS

A. Materials shall not be used for construction until approved by the Engineer.

B. Seed: Signed copies of vendor's statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Statement shall certify that each container of seed delivered is fully labeled in accord with Federal Seed Act and equals or exceeds specification requirements.

C. Sod: Prior to placing sod, notify the CQA Engineer of the source and allow the Engineer to inspect. Submit documentation from supplier regarding species and percentages of purity.

D. Fertilizer: Furnish duplicate copies of invoices for all fertilizer used on project, along with certification of quality and warranty.

E. Soil Analysis: If necessary to utilize fertilizer on sodding, the Contractor shall perform and furnish a soil analysis for the on-site topsoil used in the final cover. The analysis shall be made by a qualified independent soil-testing agency, to be approved by the Engineer. The analysis shall state percentages of organic matter,

inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of the soils. The analysis shall state recommended quantities of nitrogen, phosphorus, and potash nutrients and any soil amendments to be added to produce satisfactory topsoil. The Contractor shall perform soil test 30 days prior to mobilizing for landscape construction.

F. Guarantee: Furnish copies of manufacturer/supplier warranties or guarantees for all products provided under this specification.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Provide topsoil conforming to FDOT Standard Specifications Section 987, Finished Soil Layer Materials.

2.02 SEED

A. If required by the County, due to damage by the Contractor, Contractor may restore the staging/laydown area using seed. Fresh, clean, new-crop seed labeled in accord with U.S. Department of Agriculture Rules and Regulations and the FDOT Standard Specifications under the Federal Seed Act in effect on date of bidding. Provide seed of grass species, and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified. Furnish seed in sealed standard containers labeled with producer's name and seed mixture and percentages of purity, germination, and weed seed for each grass seed species required.

Common Name	Minimum Percent Germ.	Minimum Percent Purity	Maximum Percent Weed-Seed
Bahia Grass (Pensacola)	80	95	1.0
Bermuda Grass (Unhulled)	85	95	1.0
Top Brown Millet	85	90	1.0
Rye	90	95	1.0

2.03 SOD

A. The following sections of the FDOT Standard Specifications shall apply:

1. Section 575-1, 4, 5, 6

2. Section 981-2 1, 981-3 and 981-45, Materials

B. Sod shall be recognized Argentine Bahia grass and shall be well matted with roots and shall be of firm tough texture having a compact top growth and heavy root development. It shall not contain Bermuda grass, weeds or any other objectionable vegetation. Other sodding species may be utilized pursuant to the Project's product substitution procedures. The soil embedded in the sod shall be good, clean earth and free from stones and debris. The sod shall be free from fungus, vermin and other plant diseases and shall have been mowed at least three times with an approved lawn mower, with final mowing not more than seven days before the sod is cut. The sod shall be sufficiently thick to ensure a dense stand of live grass. The sod shall be live, fresh and uninjured at the time of planting. It shall be planted as soon after being dug up as possible and shall be shaded and kept moist from the time it is dug up until the time it is planted.

2.04 MULCH

A. Provide clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, peanuts or other locally available mulch material. Do not use mulch that contains an excessive quantity of matured seeds of noxious weeds, or other species that will grow or provide a menace to surrounding land. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

2.05 FERTILIZER

A. Provide commercial fertilizer conforming to FDOT Standard Specifications, Section 982 and Orange County requirements.

B. Fertilizer shall be granulated so that 80 percent is held on a 16 mesh screen, uniform in composition, dry, and free flowing. The Contractor shall test screen one bag of fertilizer per source and per shipment.

2.06 LIMESTONE

A. Dolomitic limestone shall be an approved product designated for agricultural use.

2.07 SULFUR

A. Sulfur chips shall be an approved product designated for agricultural use.

2.08 WATER

A. The water used in the seeding and sodding operations may be obtained from Pond 2 or any municipal water system approved by the Engineer. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance, which might be harmful to plant growth. Water containing greater than 800 parts per million (ppm) dissolved solids shall not be used.

PART 3 - EXECUTION

3.01 GENERAL

A. Unless otherwise shown on the Drawings, topsoil shall be placed to achieve a minimum topsoil depth of 4-inches in all areas indicated to be seeded or sodded.

B. Mulch material shall be applied uniformly over all seeded areas.

3.02 SOIL PREPARATION

A. The Contractor shall conduct laboratory analysis on five (5) representative soil samples to determine pH content and nutrient levels. The rate for adding sulfur or lime shall be based upon recommendation by the laboratory. The soils laboratory may be obtained through the U.S. Soils Conservation Service or the University of Florida IFAS Extension Office.

B. All areas to receive topsoil, seed and/or sod shall be raked, and all rubbish, sticks, roots and stones larger than 1-inch shall be removed. Loosen subgrade surface immediately prior to being covered with topsoil. Subgrade shall be inspected and approved by the CQA Engineer before topsoil is placed.

C. Topsoil shall be placed over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling the complete Work will conform to the lines, grades, and elevations as indicated on the Drawings. No topsoil shall be spread in water or while excessively wet.

D. Loosen topsoil surface to a minimum depth of 2-inches. Remove stones over 1-inch in any dimension and sticks, roots, rubbish and other extraneous matter. Topsoil shall be inspected and approved by the CQA Engineer before subsequent operations commence.

3.03 APPLICATION OF LIMESTONE, SULFUR AND FERTILIZER

A. Sulfur and Limestone: If laboratory results indicate the addition of sulfur or lime is necessary, spread uniformly over designated areas to be seeded or sodded at the rate recommended. Thoroughly mix through upper 2-inches of topsoil.

B. After application of sulfur or lime, and prior to applying fertilizer, loosen areas to be seeded or sodded with a double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pockets or low areas, which will allow water to stand.

C. Fertilizing: Distribute fertilizer uniformly over areas to be seeded or sodded at a rate of 30 pounds per 1,000 square feet. Use a suitable distributor. Do not apply fertilizer within 10 feet of any new or existing piezometer or monitoring well.

D. Incorporate fertilizer into topsoil to depth of at least 2-inches by disk harrowing or other approved methods. Clean surface of stones or other substances, which will interfere with, turf development or subsequent mowing operations.

E. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas, which can be seeded or sodded soon after preparation.

3.04 SEEDING OPERATIONS

A. All disturbed areas that will not be reworked or sodded within 14 days maximum shall be temporarily seeded and mulched. Disturbed areas outside the "Limits of Construction" as shown on the Drawings shall be seeded and mulched at no additional cost to the County.

B. Seeding shall be in accordance with FDOT Standard Specifications, Section 570-4.5, and applied at a mixture and rate in conformance with FDOT Roadway and Traffic Design Standards (January 2000 edition) Index No. 105, for Zone I, Coastal conditions. Steep slope seeding shall be in accordance with FDOT Standard Specifications, Section 570-4.9.

C. Mulching shall be in accordance with FDOT Standard Specifications, Section 570-4.6.

D. Rolling shall be in accordance with FDOT Standard Specifications, Section 570-4.7.

E. Watering shall be in accordance with FDOT Standard Specifications, Section 570-4.8.

F. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer.

3.05 SODDING OPERATIONS

A. Sodding shall be placed within the limits of construction as shown on the Contract Drawings and in all graded and disturbed areas that have a 4 (horizontal) to 1 (vertical) slope or steeper, excluding stockpiles, and other areas as shown on the Drawings. Perimeter channels shall be sodded.

The following sections of the FDOT Standard Specifications shall apply:

Section 575-3, Construction Methods

B. Exceptions:

Section 575 3.3, replace phrase "a suitable length of roadway" with "an area." Section 575-3.3, Placing Sod; do not plant dormant sod or if ground is frozen. Rolled sod shall be placed parallel to contours. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. The offsets of individual staggered strips shall not exceed 6 inches. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass. The sod must be pegged using suitable wooden pegs. The pegs should be driven through the sod strips into firm earth, at a minimum frequency of 2 pegs per commercial rectangle (i.e. 2' by 3') and 1 peg per 50 square feet for rolled sodding. The pegs shall not be longer than 15 inches and shall be driven through the sod strips into firm earth, at suitable intervals. It is the responsibility of the Contractor to determine if the peg frequency should be increased and that sodding will not be displaced by gravity, low friction with the underlying topsoil, the flow of water or other means. The Contractor shall ensure that the pegs do not puncture or damage the underlying geosynthetics. Water sod thoroughly with a fine spray immediately after planting. Roll sod within 24 hours of placement to ensure contact between sod and subgrade.

Section 570-3.3, watering shall conform to requirements previously specified herein. Replace the word "Department" with the Word "County" in the last sentence. The cost of resodding shall be borne exclusively by the Contractor.

Section 575-3.4, Maintenance shall be performed as specified herein.

3.06 MAINTENANCE

A. Maintenance shall include watering, mowing, resodding, repair of erosion, and all other work necessary to produce a uniform stand of grass. During construction and for a period of 45 days after substantial acceptance of the Project, the Contractor shall water the sod daily (or as necessary to support growth), maintain original grades, repair erosion damage and mow the sod. Sod will be considered for final acceptance when the sod roots are firmly anchored to underlying soil and the permanent grass is healthy and growing on 97 percent of the area with no bare areas wider than 12 inches, as determined by the Engineer. If the planted areas must be resodded, reshaped, or otherwise repaired, regardless of cause, the Contractor shall perform such work at the Contractor's expense. The period of sod establishment for areas that are resodded shall extend to 1 year after the completion of resodding unless otherwise authorized by Engineer.

B. Maintenance shall be in accordance with FDOT Standard Specifications, Section 570-5 and 575-3.5; however, at a minimum, all temporary and final seeded and sodded areas shall be watered twice per week with a minimum of 1/4 inch water applied per watering event.

3.07 FINAL ACCEPTANCE

A. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of specified grass is established, free of weeds, bare or dead spots and surface irregularities.

B. Locations that were disturbed by the Contractor during construction activities shall be brought to their original condition prior to final acceptance.

END OF SECTION

DIVISION 34
TRANSPORTATION

SECTION 34 71 13

VEHICLE BARRIERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work specified in this Section includes the placement of new guardrail sections as shown on the Contract Drawings.

B. The Contractor shall furnish all necessary supervision, labor, tools, materials, and equipment to perform all Work necessary to install the guardrail sections in accordance with these Specifications and the Contract Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials used for fabrication shall match Florida Department of Transportation (FDOT) Specification Index No. 400 for guardrails and any deviation shall require approval of the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. The Contractor shall identify the required lines, levels, contours and datum.

B. The Contractor shall locate, identify and protect all utilities from damage.

C. The Contractor shall protect benchmarks, existing pipes, structures and fences from excavation equipment and vehicular traffic.

3.02 GUARDRAILS

A. New guardrail assemblies specified on the Contract Drawings shall conform to FDOT Standard Specifications for Road and Bridge Construction Section 536 “Guardrail” and Index No. 400 “Guardrail” of the FDOT Specifications and the site-specific details on the Contract Drawings.

END OF SECTION

DIVISION 35
WATERWAY AND MARINE CONSTRUCTION

SECTION 35 31 16

WALE BEAM

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work specified in this Section shall consist of the Contractor furnishing all necessary supervision, labor, tools, materials, and equipment to perform all Work in connection with the installation of the wale beams in accordance with these Specifications and Contract Drawings.

1.02 CONSTRUCTION QUALITY ASSURANCE

A. A Construction Quality Assurance Representative (CQAR) will observe each wale beam installation and the Contractor's related Construction Quality Control (CQC) activities. CQA activities shall, at a minimum, include review of Contractor's CQC activities and manufacturer's written certification for the proposed wale beam product.

1.03 CONSTRUCTION QUALITY CONTROL

A. General

1. CQC is the responsibility of the Contractor. The Contractor shall provide a full time Construction Quality Control Manager (CQCM) who shall establish and maintain quality control for wale beam placement to assure compliance with the Contract Documents, Specifications and manufacturer's specifications. The Contractor may use a qualified Project Superintendent to conduct the duties specified in lieu of a separate CQCM. The CQCM shall maintain records of quality control for all construction operations including, but not limited to, the following:

    a. Accurate location and alignment of wale beams.

    b. Final position; elevation.

    c. Stockpiling and storage.

    d. Removal and disposal of damaged wale beams.

B. Quality Control Activities

1. Each day upon completion of the installation of the wale beams, the CQAR shall review the wale beam installation documentation.

1.04 SUBMITTALS

A. The Contractor shall submit with his Bid, the manufacturer and manufacturer's material model number of the proposed wale beam on the Schedule of Manufacturers and Material Model Number form located in the Contract Documents.

B. The Contractor shall submit a listing of the manufacturer, model number, properties, literature with wale beam product data, material description, and installation instructions to the Engineer for approval, prior to the commencement of Work. Submittals, associated Work, and materials not satisfactory provided to the Engineer shall be rejected.

C. Material Characteristics Documentation

1. The Contractor shall submit to the Engineer a manufacturer's Letter of Certification that the wale beam for the Project shall meet or exceed the properties listed in Table 35 31 16-1 Wale Beam 4x6 and Table 35-31-16-2 Wale Beam 4x7.5 Properties.

D. Installation Equipment Descriptions

1. The Contractor shall submit for approval by the Engineer, prior to commencement of Work, a written statement addressing the appropriate installation equipment/tools/placement method and procedures proposed.

E. Health and Safety Plan

1. The Contractor shall create and submit to the Engineer a Health and Safety Plan as described in Section 01 80 00 Health and Safety Requirements.

2. The review of the Contractor's Health and Safety Plan by the Engineer shall be for method only. The Contractor shall retain responsibility for the application, adequacy and safety of the methods. However, construction shall not begin until the Health and Safety Plan has been submitted to the Engineer.

F. Placement Records

1. Records of the wale beam placement operations shall be submitted to the CQAR after placement is completed daily. These records shall provide a system of identification which shows the disposition of approved wale beams in the Work.

1.05 DELIVERY, STORAGE AND HANDLING

A. The Contractor is responsible for all costs, approvals, and permits necessary to transport material from the point of manufacture to the Project.

B. The Contractor shall comply with manufacturer's ordering instructions and lead time requirements.

C. Materials delivered to the site shall be new and undamaged and shall be accompanied by certified reports from the manufacturer as to meeting the Project specifications.

D. Wale beams shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage. Storage of wale beams shall also facilitate inspection.

E. Upon delivery of materials to the site, the Contractor shall visually inspect all materials for defects or damage. If serious defect or damage is detected, the Contractor shall immediately notify the CQAR.

F. Store wale beams on a relatively level surface with a slight pitch to allow water to drain.

1.06 UTILITIES

A. The Contractor shall be responsible for locating all utilities that cross the path of the Work. All utilities shall be maintained and the Project shall be constructed around the utility, by temporarily removing then reinstalling the utility, if required.

B. All utility locations shown on the Contract Drawings shall be considered approximate and should not be used in lieu of official utility surveys. Utility hazards should be assumed to be both above ground and below ground.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The wale beam material for the Project shall meet or exceed the properties listed in Table 35 31 16-1 Wale Beam 4x6 and Table 35-31-16-2 4x7.5 Properties.

B. Acceptable wale beams for the Project are the following:

1. EverComp Wale Beam 4x6 I-Series by Everlast Synthetic Products, LLC, 1000 Wyngate Parkway, Suite 100, Woodstock, GA 30189, phone 1-800-687-0036 and fax 1-800-687-0048.

2. EverComp Wale Beam 4x7.5 (2) X-Series by Everlast Synthetic Products, LLC, 1000 Wyngate Parkway, Suite 100, Woodstock, GA 30189, phone 1-800-687-0036 and fax 1-800-687-0048.

3. Crane Materials International (CMI) wale beam Model UC-6 STR or TG 6x8 by CMI, 4501 Circle 75 Pkwy SE # E5370, Atlanta, GA 30339, phone 1-770-933-8166.

4. Or Engineer approved equal.

TABLE 35 31 16-1 WALE BEAM 4x6 PROPERTIES

PROPERTIES	UNITS	VALUE
Width	inches	4.0
Depth	inches	6.0
Modulus of Elasticity X-X Axis	psi	3.5×10^6
Modulus of Elasticity Y-Y Axis	psi	3.5×10^6
Section of Modulus (X-X)	in^3	9
Section of Modulus (Y-Y)	In^3	7
Moment of Inertia (X-X)	in^4	27
Moment of Inertia (Y-Y)	in^4	14

TABLE 35 31 16-2 WALE BEAM 4x7.5 PROPERTIES

PROPERTIES	UNITS	VALUE
Width	inches	4.0
Depth	inches	7.5
Modulus of Elasticity X-X Axis	psi	4×10^6
Modulus of Elasticity Y-Y Axis	psi	4×10^6
Section of Modulus (X-X)	in^3	14
Section of Modulus (Y-Y)	In^3	9
Moment of Inertia (X-X)	in^4	54
Moment of Inertia (Y-Y)	in^4	19

C. The sheet pile wall shall be per Section 31 41 16 Fiber Reinforced Polymer Sheet Pile and as noted on the Contract Drawings.

D. The tie-rod, saddle bearing plate, front/rear wale connection, wale/tie-rod connections, wale beam splice systems, plates, bolts, nuts, washers, etc. shall be as noted on the Contract Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Project Layout

1. Wale beams shall be located along the sheet pile wall alignment as shown on the Contract Drawings. Wale beams shall be placed as true to the line to within ± 0.10 feet.

2. Wale beams damaged during installation or placed out of alignment shall be removed and replaced at the Contractor's expense.

B. Installation

1. Wale beams shall be installed as shown on the Contract Drawings and as recommended by the manufacturer.

2. Wale beam installation shall include all hardware shown on the Contract Drawings such as wale/tie-rod connections, wale beam splice systems, plates, bolts, nuts, washers, etc. .

C. Equipment

1. The Contractor shall supply and use equipment appropriate for the installation of the wale beams.

END OF SECTION

SUPPLEMENTAL REPORT

ATTACHMENT A
PSI GEOTECHNICAL ENGINEERING SERVICES REPORT, ORANGE COUNTY LANDFILL – POND 2 BERM FAILURE MARCH 7, 2018.

Project Number: 07571889
March 7, 2018

Professional Service Industries, Inc.
1748 33rd Street, Orlando, FL 32839
Phone: (407) 304-5560
Fax: (407) 304-5561

Mr. James W. Flynt, P.E.
Chief Engineer
Orange County Utilities Department
5901 Young Pine Road
Orlando, Florida 32829

RE: Report
Geotechnical Engineering Services
Orange County Landfill – Pond 2 Berm Failure
Orange County, Florida

Dear Mr. Flynt:

In accordance with PSI Proposal No. 0757-228360 dated December 8, 2017 and your authorization (PO No. C17903C004), Professional Service Industries, Inc. (PSI) has completed a geotechnical evaluation at the noted berm failure location. The subsurface exploration was conducted to attempt to determine the cause of the berm failure and provide geotechnical engineering recommendations to guide design and re-construction of the berm.

PROJECT INFORMATION

The project site is the existing Pond 2 located at the northeast corner of the Orange County Landfill. Pond 2 was originally a borrow pit used in the late 1980's and early 1990's to provide cover material for the daily landfill operations. After the fill materials were removed, the area was converted to a wet pond (Pond 2). Based on a review of the original construction plans, the pond bottom is generally near elevation +65 feet NAVD. The pond is teardrop in shape and approximately 40 to 45 acres in area. The north side of the pond is outlined by Pope Street while the southern and eastern sides of the pond are defined by a berm. The southern berm separates Pond 2 from the Wide Cypress Swamp. We understand Pond 2 is regularly pumped down to form an inward gradient of groundwater to capture water for treatment. Typically, the water is sent to the OUC power plant for use as cooling water. After Hurricane Irma, the water was pumped into Wide Cypress Swamp via a concrete trough that is approximately 550 feet in length and includes a concrete flume design to reduce erosion.

The main focus of PSI's geotechnical study was the southern berm separating Pond 2 from the Wide Cypress Swamp. The southern berm is approximately 3,400 feet in length. Approximately 50 feet of the berm just west of the berm midpoint failed, washing soils and debris into Pond 2. It is PSI's understanding that the Pond 2 control level is typically on the order of +71.3 to +71.8 feet NAVD and that prior to the failure, the water level in the Wide Cypress Swamp was approximately +79 feet NAVD. It is also PSI's understanding that the water elevation of the wetland is more typically near +74 to +75 feet NAVD.

The noted information/assumptions have been used for the purpose of preparing this geotechnical report. If any of the noted project information/assumptions are incorrect or have changed, PSI should be notified so evaluations and recommendations provided in this report can be amended as appropriate.

REVIEW OF PUBLISHED DATA

USGS Topographic Map

The topographic survey map published by the USGS entitled "Narcoossee NW, Florida" was reviewed for the general ground surface features in the area of Pond 2. Based on this review, Wide Cypress Swamp is generally at an elevation of +80 feet NGVD or lower. Prior to the location of Pond 2 being utilized as a borrow pit, ground surface elevations generally ranged from approximately +80 feet to +83 feet NGVD. Based on survey data provided to PSI by Orange County, the bottom elevation of Pond 2 is approximately +65 feet NAVD (approximately +66 feet NGVD). The top of the berm is near elevation +83 feet NAVD (approximately +84 feet NGVD).

Figure 1 of the **Appendix** contains an excerpt of the USGS map for the site.

NRCS Soil Survey

The "Soil Survey of Orange County, Florida," published by the USDA NRCS, was reviewed for general near-surface soil information within the general project vicinity. This information indicates that there are four soil series within the vicinity of the project. The general information provided by the NRCS for the mapped soil series are summarized in the following table.

Soil Series	Depth (inches)	Unified Classification	USDA Seasonal High Groundwater Table
			Depth (feet)
1 – Arents	0 to 80	-	-
37 – St. Johns Fine Sand	0 to 80	SP, SP-SM, SM	0 to 1
42 – Sanibel Muck	0 to 80	PT, SP, SP-SM	+1 to 1
44 – Smyrna Fine Sand	0 to 80	SP, SP-SM, SM	0 to 1

The NRCS Orange County Soil Survey indicates soil mapping series Arents (1), St. Johns Fine Sand (37) and Smyrna Fine Sand (44) within the limits of Pond 2 prior to this location being utilized as a borrow pit and eventually a pond. The Arents (Soil Series 1) soil series indicates earth moving operations have been used to raise grades in areas such as sloughs, marshes or shallow depressions. The fill material can come from several different sources and consist of multiple soil types. The depth to the estimated seasonal high groundwater table for this soil mapping unit is normally dependent upon the functioning of the man-made drainage systems.

Figure 2 of the **Appendix** contains an excerpt of the USDA NRCS Soils map for the site.

FIELD EXPLORATION

General

The first phase of the field exploration consisted of geophysical testing. The geophysical testing performed included Ground Penetrating Radar (GPR) and Electrical Resistivity Imaging (ERI). Bottom profiling in the area of the berm failure was planned, however there was not enough water depth to float the equipment. Therefore, GPR was performed in the channel formed by the berm failure. The GPR and ERI transects performed for the geophysical study are shown on **Figure 1** of the attached **Geophysical Investigation Report** in the **Appendix**.

The second phase of the field exploration consisted of performing Standard Penetration Test (SPT) borings. Boring locations were based on the results of the geophysical study. The approximate locations of the Standard Penetration Test (SPT) borings performed are presented on **Sheet 1** in the **Appendix**. The soil types encountered at the specific boring locations are presented in the form of soil profiles on **Sheet 2 w**ith the encountered soils described in USCS format, measured groundwater levels and laboratory tests results.

The stratification presented is based on visual observation of the recovered soil samples, laboratory testing and interpretation of field logs by a geotechnical engineer. It should be noted that variations in the subsurface conditions are expected and may be encountered between and away from the borings. Also, whereas the individual boring logs indicate distinct strata breaks, the actual transition between the soil layers may be more gradual than shown on the soil profiles.

Standard Penetration Test (SPT) Borings

The SPT borings were performed in general accordance with American Society of Testing and Materials (ASTM) D-1586. The boreholes were advanced by the rotary wash method with bentonite-based mud used as the circulating fluid to stabilize the borehole. A manual auger boring was performed for the upper four feet of each SPT boring to confirm clearance of buried utilities that may have been present. Continuous soil sampling was then performed to a depth of ten feet and at 5-foot spacing thereafter to the boring termination depths. Upon completion, the boreholes were grout sealed to the existing grade with a mix of Portland cement and bentonite clay.

The recovered split spoon samples from PSI's borings were visually classified in the field with representative portions of the samples placed in air-tight jars and transported to our Orlando office for review by a geotechnical engineer and confirmation of the field classification.

Geophysical Testing

Ground Penetrating Radar Survey: Ground Penetrating Radar (GPR) consists of a set of integrated electronic components that transmits high frequency (100 to 1500 megahertz [MHz]) electromagnetic waves into the ground and records the energy reflected back to the ground surface. The GPR system consists of an antenna, which serves as both a transmitter and receiver, and a profiling recorder that both processes the incoming signal and provides a graphic display of the data.

The GPR data can be reviewed as both printed hard copy output or recorded on the profiling recorder's hard drive for later review. A GPR survey was conducted along a series of parallel transects across the top of the berm and in the channel of the berm failure. The locations of the GPR transects are provided on **Figure 1** of the **Geophysical Investigation Report** in the **Appendix**.

Electrical Resistivity Imaging Survey: Electrical resistivity imaging (ERI) surveying is a geophysical method in which an electrical current is introduced into the earth; the subsequent response (potential) is measured at the ground surface to determine the resistance of the underlying earth materials. The resistivity survey is conducted by applying electrical current into the earth from a series of electrodes and measuring the associated potential between a second set of implanted electrodes. Field readings are in volts. Field readings are then converted to resistivity values using Ohm's Law and a geometric correction factor for the spacing and configuration of the electrodes. The calculated resistivity values are known as "apparent" resistivity values. The values are referred to as "apparent" because the calculations for the values assume that the volume of earth material being measured is electrically homogeneous. Such field conditions are rarely present. The ERI survey was conducted using a series of electrodes placed in a line with uniform spacing between each electrode. A total of 2 ERI transects were performed along the top of the berm on either side of the failure area. The ERI data was analyzed using Earth Imager 2D, a computer inversion program, which provides two-dimensional vertical cross-sectional resistivity model of the subsurface.

Soil Conditions

In general, the borings revealed a series of fine sands grading relatively clean to slightly silty in composition (i.e. SP and SP-SM materials) from the existing grade to the boring termination depths. The relative density of the material encountered generally ranged from loose to medium dense in the upper 10 feet, and medium dense to dense below 10 feet. An exception to this was observed in SPT boring B-2 where dark brown sand with trace to some organics was encountered at a depth of approximately 4 to 8 feet below the existing grade and a layer of sand with trace organics in the depth interval 18.5 to 23.5 feet. The organic content of this layer ranged from 4 to 14 percent by dry weight.

The above soil summary is generalized. Detailed descriptions of the individual borings are shown on soil boring profiles on **Sheet 2** in the **Appendix**. The stratification presented is based on visual examination of the recovered soil samples, interpretation of field logs by a geotechnical engineer, and laboratory testing. Included with the soil profiles are results of the laboratory testing and groundwater levels measured at the time the borings were performed.

Groundwater Conditions

At the time of our fieldwork groundwater was not encountered (GNE) in the upper ten feet of the SPT borings. Groundwater levels on the Pond 2 side of the berm are controlled while water levels on the Wide Cypress Swamp side of the berm are not. Based on conversations with the Orange County Utilities Department, Pond 2 Groundwater levels are typically controlled between +71.3 to +71.8 feet NAVD. Groundwater levels at the project location are anticipated to be between the Pond 2 control level and the prevailing water level in Wide Cypress Swamp.

Geophysical Testing Results

The geophysical testing utilized Ground Penetrating Radar(GPR) and Electrical Resistivity Imaging (ERI). ERI testing was performed along two transects along the top of the berm while multiple GPR transects were performed along the top of the berm and in the water within the failure area. A copy of the **Geophysical Investigation Final Report** is included in the **Appendix**. The approximate locations of the ERI and GPR Transects are shown on **Figure 1** of the **GeoView Report Appendix**.

The ERI and GPR testing did not encounter any anomalies that would indicate the presence of sinkhole activity. However, GPR transect 8 performed in the channel at the location of the failure did appear to show disturbance of the soils at depths between approximately 8 and 14 feet below the existing grade. The graphical representation of transect 8 is shown in the **Appendix** of the attached **Geophysical Investigation Report**.

BERM EVALUATION

Geophysical testing and SPT borings were performed at the berm failure location to attempt to determine the possible cause of the failure and to assist with providing recommendations for repair of the berm. In general, the borings did not encounter loose/raveling soil conditions and the geophysical testing did not indicate any subsurface anomalies typically indicative of sinkhole activity. Based on PSI's borings and the geophysical data, it does not appear a sinkhole was the cause of the berm failure. The borings also did not encounter unsuitable soils to the boring termination depths, indicating the berm stability was not due to poor soils. Whereas some of the soils were noted to contain between 4 and 14 percent organics, these sands were indicative of "hardpan" soils which have relatively high blow counts and corresponding strength characteristics. Since a sinkhole and poor soil conditions do not appear to be the cause for the berm failure, PSI evaluated berm stability under the head differential between Pond 2 and Wide Cypress Swamp at the time of the failure.

A global stability analysis of the berm was performed to estimate the existing (pre-failure) berm's factor of safety. The analysis was performed using the computer program STABL for Windows 3.0. As stated earlier, it is PSI's understanding that the Pond 2 control elevation is typically on the order of +71.3 to +71.8 feet NAVD and that the water elevation in the Wide Cypress Swamp is typically near +74 to +75 feet NAVD. Shortly after Hurricane Irma passed, the water level in Pond 2 was still controlled, but the water level in the Wide Cypress Swamp reached a reported elevation of approximately +79 feet NAVD. Based on this water elevation information, two scenarios were analyzed.

The first scenario analyzed modeled the existing berm with the level in Pond 2 at +71.8 feet NAVD and the water elevation in Wide Cypress Swamp at +75 feet NAVD. The second scenario maintained the +71.8 feet NAVD water elevation in Pond 2 but increased the water elevation of Wide Cypress Swamp to +79 feet NAVD. Berm geometry was estimated from the survey provided to PSI by the Orange County Utilities Department. Soil parameters were based on the results of the SPT borings and laboratory testing performed by PSI. Minimum factors of safety against global failure of between 1.3 and 1.5 are required according the Federal Highway Administration (FHWA) and the Florida Department of Transportation (FDOT), respectively. The results of the analyses indicate factors of safety of 1.5 for both scenarios. Lower factors or safety between 1.3 and 1.4 were noted during the analyses, however in these cases, the failure planes were more of a surface failure or sloughing of the slope face on the pond side due to seepage forces and not a global failure of the berm. Copies of the STABL computer printouts

are included in the **Appendix**. Based on the results of this analysis and the historic performance of this berm, it does not appear the berm failed due to what is thought as typical global instability due to soil strength.

Based on the results of PSI's global stability analyses, the boring results, GPR transect 8 and considering the approximately 8 feet of head difference between Pond 2 and Wide Cypress Swamp, it is the opinion of PSI that the berm failure is most likely due to hydraulic seepage under and through the berm.

Referring to borings B-1 and B-2 on **Sheet 2**, the soil at the base of the berm (approx. 10 to 15 feet below the top of the berm) is composed of mostly clean sands that have a fines content of 5 percent or less passing the U.S. Standard No. 200 sieve by dry weight, making this soil highly permeable.

The reported head difference of approximately 8 feet between Pond 2 and the swamp appears to have caused an increase in seepage through the layers of clean sand eventually leading to soil migration or "piping" of the soil from under the berm. The seepage most likely exited near the toe of the berm on the Pond 2 side, which would result in the erosion of the slope. The face of the slope was then gradually eroded, with the rate of the erosion process increasing as more soil is eroded from the berm and the seepage rate increases. The increased hydraulic head can also cause an increase in pore pressure. The increased pore pressure will cause a reduction of the effective stress which results in the reduction of the shear strength in the soil mass. The reduced shear strength can cause a decrease in slope stability. It is PSI's opinion that the soil disturbance shown by transect 8 presented in the GPR report is consistent with this theory.

BERM RECONSTRUCTION RECOMMENDATIONS

General

It is PSI's understanding that the failed section of berm is to be reconstructed to match the berm section that previously existed. The following recommendations for reconstructing the berm have been developed on the basis of the previously described project characteristics and subsurface conditions encountered.

Once final design plans and specifications are available, a general review by PSI is recommended as a means to check that the evaluations made in preparation of this report are correct and that our recommendations are properly interpreted and implemented.

Site Clearing/Debris Removal

Based on site visits, debris consisting of trees, branches and other vegetation was washed into the channel where the berm previously existed. Prior to the outset of construction, all trees, branches, roots and any miscellaneous debris and/or other deleterious materials should be removed from the proposed footprint of the berm. All silts and organic soil deposited within the limits of the berm should be removed until the sandy soils below are exposed.

Initial clearing/debris removal should be carried out under the observation of a representative of the geotechnical engineer. After the clearing and debris removal is complete, the berm footprint should be inspected by a representative of the geotechnical engineer to verify adequate debris and unsuitable soil removal.

Subgrade Preparation and Fill Placement

PSI recommends that subgrade preparation and fill placement be performed under dry conditions. To achieve a dry condition, a temporary sheet pile cofferdam and dewatering will be needed. The cofferdam and dewatering system should be designed by a qualified Professional Engineer licensed in the State of Florida. Refer to **Table 1** of the **Appendix** for soil parameters to assist with the design of the cofferdam. Dewatering should be performed from the inside of the cofferdam to reduce the drawdown impact to the adjacent wetland. The dewatering system should be capable of maintaining the groundwater level a minimum of 2 feet below the lowest compaction surface.

Following the debris removal and clearing, the exposed subgrade should be evaluated as directed by representatives of PSI to confirm that all unsuitable materials have been removed and any backfill required to restore grades is properly placed and compacted. The berm area should then be proof-rolled to provide a stable/unyielding subgrade prior to placing fill. Proof rolling should consist of compaction with a non-vibratory roller.

The purposes of the proof rolling will be to detect unsuitable or soft/loose soils that yield when subjected to compaction and to densify near-surface loose sands for support of the engineered fill. Material that yields excessively during proof rolling should be replaced with fill selected and compacted as described in the "Engineering Fill" section of this report. If the soil subgrade is saturated, or the fill moisture content is over "optimum", instability may occur and the contractor will be required to implement remedial measures to successfully place and compact fill.

It is recommended that the subgrade be compacted to at least 95 percent of the material's modified Proctor (AASHTO T-180) maximum dry density to a minimum depth of 12 inches below stripped grade within the limits of the berm repair area. Following satisfactory completion of initial compaction of the subgrade, the proposed berm may be re-constructed.

Engineered Fill

Additional material required for construction of the berm and other engineered fills for the project should consist of clean sand that is free of organic matter, clay, rubble, debris and other deleterious substances. Ideally, this material should have a fines content between 10 and 15 percent by dry weight passing the U.S. Standard Number 200 sieve.

Engineered fill with a fines content of less than 10 percent is not recommended. The use of low fines content sand for reconstruction of the berm could result in the creation of a preferred drainage path for the water seepage/piping potentially causing berm instability. PSI recommends sieve analysis be performed on multiple soil samples from the fill source to verify it meets the requirements stated in this report.

Engineered fill should be placed at a moisture content near optimum and in uniform lifts not exceeding 12 inches in loose thickness. Due to the fines content specified, a lift thickness of less than 12 inches may be needed to achieve the required density. Fill should be thoroughly compacted to at least 95 percent of the material's modified Proctor (AASHTO T-180) maximum dry density prior to placing the next lift of fill. Place the fill in this manner until the berm reaches the line and grade of the plans.

Subgrade Preparation and Fill Placement – OPTION 2

If the construction of a cofferdam and dewatering are not feasible, the berm can be reconstructed by placing clean, well-draining sand fill with a fines content of 5 or less passing the U.S. Standard Sieve by dry weight until 2 feet above the prevailing water table. The purpose of the well-draining fill material is to construct a working platform so that the remaining soil can be placed and properly compacted. The initial layers should be placed to a firm and unyielding position. Once the fill soil is 2 feet above the prevailing water level, the remaining engineered fill required to reach the plan line and grade should then be placed as directed in the Engineered Fill section of this report.

However, prior to the placement of the initial fill soil to construct a working platform, a permanent sheet pile cut-off wall should be installed down the centerline of the berm, parallel to the berm access road on top of the berm. The purpose of the cut-off wall is to prevent seepage through the clean soil placed at the base of the berm used to construct the working platform. If a cutoff wall is not installed, this section of berm could fail in a similar manner to the current failure. The permanent sheet pile wall is recommended to be installed to a depth of 20 feet below the proposed top of berm and extend 20 feet east and west of the berm failure limits. The top of the permanent sheet pile should be installed between 12 and 18 inches below the top of the berm so that access road maintenance can be performed without interference from the sheet pile.

Erosion Control

After the berm is reconstructed, the berm faces should be protected from erosion. This can be accomplished by placing a temporary erosion mat, such as the type made of coconut husk, and allowing local vegetation to grow or seeding the berm faces prior to placing the erosion mat. The berm faces can also be protected by placing sod immediately after the berm is completed. If sod is to be placed, sand grown sod is recommended.

Pond 2 Control Levels

It is PSI's opinion that the main contributing factor to the berm failure was the head difference due to the water levels between Pond 2 and Wide Cypress Swamp. It is PSI's understanding that this failure is the first failure for this berm which has been in-place for more than 20 years. It is possible that future failures could occur when similar conditions are present. PSI recommends that a monitoring program utilizing staff gauges be implemented. Staff gauges should be installed in the pond and wetland sides and monitored on a monthly interval. The monitoring frequency should be increased during Florida's wet season (June through September). If possible, pond levels should be controlled at higher elevations to maintain smaller head differences between the pond and the wetland. Frequent visual inspections for indicators of seepage and erosion of the berm are also recommended. Some of the seepage indicators are water seeping out of the pond side slope above the pond level or turbulent (boiling) water at the toe of the slope.

OTHER CONSIDERATIONS

Excavations

In Federal register, Volume 54, No., 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, general construction excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if not strictly followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state and federal safety regulations.

We are providing this information solely as a service to our client. PSI is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Temporary Dewatering

The dewatering system should be designed and operated to lower the groundwater table to a depth at least 2 feet below the bottom of surfaces to be compacted in any given area. The design and discharge of the dewatering system should be in accordance with current regulatory criteria.

REPORT LIMITATIONS

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data.

The scope of our exploration was intended to evaluate soil conditions within the influence of the proposed berm and does not include a detailed evaluation of potential deep soil problems such as sinkholes. The analysis did include an evaluation of whether or not a sinkhole formed below the failed section of berm. No additional statements regarding the potential for the formation of sinkholes at this location are inferred or implied. The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings and geophysical testing performed at the locations indicated and does not reflect any variations which may occur between or away from the borings or geophysical testing. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event information contradictory to PSI's statements provided herein becomes available.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

CLOSURE

PSI appreciates the opportunity to provide our services to you on this project. If you have any questions regarding the information provided in this report, or if we may be of further service, please contact the undersigned.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.
Certificate of Authorization No. 3684

Venkata Prashanth Muppana, E.I.
Staff Engineer

Eric W. Nagowski, E.I.
Project Engineer

Robert A. Trompke, P.E.
Principal Consultant/Department Manager
Florida License No. 55456

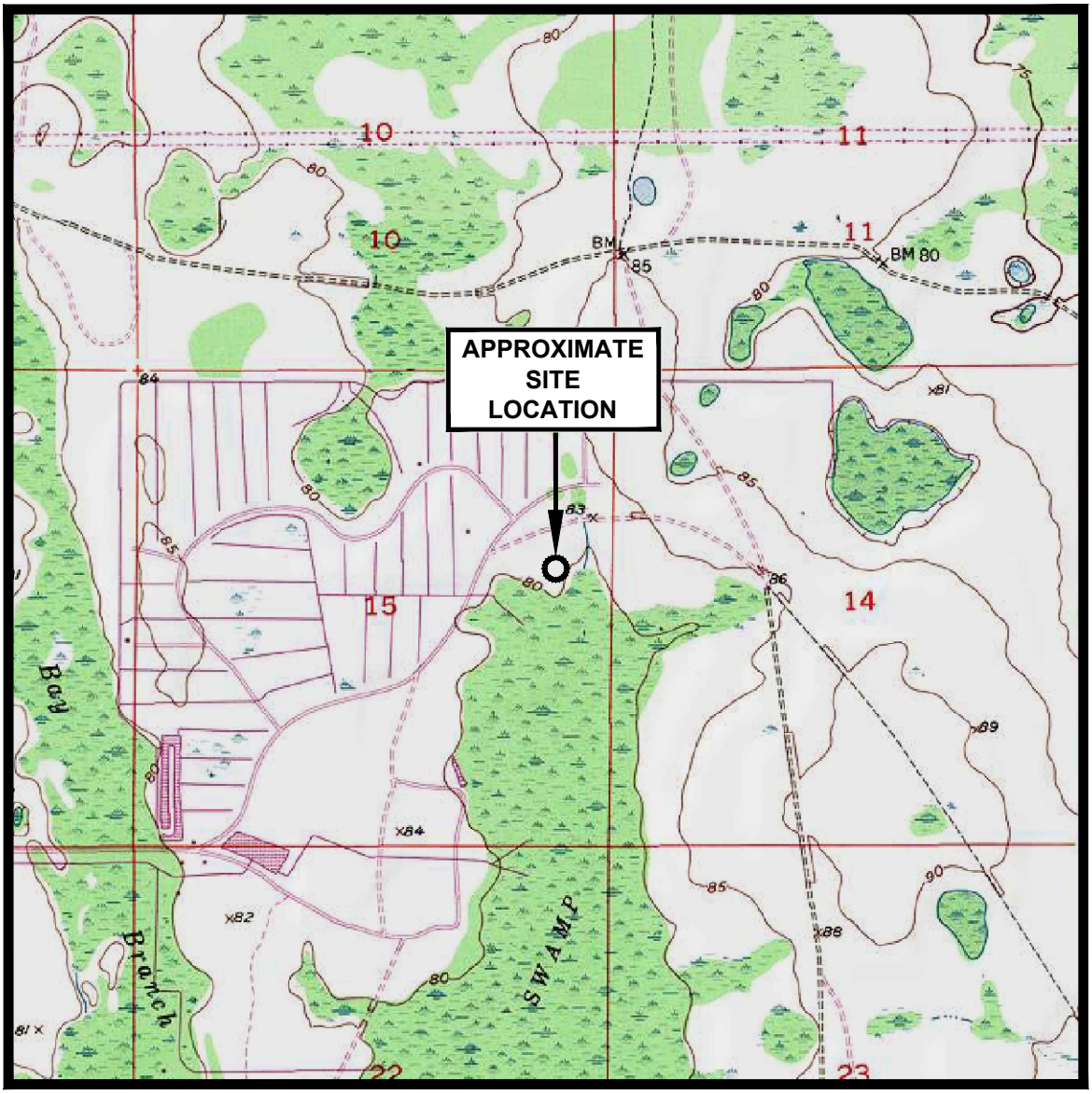
07571889 (OCLF Berm 2).docx

Appendix

- Tables 1 – Soil Parameters for Sheet Pile Wall Design
- Figure 1 – USGS Quadrangle Map
- Figure 2 – USDA SCS Soil Survey Map
- Sheet 1 – Boring Location Plan
- Sheet 2 – Boring Profiles
- STABLE for Windows 3.0 Results
- GeoView Report of Geophysical Investigation - Dated February 21, 2018.

APPENDIX

TABLE 1 SOIL PARAMETERS FOR SHEET PILE WALL DESIGN Orange County Landfill Pond 2 Berm									
Borings	**Soil Elevation Interval (feet, NAVD88)**	**Soil Saturated Unit Weight, γ_{sat} (pcf)**	**Soil Effective Unit Weight, γ_{eff} (pcf)**	**Angle of Internal Friction, ø (degrees)**	**Wall Friction Angle, δ (degrees)**	**Adhesion, (psf)**	**Cohesion, c (psf)**	**Earth Pressure Coefficients**	
								Active (K_a)	**Passive (K_p)**
B-1 and B-2	+83 to +76	105	42.6	29	17	-	-	0.347	2.88
	+76 to +67	110	47.6	30	17	-	-	0.333	3.00
	+67 to +58	115	52.6	33	17	-	-	0.295	3.39
	+58 to +37	115	52.6	32	17	-	-	0.307	3.25
	+37 to +43	110	47.6	30	17	-	-	0.333	3.00



REFERENCE: U.S.G.S. "NARCOOSSEE NW, FLORIDA" QUADRANGLE MAP

SECTION: 15
TOWNSHIP: 23 SOUTH
RANGE: 31 EAST

ISSUED: 1989
PHOTOREVISED: 1980
SCALE: 1"=2000'

VICINITY MAP

ORANGE COUNTY LANDFILL
POND 2 BERM FAILURE

ORLANDO, ORANGE COUNTY, FLORIDA

intertek psi

DRAWN:	DJW	SCALE:	NOTED	PROJ. NO:	07571889
CHKD:	EWN	DATE:	2-5-18	FIGURE:	1

REFERENCE: U.S.D.A.-S.C.S. "ORANGE COUNTY, FLORIDA" SOILS MAP

SECTION: *15*
TOWNSHIP: *23 SOUTH*
RANGE: *31 EAST*

ISSUED: *N/A*
SCALE: *1"=500'*

SOILS LEGEND

1	ARENTS, NEARLY LEVEL
37	ST. JOHNS FINE SAND
42	SANIBEL MUCK
44	SMYRNA, WET, FINE SAND, 0 TO 2 PERCENT SLOPES

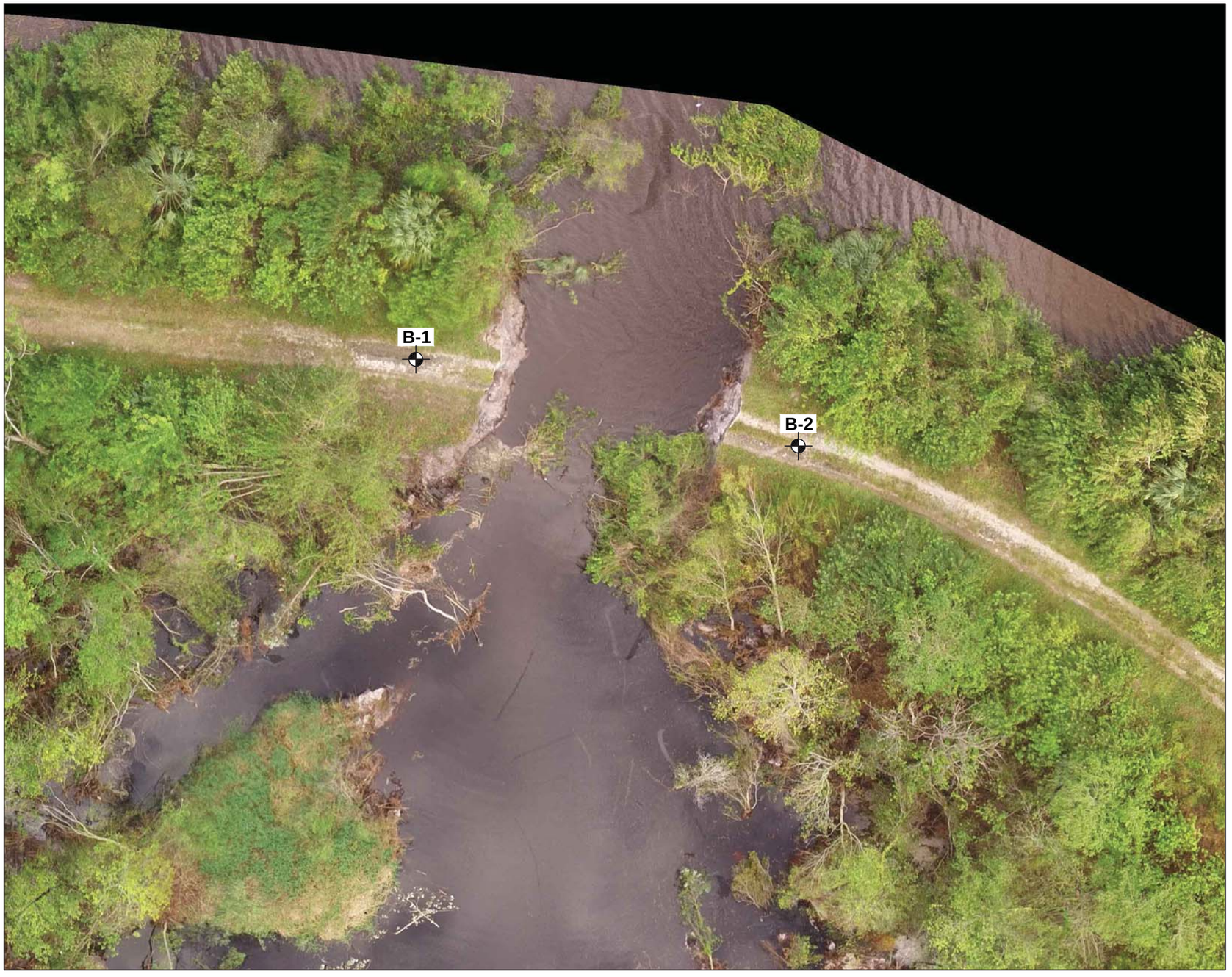
SOILS MAP

ORANGE COUNTY LANDFILL
POND 2 BERM FAILURE

ORLANDO, ORANGE COUNTY, FLORIDA

intertek psi

DRAWN:	DJW	SCALE:	NOTED	PROJ. NO:	07571889
CHKD:	EWN	DATE:	2-5-18	FIGURE:	2



LOCATION PLAN
N.T.S.

N
W
E
S

LEGEND

APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

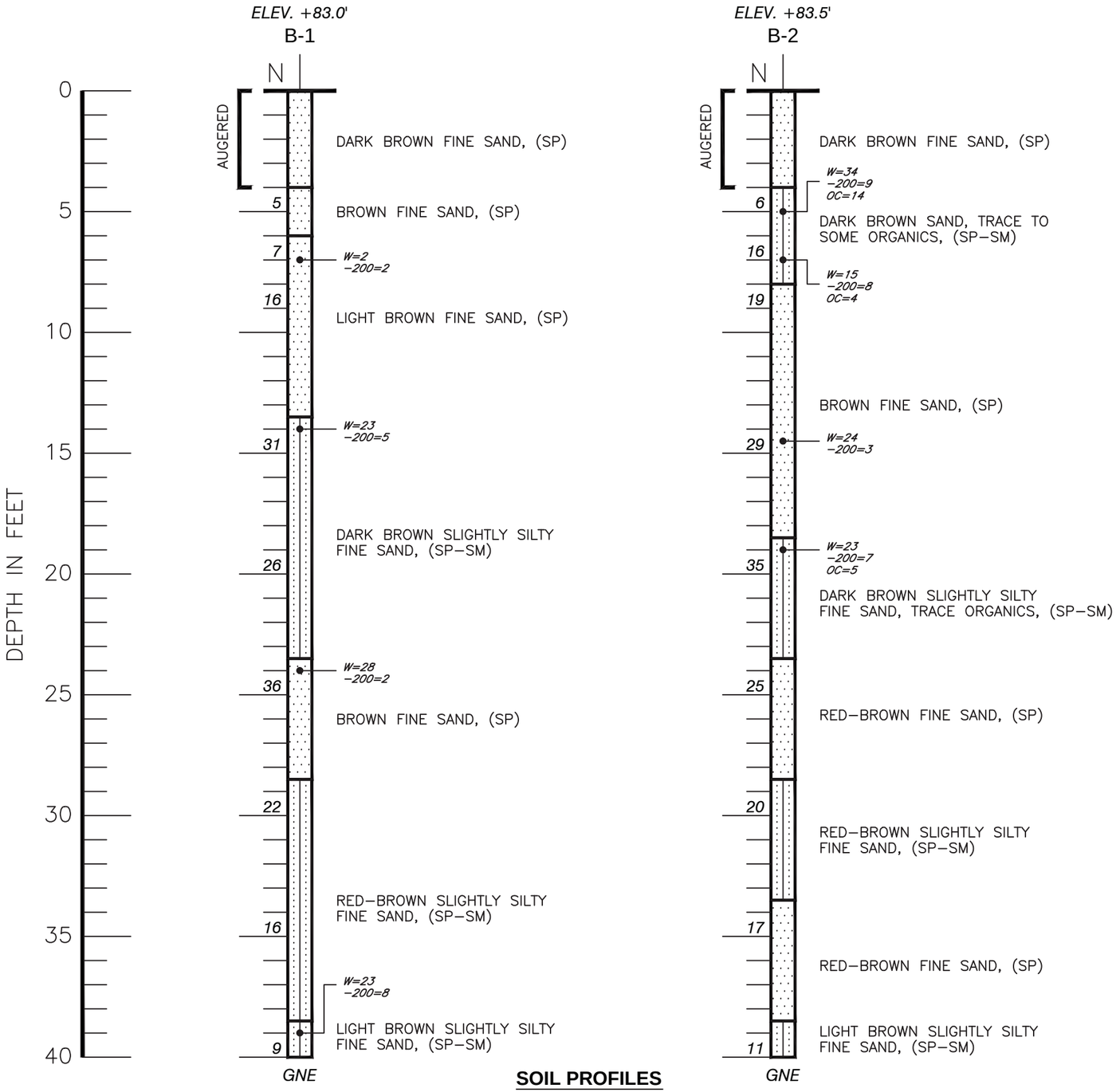
GEOTECHNICAL ENGINEERING SERVICES

ORANGE COUNTY LANDFILL
POND 2 BERM FAILURE

ORLANDO, ORANGE COUNTY, FLORIDA

intertek psi

DRAWN:	DJW	SCALE:	NOTED	PROJ. NO:	07571889
CHKD:	EWN	DATE:	2-5-18	SHEET:	1



SOIL PROFILES

SCALE: 1"=5'

LEGEND

(SP)	*UNIFIED SOIL CLASSIFICATION GROUP SYMBOL*
N	*STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT USING AN AUTOMATIC HAMMER*
GNE	*GROUNDWATER NOT EVIDENT IN UPPER 10 FEET OF BORING*
W	*NATURAL MOISTURE CONTENT IN PERCENT*
-200	*FINES PASSING #200 SIEVE IN PERCENT*
OC	*ORGANIC CONTENT IN PERCENT*
ELEV. +83.0'	*GROUND SURFACE ELEVATION ESTIMATED FROM SURVEY PROVIDED TO PSI BY ORANGE COUNTY SOLID WASTE DIVISION.*

GEOTECHNICAL ENGINEERING SERVICES

ORANGE COUNTY LANDFILL
POND 2 BERM FAILURE

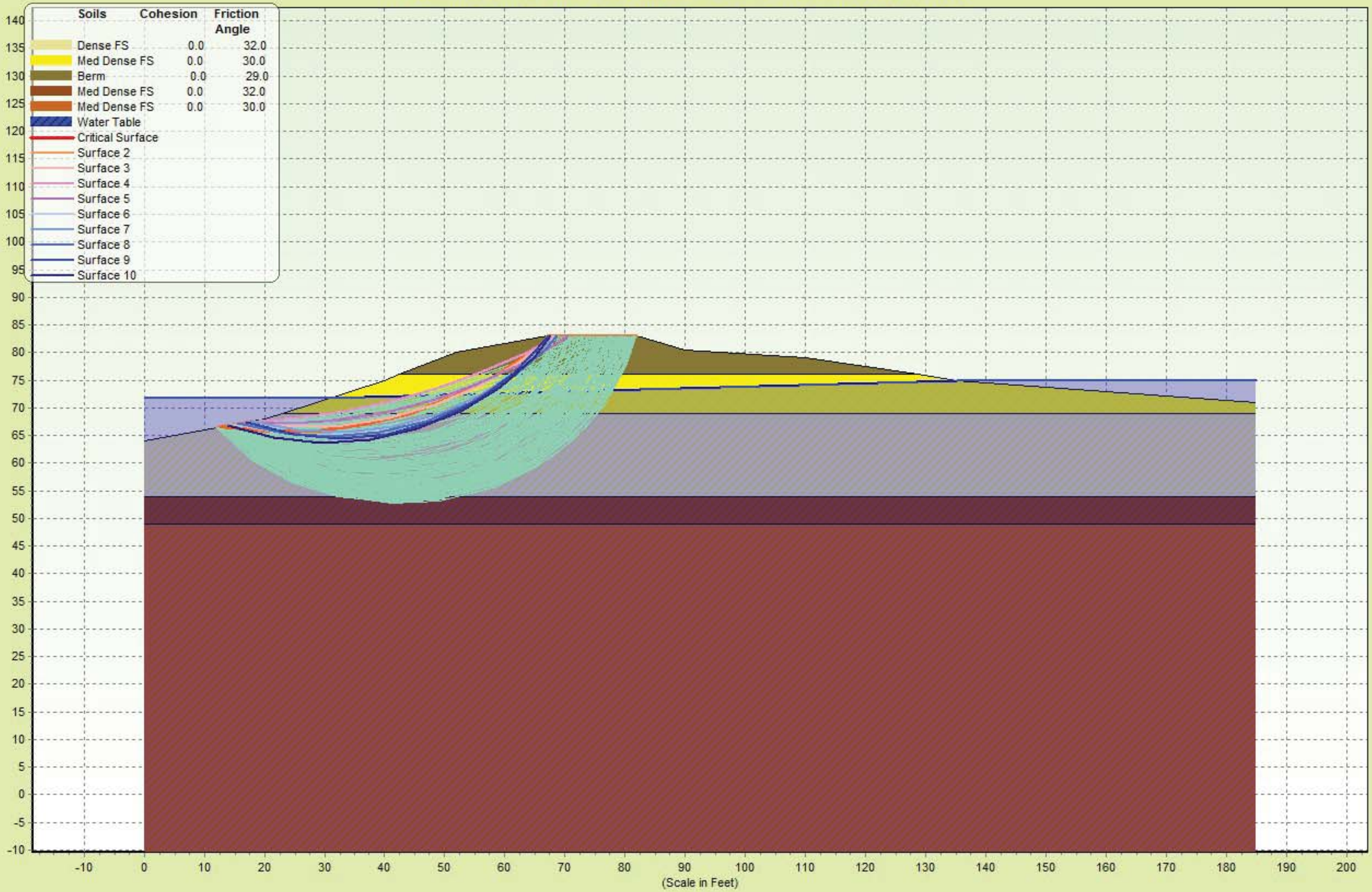
ORLANDO, ORANGE COUNTY, FLORIDA

intertek psi

DRAWN:	DJW	SCALE:	NOTED	PROJ. NO:	07571889
CHKD:	EWN	DATE:	2-5-18	SHEET:	2

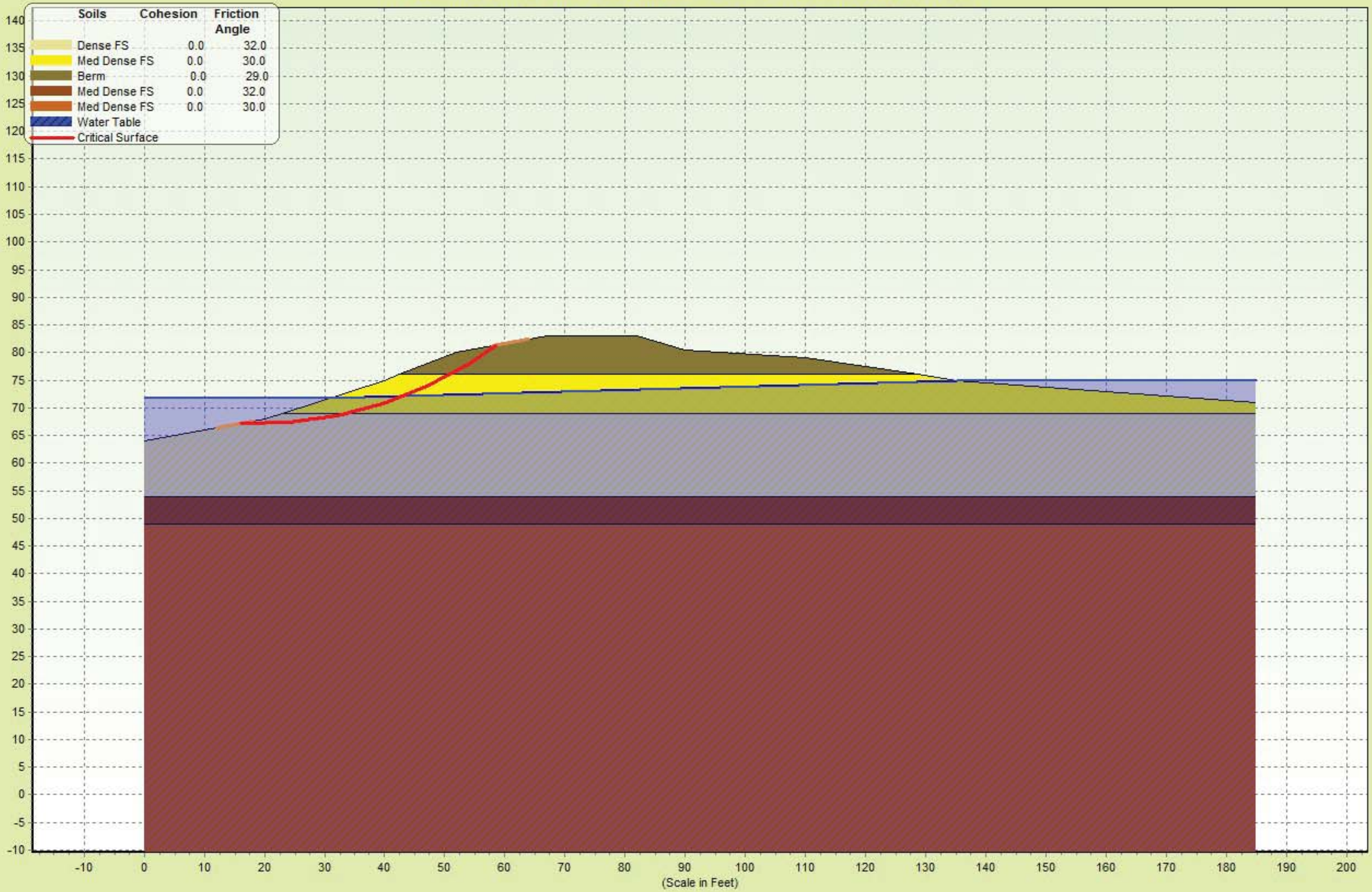
Problem: Berm 2 Failure - Groundwater Case 1 - FS Min- Bishop = 1.651

Soils	Cohesion	Friction Angle
Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Berm	0.0	29.0
Med Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Water Table		
Critical Surface		
Surface 2		
Surface 3		
Surface 4		
Surface 5		
Surface 6		
Surface 7		
Surface 8		
Surface 9		
Surface 10		



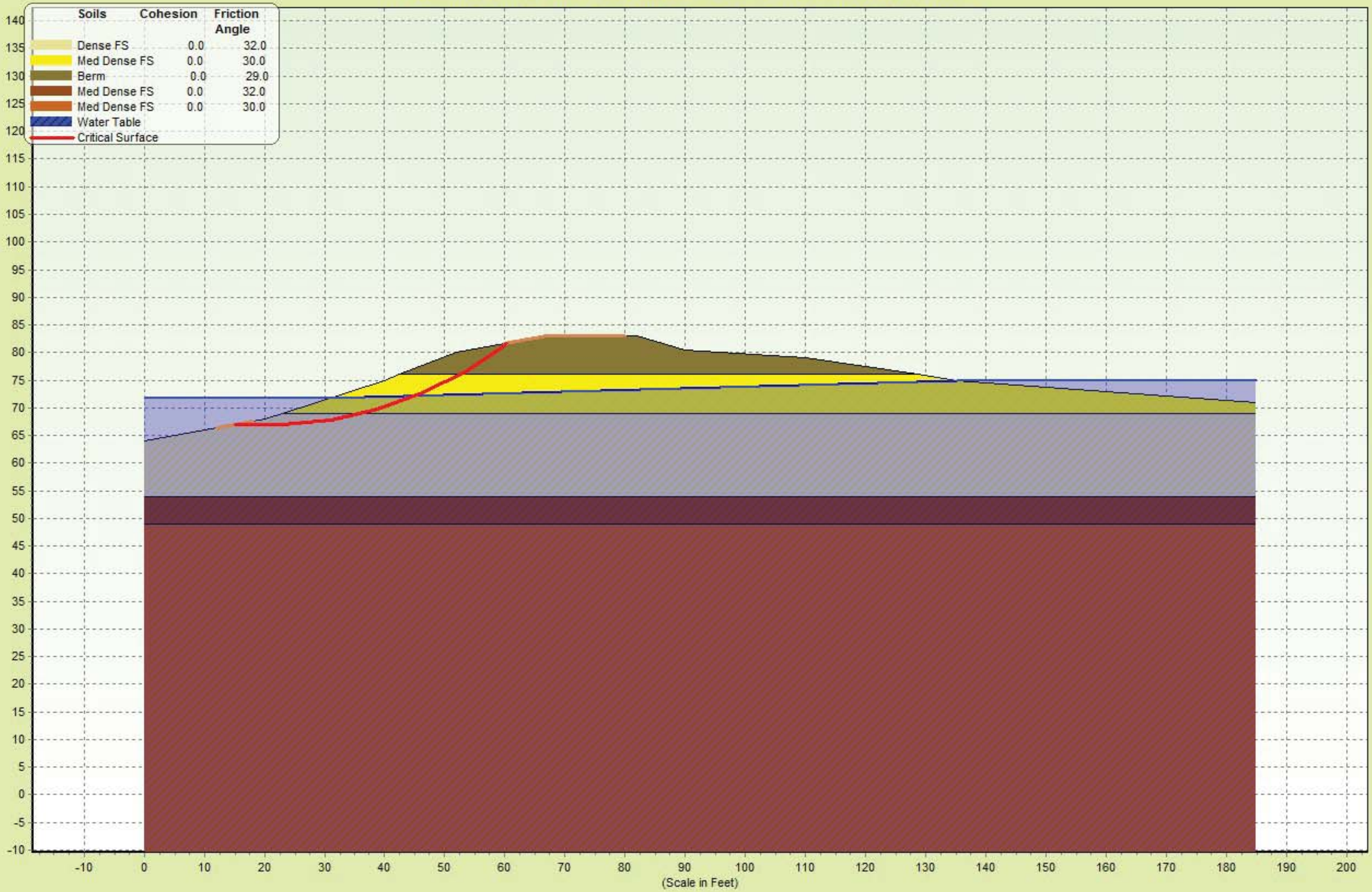
Problem: Berm 2 Failure - Groundwater Case 1 - FS Min- Bishop = 1.493

Soils	Cohesion	Friction Angle
Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Berm	0.0	29.0
Med Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Water Table		
Critical Surface		



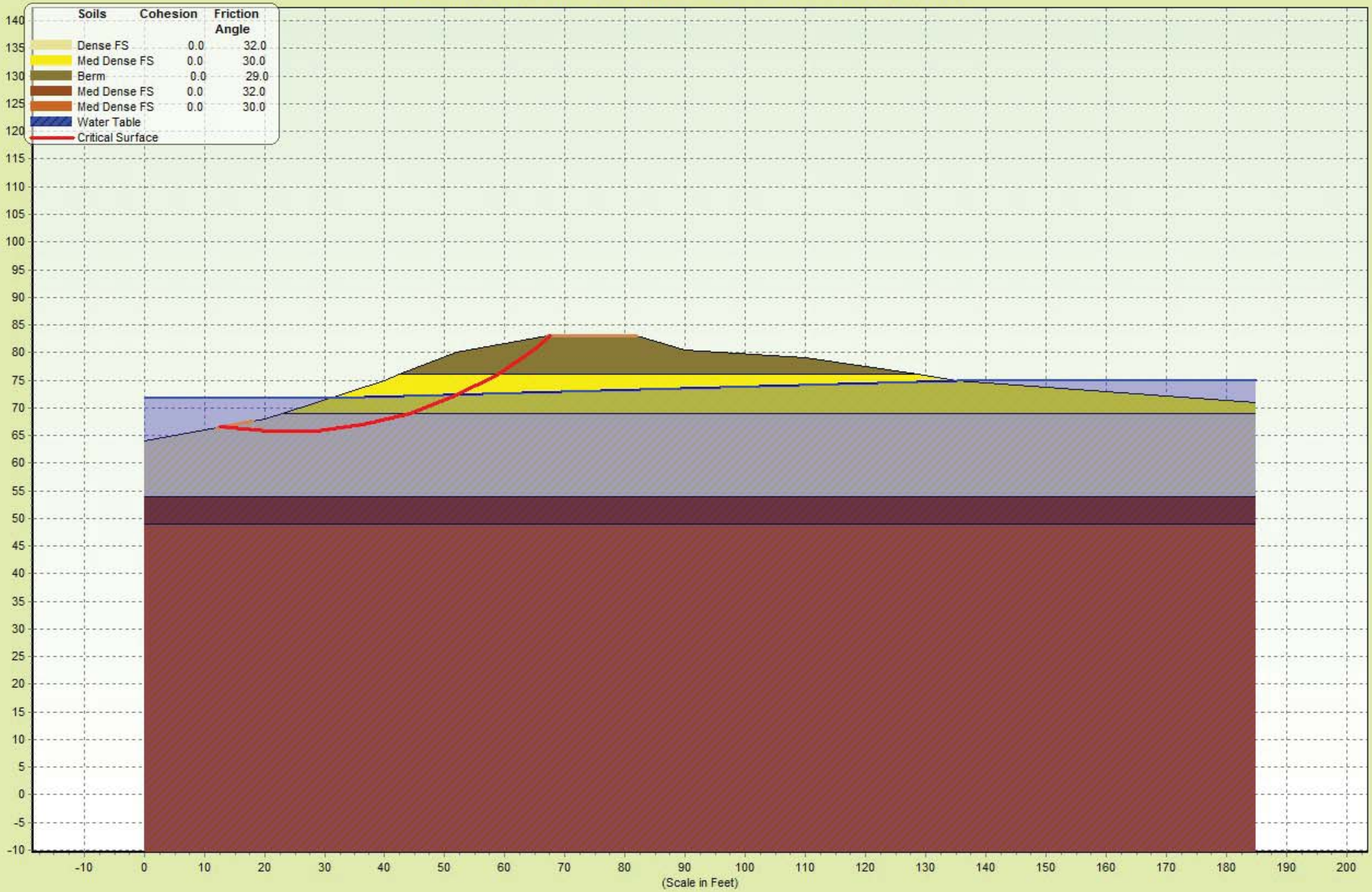
Problem: Berm 2 Failure - Groundwater Case 1 - FS Min- Bishop = 1.525

Soils	Cohesion	Friction Angle
Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Berm	0.0	29.0
Med Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Water Table		
Critical Surface		



Problem: Berm 2 Failure - Groundwater Case 1 - FS Min- Bishop = 1.651

Soils	Cohesion	Friction Angle
Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Berm	0.0	29.0
Med Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Water Table		
Critical Surface		



** STABL for WINDOWS **
by
Geotechnical Software Solutions

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:
Time of Run:
Run By:
Input Data Filename: run.in
Output Filename: result.out
Unit: U.S.C.
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION Berm 2 Failure - Groundwater Case 1

BOUNDARY COORDINATES

11 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	64.00	20.00	68.00	3
2	20.00	68.00	23.00	69.00	3
3	23.00	69.00	40.00	75.00	2
4	40.00	75.00	42.40	76.00	2
5	42.40	76.00	52.00	80.00	1
6	52.00	80.00	67.00	83.00	1
7	67.00	83.00	82.00	83.00	1
8	82.00	83.00	90.00	80.50	1
9	90.00	80.50	110.00	79.00	1
10	110.00	79.00	128.80	76.00	1
11	128.80	76.00	135.00	75.00	2
12	135.00	75.00	185.00	71.00	2
13	42.40	76.00	128.80	76.00	2
14	23.00	69.00	185.00	69.00	3
15	0.00	54.00	185.00	54.00	4
16	0.00	49.00	185.00	49.00	5

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	100.0	105.0	0.0	29.0	0.00	0.0	1
2	105.0	110.0	0.0	30.0	0.00	0.0	1
3	110.0	115.0	0.0	32.0	0.00	0.0	1
4	110.0	115.0	0.0	32.0	0.00	0.0	1
5	105.0	110.0	0.0	30.0	0.00	0.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	71.80
2	30.00	71.80
3	135.00	75.00
4	185.00	75.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 12.00 ft.
and X = 18.00 ft.

Each Surface Terminates Between X = 67.00 ft.
and X = 82.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

8.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	12.63	66.53
2	20.59	65.70
3	28.59	65.86
4	36.51	66.98
5	44.23	69.06
6	51.65	72.07
7	58.64	75.96
8	65.10	80.67
9	67.60	83.00

Circle Center At X = 23.3 ; Y = 131.2 and Radius, 65.6

*** 1.651 ***

Individual data on the 18 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Earthquake Force Norm (lbs)	Earthquake Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.4	947.2	2127.1	2613.6	0.0	0.0	0.0	0.0	0.0
2	0.6	160.3	143.6	224.4	0.0	0.0	0.0	0.0	0.0
3	2.4	796.1	507.6	913.7	0.0	0.0	0.0	0.0	0.0

4	5.6	2661.1	670.7	2091.8	0.0	0.0	0.0	0.0	0.0
5	1.4	839.2	54.1	520.0	0.0	0.0	0.0	0.0	0.0
6	6.5	4424.9	0.0	2206.1	0.0	0.0	0.0	0.0	0.0
7	3.5	2648.6	0.0	1037.4	0.0	0.0	0.0	0.0	0.0
8	2.4	1883.9	0.0	604.0	0.0	0.0	0.0	0.0	0.0
9	1.6	1293.8	0.0	353.0	0.0	0.0	0.0	0.0	0.0
10	0.2	191.6	0.0	48.3	0.0	0.0	0.0	0.0	0.0
11	7.4	6006.2	0.0	888.2	0.0	0.0	0.0	0.0	0.0
12	0.4	281.8	0.0	7.5	0.0	0.0	0.0	0.0	0.0
13	0.4	303.7	0.0	2.8	0.0	0.0	0.0	0.0	0.0
14	6.3	4107.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.1	30.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	6.4	2336.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	1.9	238.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.6	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	16.74	67.35
2	24.70	66.55
3	32.69	66.82
4	40.58	68.15
5	48.22	70.53
6	55.47	73.91
7	62.21	78.22
8	67.83	83.00

Circle Center At X = 26.7 ; Y = 126.1 and Radius, 59.6

*** 1.654 ***

1

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.05	67.41
2	25.01	66.56
3	33.00	66.79
4	40.90	68.11
5	48.53	70.49
6	55.78	73.87
7	62.50	78.21
8	68.08	83.00

Circle Center At X = 27.3 ; Y = 125.2 and Radius, 58.7

*** 1.662 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.37	67.47
2	25.34	68.16
3	33.24	69.40
4	41.03	71.22
5	48.68	73.58
6	56.13	76.49
7	63.36	79.92
8	68.81	83.00

Circle Center At X = 12.0 ; Y = 178.4 and Radius, 111.0

*** 1.684 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	16.42	67.28
2	24.42	67.14
3	32.40	67.78
4	40.27	69.18
5	47.97	71.34
6	55.43	74.24
7	62.57	77.85
8	69.33	82.13
9	70.45	83.00

Circle Center At X = 21.9 ; Y = 149.5 and Radius, 82.4

*** 1.707 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.16	67.03
2	22.98	65.36
3	30.97	64.94
4	38.93	65.78
5	46.65	67.85
6	53.96	71.11
7	60.66	75.48
8	66.60	80.84
9	68.34	83.00

Circle Center At X = 29.6 ; Y = 115.8 and Radius, 50.9

*** 1.711 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.68	67.54
2	25.52	65.93
3	33.52	65.64
4	41.45	66.67
5	49.11	68.98
6	56.28	72.52
7	62.78	77.19
8	68.42	82.86
9	68.52	83.00

Circle Center At X = 31.3 ; Y = 114.1 and Radius, 48.5

*** 1.717 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.47	67.09
2	23.27	65.31
3	31.26	64.80
4	39.22	65.57
5	46.95	67.61
6	54.26	70.86
7	60.95	75.25
8	66.86	80.65
9	68.72	83.00

Circle Center At X = 30.4 ; Y = 114.5 and Radius, 49.7

*** 1.728 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.05	67.41
2	24.74	65.19
3	32.71	64.47
4	40.67	65.28
5	48.33	67.59
6	55.41	71.31
7	61.65	76.31
8	66.83	82.41
9	67.16	83.00

Circle Center At X = 32.5 ; Y = 106.3 and Radius, 41.9

*** 1.743 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.90	66.78

2	21.58	64.54
3	29.53	63.67
4	37.51	64.20
5	45.28	66.11
6	52.60	69.35
7	59.24	73.81
8	65.00	79.36
9	67.65	83.00

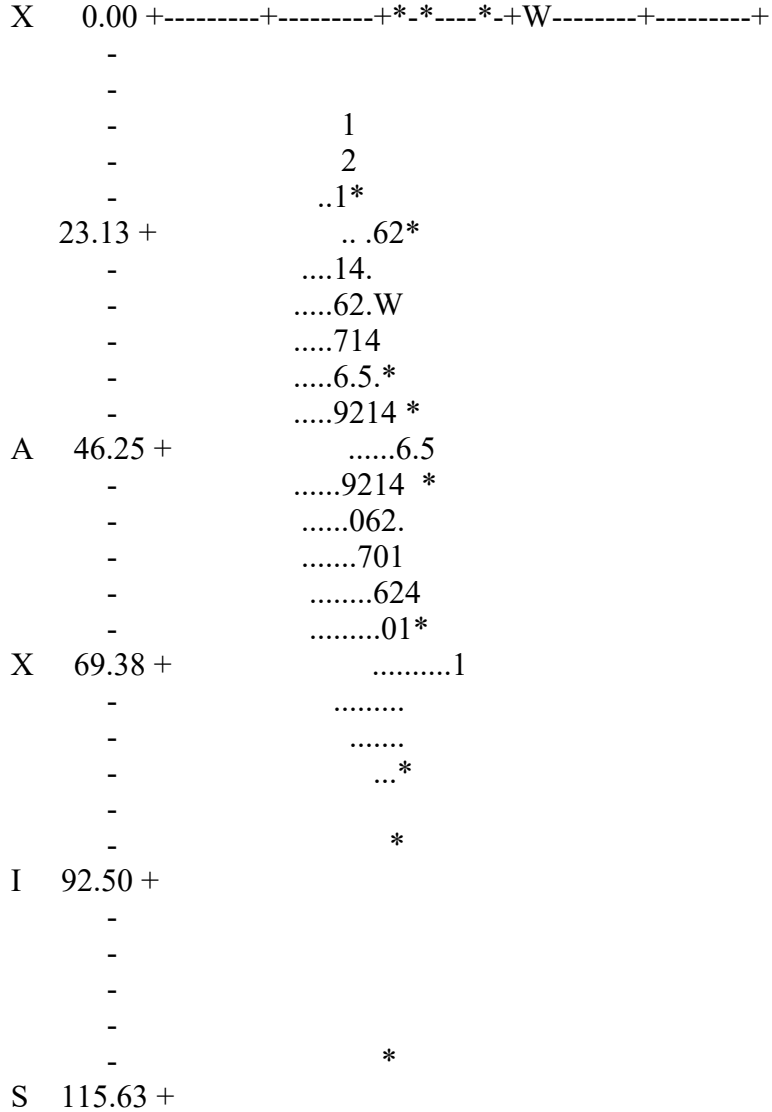
Circle Center At X = 30.5 ; Y = 109.4 and Radius, 45.8

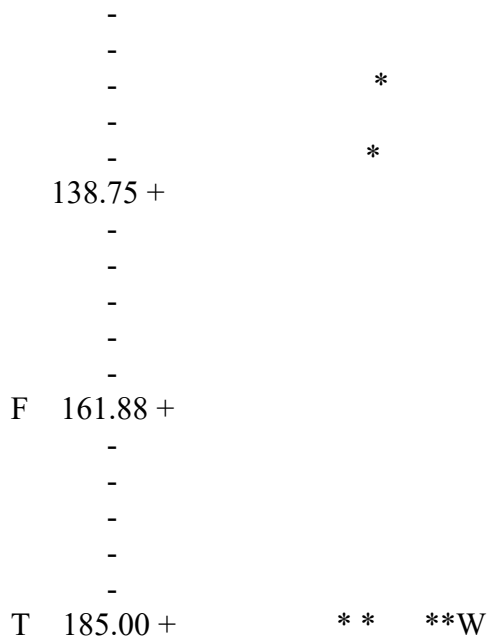
*** 1.748 ***

1

Y A X I S F T

0.00 23.13 46.25 69.38 92.50 115.63

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F 161.88 +
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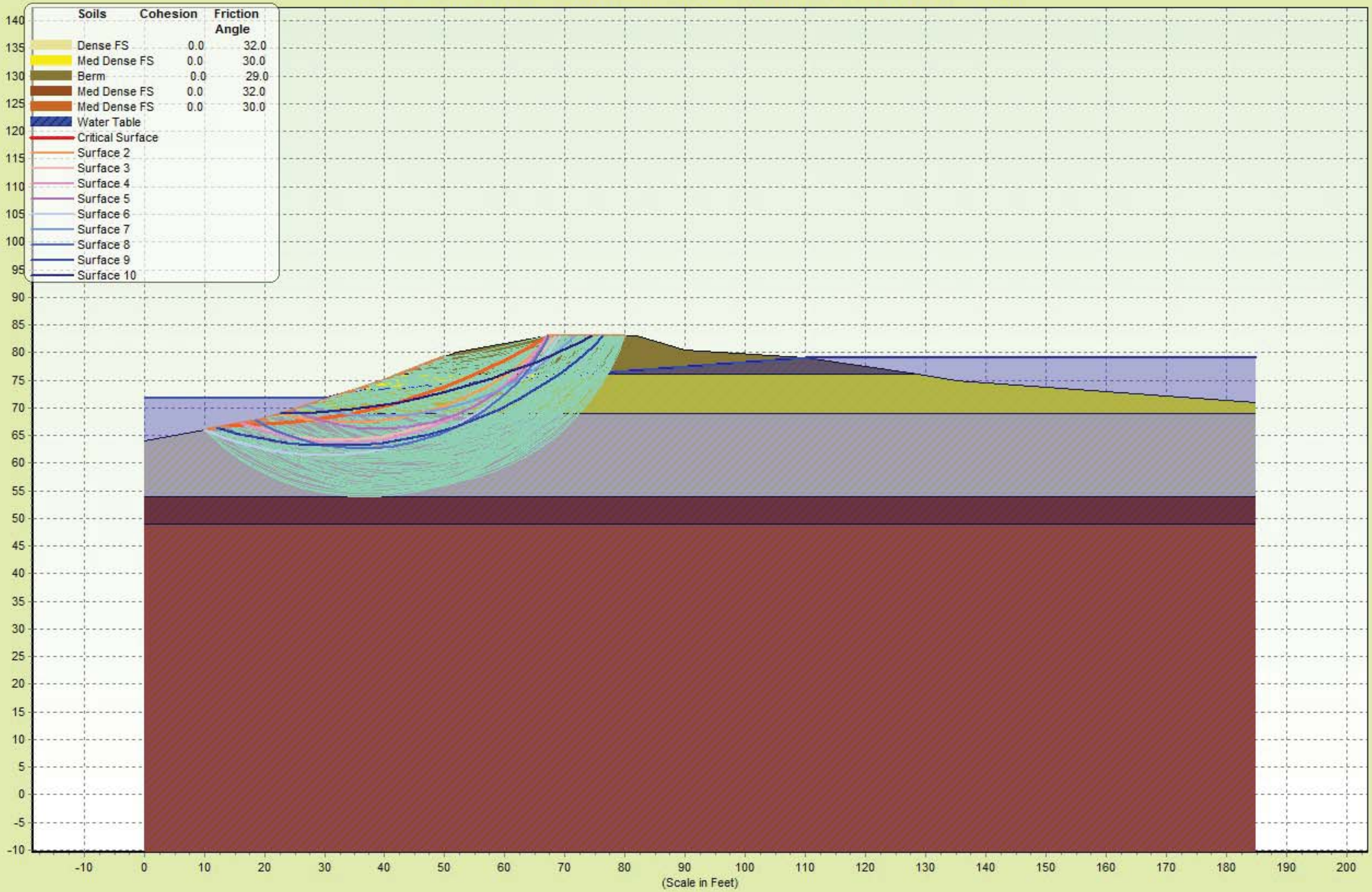
T 185.00 +
* *
**W

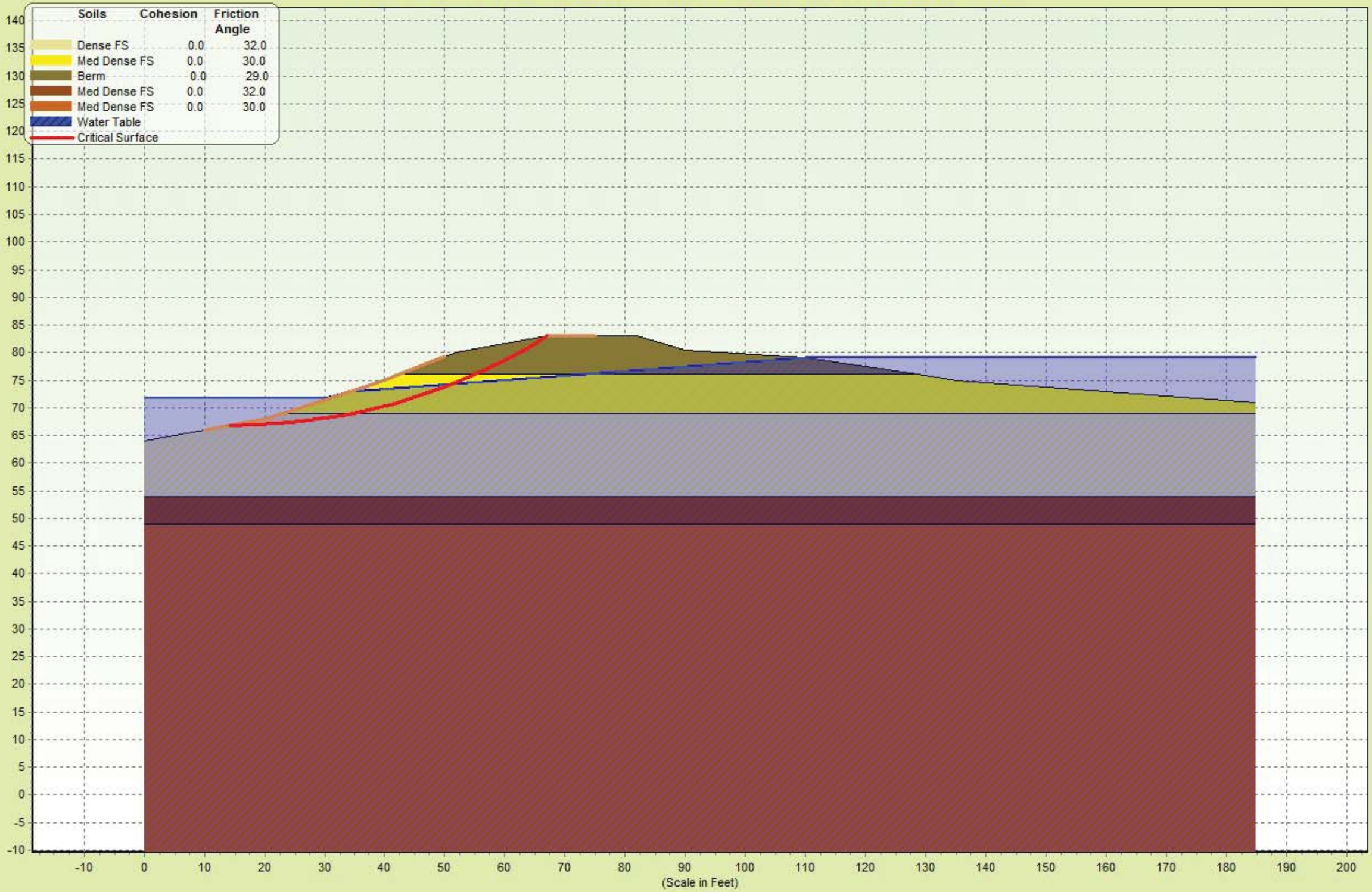
Problem: Berm 2 Failure - Groundwater Case 2 Hurricane - FS Min- Bishop = 1.456

Soils	Cohesion	Friction Angle
Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Berm	0.0	29.0
Med Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Water Table		
Critical Surface		
Surface 2		
Surface 3		
Surface 4		
Surface 5		
Surface 6		
Surface 7		
Surface 8		
Surface 9		
Surface 10		



Problem: Berm 2 Failure - Groundwater Case 2 Hurricane - FS Min- Bishop = 1.456

Soils	Cohesion	Friction Angle
Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Berm	0.0	29.0
Med Dense FS	0.0	32.0
Med Dense FS	0.0	30.0
Water Table		
Critical Surface		



** STABL for WINDOWS **
by
Geotechnical Software Solutions

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:
Time of Run:
Run By:
Input Data Filename: run.in
Output Filename: result.out
Unit: U.S.C.
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION Berm 2 Failure - Groundwater Case 2 Hurricane

BOUNDARY COORDINATES

11 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	64.00	20.00	68.00	3
2	20.00	68.00	23.00	69.00	3
3	23.00	69.00	40.00	75.00	2
4	40.00	75.00	42.40	76.00	2
5	42.40	76.00	52.00	80.00	1
6	52.00	80.00	67.00	83.00	1
7	67.00	83.00	82.00	83.00	1
8	82.00	83.00	90.00	80.50	1
9	90.00	80.50	110.00	79.00	1
10	110.00	79.00	128.80	76.00	1
11	128.80	76.00	135.00	75.00	2
12	135.00	75.00	185.00	71.00	2
13	42.40	76.00	128.80	76.00	2
14	23.00	69.00	185.00	69.00	3
15	0.00	54.00	185.00	54.00	4
16	0.00	49.00	185.00	49.00	5

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	100.0	105.0	0.0	29.0	0.00	0.0	1
2	105.0	110.0	0.0	30.0	0.00	0.0	1
3	110.0	115.0	0.0	32.0	0.00	0.0	1
4	110.0	115.0	0.0	32.0	0.00	0.0	1
5	105.0	110.0	0.0	30.0	0.00	0.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 5 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	71.80
2	30.00	71.80
3	34.30	73.00
4	110.00	79.00
5	185.00	79.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 10.00 ft.
and X = 50.00 ft.

Each Surface Terminates Between X = 67.00 ft.

and X = 75.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

4.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.21	66.84
2	18.21	66.90
3	22.20	67.13
4	26.18	67.53
5	30.14	68.10
6	34.07	68.85
7	37.97	69.76
8	41.82	70.85
9	45.62	72.10
10	49.36	73.51
11	53.03	75.09
12	56.64	76.82
13	60.17	78.71
14	63.61	80.75
15	66.96	82.93
16	67.05	83.00

Circle Center At X = 14.9 ; Y = 158.9 and Radius, 92.1

*** 1.456 ***

Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Earthquake Force Norm (lbs)	Earthquake Force Tan (lbs)	Surcharge Force Hor (lbs)	Surcharge Force Ver (lbs)	Surcharge Load
1	4.0	171.2	1160.1	1230.6	0.0	0.0	0.0	0.0	0.0
2	1.8	179.5	453.1	542.6	0.0	0.0	0.0	0.0	0.0
3	2.2	330.5	497.6	652.5	0.0	0.0	0.0	0.0	0.0
4	0.8	155.7	153.5	231.3	0.0	0.0	0.0	0.0	0.0
5	3.2	794.4	471.5	885.0	0.0	0.0	0.0	0.0	0.0
6	3.8	1278.6	253.2	961.2	0.0	0.0	0.0	0.0	0.0
7	0.1	53.9	1.8	32.2	0.0	0.0	0.0	0.0	0.0
8	3.9	1626.4	8.4	941.2	0.0	0.0	0.0	0.0	0.0
9	0.2	102.0	0.0	57.6	0.0	0.0	0.0	0.0	0.0
10	0.4	187.8	0.0	107.9	0.0	0.0	0.0	0.0	0.0
11	3.3	1537.9	0.0	785.1	0.0	0.0	0.0	0.0	0.0
12	2.0	1014.0	0.0	436.4	0.0	0.0	0.0	0.0	0.0
13	1.8	939.3	0.0	344.1	0.0	0.0	0.0	0.0	0.0
14	0.6	310.1	0.0	102.2	0.0	0.0	0.0	0.0	0.0
15	3.2	1747.0	0.0	463.4	0.0	0.0	0.0	0.0	0.0
16	3.7	2071.5	0.0	308.6	0.0	0.0	0.0	0.0	0.0
17	2.0	1073.2	0.0	45.0	0.0	0.0	0.0	0.0	0.0
18	0.7	374.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	1.0	547.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	1.9	926.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	1.7	741.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	3.5	1240.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	3.4	774.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	3.3	273.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	22.63	68.88
2	26.63	68.68
3	30.63	68.72
4	34.62	68.98
5	38.59	69.48
6	42.52	70.21
7	46.40	71.16
8	50.23	72.34
9	53.98	73.74
10	57.64	75.35
11	61.20	77.17
12	64.65	79.20
13	67.97	81.42
14	70.07	83.00

Circle Center At X = 28.0 ; Y = 137.5 and Radius, 68.8

*** 1.540 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.84	70.36
2	30.84	70.42
3	34.83	70.72
4	38.80	71.25
5	42.72	72.00
6	46.60	72.99
7	50.41	74.20
8	54.15	75.63
9	57.80	77.27
10	61.34	79.12
11	64.77	81.18
12	67.45	83.00

Circle Center At X = 27.8 ; Y = 138.9 and Radius, 68.6

*** 1.573 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.74	69.61
2	28.56	68.44
3	32.49	67.69
4	36.48	67.36
5	40.48	67.46
6	44.44	67.99
7	48.33	68.93
8	52.09	70.29
9	55.69	72.04
10	59.08	74.16
11	62.22	76.64
12	65.08	79.44
13	67.62	82.52

14 67.94 83.00

Circle Center At X = 37.6 ; Y = 104.7 and Radius, 37.3

*** 1.583 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.95	71.10
2	32.81	70.08
3	36.77	69.51
4	40.77	69.40
5	44.76	69.76
6	48.67	70.57
7	52.47	71.84
8	56.09	73.53
9	59.49	75.63
10	62.63	78.11
11	65.46	80.94
12	67.09	83.00

Circle Center At X = 39.7 ; Y = 103.7 and Radius, 34.4

*** 1.601 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.95	71.10
2	32.80	70.01
3	36.75	69.38
4	40.74	69.22
5	44.73	69.53
6	48.66	70.31
7	52.46	71.54
8	56.10	73.21
9	59.51	75.29
10	62.66	77.76

11	65.49	80.59
12	67.40	83.00

Circle Center At X = 40.1 ; Y = 103.1 and Radius, 33.9

*** 1.613 ***

1

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.21	66.84
2	18.21	67.03
3	22.19	67.34
4	26.17	67.78
5	30.13	68.34
6	34.07	69.02
7	37.99	69.81
8	41.89	70.73
9	45.75	71.77
10	49.58	72.93
11	53.37	74.20
12	57.12	75.59
13	60.83	77.09
14	64.49	78.71
15	68.09	80.44
16	71.65	82.28
17	72.94	83.00

Circle Center At X = 10.0 ; Y = 197.0 and Radius, 130.2

*** 1.627 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	24.74	69.61
2	28.65	70.44
3	32.55	71.35
4	36.43	72.33

5	40.28	73.38
6	44.12	74.50
7	47.94	75.69
8	51.74	76.96
9	55.51	78.29
10	59.25	79.70
11	62.97	81.18
12	66.66	82.72
13	67.29	83.00

Circle Center At X = -17.7 ; Y = 278.9 and Radius, 213.6

*** 1.635 ***

1

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.21	66.84
2	18.05	65.73
3	21.96	64.89
4	25.93	64.34
5	29.92	64.08
6	33.92	64.10
7	37.91	64.42
8	41.86	65.02
9	45.76	65.91
10	49.59	67.07
11	53.32	68.51
12	56.94	70.21
13	60.43	72.17
14	63.76	74.38
15	66.93	76.82
16	69.91	79.49
17	72.70	82.36
18	73.23	83.00

Circle Center At X = 31.6 ; Y = 119.3 and Radius, 55.3

*** 1.640 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	12.11	66.42
2	15.93	65.25
3	19.83	64.35
4	23.78	63.74
5	27.77	63.41
6	31.77	63.36
7	35.76	63.61
8	39.73	64.13
9	43.64	64.94
10	47.49	66.03
11	51.25	67.39
12	54.91	69.02
13	58.44	70.90
14	61.82	73.03
15	65.05	75.40
16	68.09	77.99
17	70.95	80.79
18	72.90	83.00

Circle Center At X = 30.4 ; Y = 119.2 and Radius, 55.8

*** 1.643 ***

1

```
        Y          A     X     I     S          F     T


          0.00     23.13     46.25     69.38     92.50     115.63

X      0.00 +---------+---------+*-*----*-+W--------+---------+
             -
             -
             -                    ..0
             -                   ..01
             -                   ...9*
       23.13 +                     ...91*
             -                   ...0912.
             -                   ...0912W
             -                  .....9413W
             -                  .....9.13*
             -                   ....94218*
A      46.25 +                     ....945138.
             -                   ....94218.*
             -                   .....44138.
             -                    ....90418.
             -                     ....90218
```

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          -                      ....9921*
X     69.38 +                         ....922
          -                          ....7
          -
          -                              *
          -
          -                             *
I     92.50 +
          -
          -
          -
          -
          -                            *
S    115.63 +
          -
          -
          -                           *
          -
          -                          *
     138.75 +
          -
          -
          -
          -
          -
F    161.88 +
          -
          -
          -
          -
          -
T    185.00 +                  * *      **  W
```

FINAL REPORT
GEOPHYSICAL INVESTIGATION
ORANGE COUNTY LANDFILL - POND 2 BERM
ORLANDO, FL

Prepared for Professional Service Industries, Inc.
Orlando, FL

Prepared by GeoView, Inc.
St. Petersburg, FL

February 21, 2018

Mr. Eric Nagowski, E.I.
Professional Service Industries, Inc.
1748 33rd Street
Orlando, FL 32839

Subject: Transmittal of Final Report for Geophysical Investigation
Orange County Landfill - Pond 2 Berm - Orlando, Florida
GeoView Project Number 26421

Dear Mr. Nagowski,

GeoView, Inc. (GeoView) is pleased to submit the final report that summarizes and presents the results of the geophysical investigation conducted along the Berm of Pond 2 at the Orange County Landfill. Ground penetrating radar and electrical resistivity were used to evaluate near-surface geological conditions. GeoView appreciates the opportunity to have assisted you on this project. If you have any questions or comments about the report, please contact us.

GEOVIEW, INC.

Michael J. Wightman, P.G.
Principal Geophysicist, President
Florida Professional Geologist
Number 1423

Chris Taylor, P.G.
Vice President
Florida Professional Geologist
Number 2256

1.0 Introduction

A geophysical investigation was conducted at Orange County Landfill in Orlando, Florida. Prior to the investigation, a portion of the southern berm of Pond 2 had failed. The purpose of the investigation was to help characterize near-surface geological conditions in the area of the berm failure to identify subsurface features that may be associated with additional sinkhole activity along the berm and the adjacent portion of the pond. The results of the investigation are shown on Figure 1. The investigation was conducted on February 23, 2018.

2.0 Description of Geophysical Investigation

The investigation was conducted using Electrical Resistivity Imaging and Ground Penetrating Radar.

2.1 Ground Penetrating Radar Survey

The GPR survey was conducted along a series of transects twelve transects. Six of the transects were performed on the berm. Six of the transects were performed within the area of the washout and in a portion of the pond immediately north of the washout using a portable boat. The locations of the transects are shown on Figure 1. The GPR data was collected with a Mala radar system. The GPR settings used for the survey are presented in Table 1.

Table 1
GPR Equipment Settings Used for GPR Surveys

Antenna Frequency	Location	Time Range (nano-seconds)	Estimated Depth of GPR Signal Penetration
250 MHz 1/	On Berm	205	14 to 18 ft bls
250 MHz 1/	In Washout	223	10 to 15 ft bls

1/ MHz means mega-Hertz and is the mid-range operating frequency of the GPR antenna.

Initially, a sub-bottom profile survey was proposed in the area of the washout. However, the shallow water depth prevented the collection of the sub-bottom data. GPR data was collected instead in the area of the washout. A description of the GPR technique and the methods employed for geological characterization studies is provided in Appendix 2.2.

2.2 Electrical Resistivity Imaging Survey

The ERI survey was conducted using the Advanced Geosciences, Inc. Sting R8 automatic electrode resistivity system. Two ERI transects were performed

using up to 21 electrodes with an “a spacing” of 10 ft. A dipole-dipole combined with an inverse Schlumberger electrode configuration was used with a maximum “n value” of six. The ERI data was analyzed using EarthImager 2D, a computer inversion program, which provides two-dimensional vertical cross-sectional resistivity model (pseudo-section) of the subsurface. A description of the ERI method and the methods employed for geotechnical characterization studies is provided in Appendix A2.2. A discussion of the modeling process used to create the ERI results is provided in Appendix A2.2.1.

3.0 Identification of Possible Sinkhole Features Using GPR and ERI Methods

3.1 Identification of Possible Sinkhole Features Using GPR

The features observed on GPR data that are most commonly associated with sinkhole activity are:

- A downwarping of GPR reflector sets, that are associated with suspected lithological contacts, towards a common center. Such features typically have a bowl or funnel shaped configuration and can be associated with a deflection of overlying sediment horizons caused by the migration of sediments into voids in the underlying limestone. If the GPR reflector sets are sharply downwarping and intersect, they can create a “bow-tie” shaped GPR reflection feature, which often designates the apparent center of the GPR anomaly.
- A localized significant increase in the depth of the penetration and/or amplitude of the GPR signal response. The increase in GPR signal penetration depth or amplitude is often associated with either a localized increase in sand content at depth or decrease in soil density.
- An apparent discontinuity in GPR reflector sets, that are associated with suspected lithological contacts. The apparent discontinuities and/or disruption of the GPR reflector sets may be associated with the downward migration of sediments.

The greater the severity of these features or a combination of these features the greater the likelihood that the identified feature is a sinkhole. It is not possible based on the GPR data alone to determine if an identified feature is a sinkhole or, more important, whether that feature is an active sinkhole.

3.2 Identification of Possible Sinkhole Features Using ERI

Sinkhole features are typically characterized by one of the following conditions on the ERI profile:

1. The occurrence of highly resistive material that extends to depth in a columnar fashion towards the top of the limestone. Such a feature may indicate the presence of a sand-filled depression or raveling zone.
2. The localized presence of low-resistivity material extending below the interpreted depth to the top of limestone. Such a feature may indicate the presence of a clay-filled void or fracture with the limestone or the presence of highly weathered limestone rock.
3. Any significant localized increase in the depth to limestone. Such a feature may indicate the presence of an in-filled depression (paleo-sink).

When comparing the results of the ERI method, the following considerations should be given. The ERI method, for example, describes the transition from clay to limestone as a transition, rather than a discrete depth. This transition is due to several factors including: a) The vertical density of the resistivity data decreasing with depth and b) The possibility that the upper portion of the limestone is weathered which would create a physical transition zone in terms of resistivity between the clay and competent (non-weathered) limestone and c) The limitations in the modeling process.

4.0 Survey Results

4.1 Discussion of GPR Survey Results

Results of the GPR survey indicated the presence of two well-defined, relatively continuous set of GPR reflectors at an approximate depth range of 1 to 4 and 7 to 10 ft bls. The reflector sets are most likely associated with some change in lithological conditions at that depth range. The GPR reflector sets were continuous across the surveyed areas of the project site. No observed areas of significant downwarping or other indicators of possible sinkhole activity were observed. The GPR did show minor changes in water depth in the area of the washout and north of the washout. However, the reflectors below the bottom of the pond do not show indications of karst activity.

Examples of the GPR data collected are the site provided in Appendix 1. A discussion of the limitations of the GPR technique in geological characterization studies is provided in Appendix 2.

4.2 Discussion of ERI Survey Results

Results from the ERI survey are presented in Appendix 1. The ERI transects are of acceptable quality (a discussion of the criteria used to determine the quality of an ERI inversion model is provided in Appendix A2.3.1).

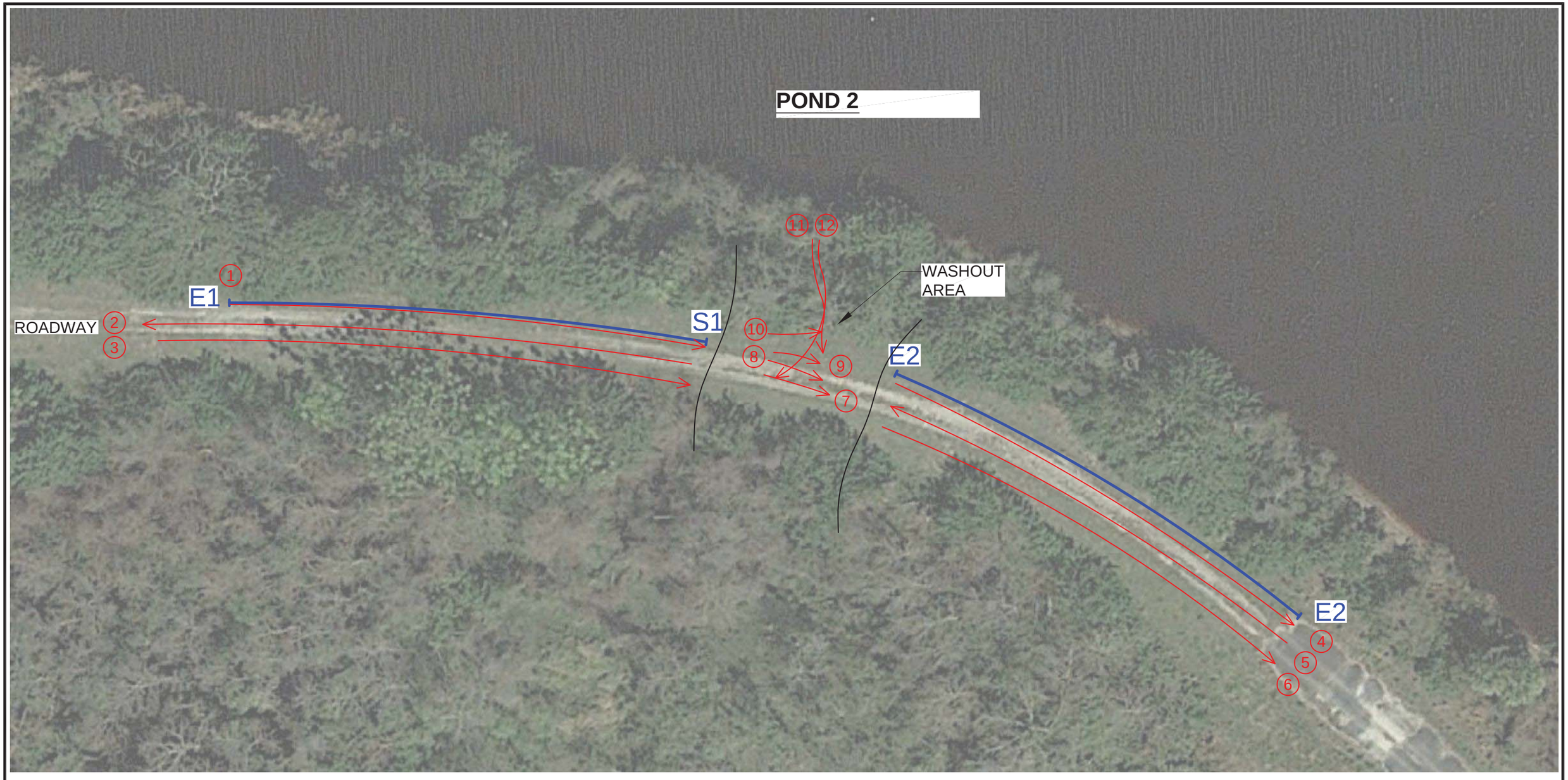
Analysis of the ERI transects indicate the presence of high to moderate resistivity near-surface soil materials to a depth range of 18 to 24 ft bls (represented in red to yellow on the ERI transects). This high to moderate resistivity layer is most likely associated with sandy soils. The surficial high to moderate resistivity layer is underlain by a low resistivity layer (represented in blue) to the maximum depth of investigation of the ERI transects which ranged from approximately 29 to 38 ft bls. The low resistivity soils are most likely associated with an increase in clay content. Lateral variations were observed in the resistivity of soil materials across the project site. However, no geological structures commonly associated with sinkhole activity were observed in either of the two ERI transects. Accordingly, the ERI survey does not show any indication of sinkhole activity within the survey area.

4.3 Correlation of Geophysical Study Results

Both the GPR and ERI identified layers appear to be laterally continuous within the boundaries of the survey area. Accordingly, the geophysical methods are in agreement that no indications of sinkhole activity are present based on the results of the respective methods.

APPENDIX 1

FIGURE, SITE PHOTOGRAPH AND EXAMPLE OF GPR DATA, AND ERI TRANSECTS



EXPLANATION

S1 — E1 LOCATION OF ERI TRANSECT LINES WITH START AND END POINTS

5 → PATH OF GPR TRANSECT LINES WITH DESIGNATION NUMBER

N

0 30'

SCALE: 1"=30' APPROXIMATE

NOTE: BASE MAP WAS PROVIDED BY OTHERS

GeoView

FIGURE 1

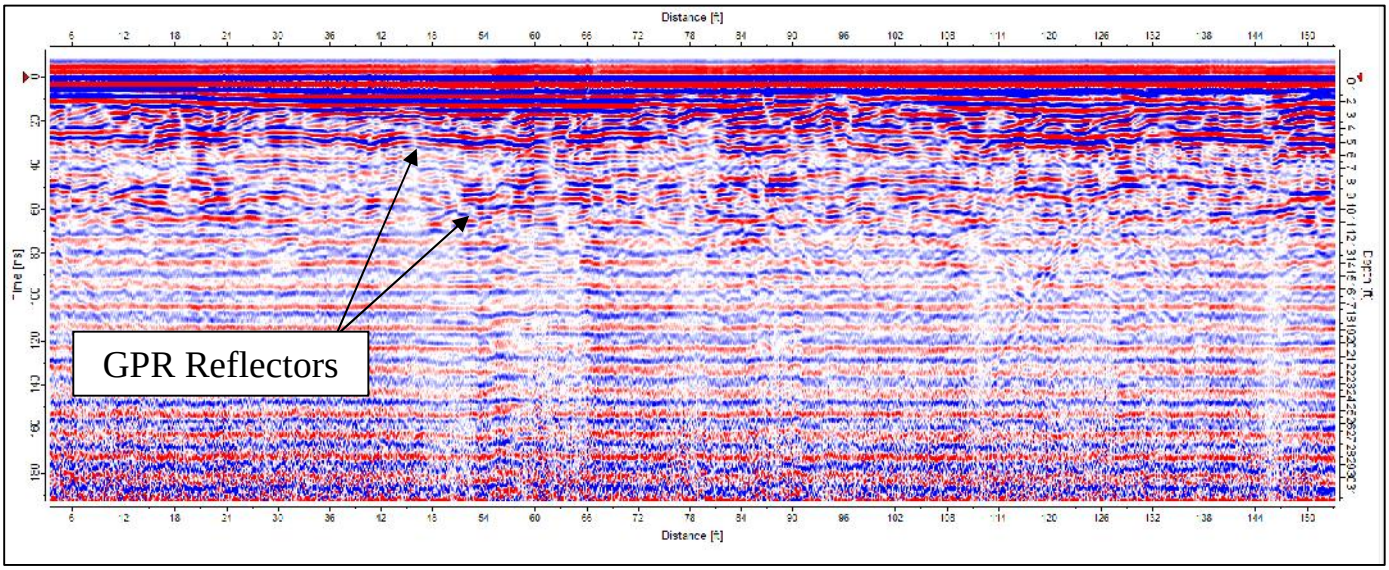
SITE MAP SHOWING RESULTS OF GEOPHYSICAL INVESTIGATION

ORANGE COUNTY LANDFILL-POND 2 SITE
5901 YOUNG PINE ROAD
ORLANDO, FLORIDA

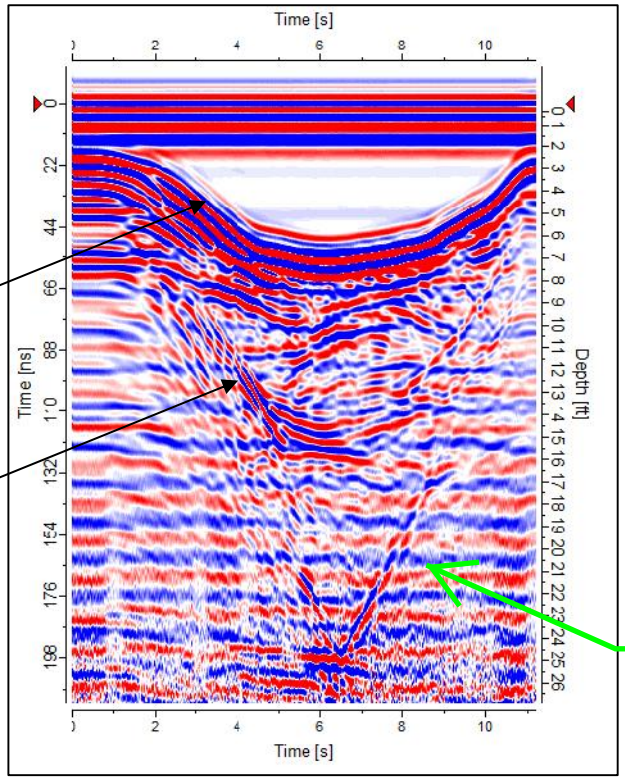
PROFESSIONAL SERVICES INDUSTRIES, INC.
ORLANDO, FLORIDA

PROJECT: 26421
DATE: 02/21/18

Collection of GPR Data in the Washout



GPR Transect 2 Collected on Berm

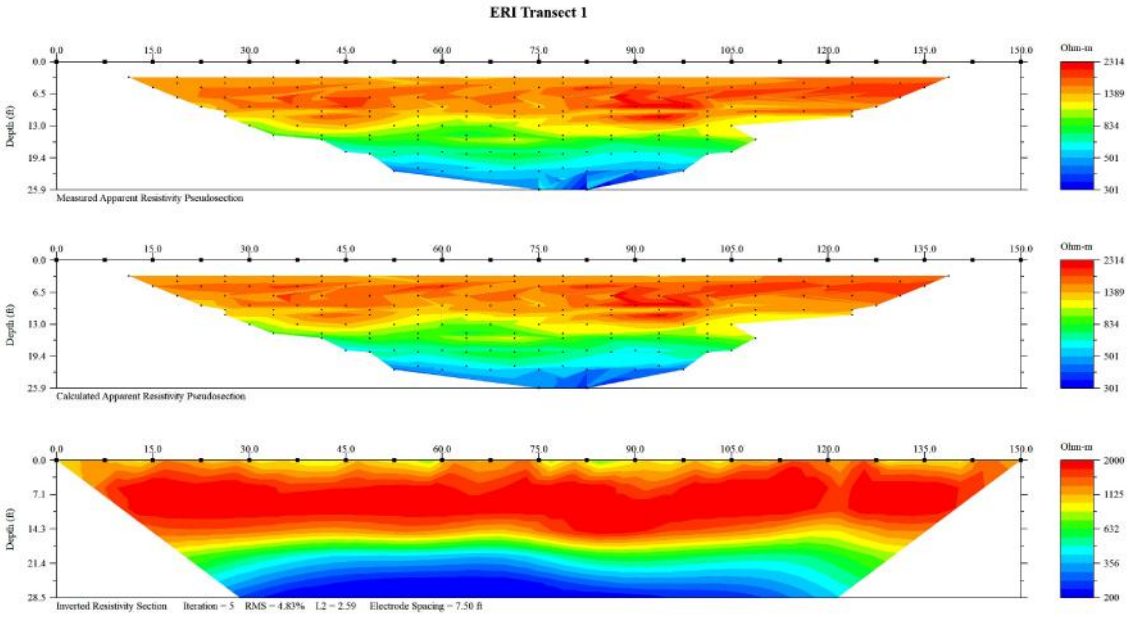


Pond Bottom

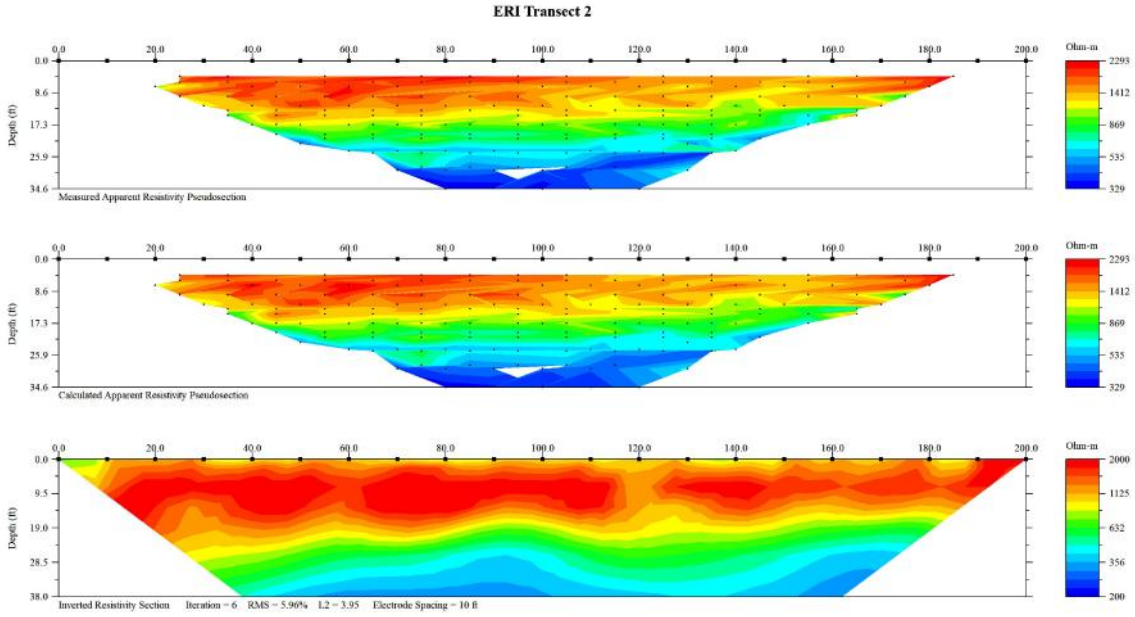
Reflection Multiple

V-shape is a reflection of the GPR signal from the shoreline.

GPR Transect 8 Collected in Washout



ERI Transect 1



ERI Transect 2

APPENDIX 2
DESCRIPTION OF GEOPHYSICAL METHODS, SURVEY METHODOLOGIES AND LIMITATIONS

A2.1 On Site Measurements

The measurements that were collected and used to create the site map were made using a Trimble GeoXH GPS with an external tornado antenna.

A2.2 Ground Penetrating Radar

Ground Penetrating Radar (GPR) consists of a set of integrated electronic components that transmits high frequency (200 to 1500 megahertz [MHz]) electromagnetic waves into the ground and records the energy reflected back to the ground surface. The GPR system consists of an antenna, which serves as both a transmitter and receiver, and a profiling recorder that both processes the incoming signal and provides a graphic display of the data. The GPR data can be reviewed as both printed hard copy output or recorded on the profiling recorder's hard drive for later review. GeoView uses a Mala GPR system.

A GPR survey provides a graphic cross-sectional view of subsurface conditions. This cross-sectional view is created from the reflections of repetitive short-duration electromagnetic (EM) waves that are generated as the antenna is pulled across the ground surface. The reflections occur at the subsurface contacts between materials with differing electrical properties. The electrical property contrast that causes the reflections is the dielectric permittivity that is directly related to conductivity of a material. The GPR method is commonly used to identify such targets as underground utilities, underground storage tanks or drums, buried debris, voids or geological features.

The greater the electrical contrast between the surrounding earth materials and target of interest, the greater the amplitude of the reflected return signal. Unless the buried object is metal, only part of the signal energy will be reflected back to the antenna with the remaining portion of the signal continuing to propagate downward to be reflected by deeper features. If there is little or no electrical contrast between the target interest and surrounding earth materials it will be very difficult if not impossible to identify the object using GPR.

The depth of penetration of the GPR signal is very site specific and is controlled by two primary factors: subsurface soil conditions and selected antenna frequency. The GPR signal is attenuated (absorbed) as is passes through earth materials. As the energy of the GPR signal is diminished due to attenuation, the

energy of the reflected waves is reduced, eventually to the level that the reflections can no longer be detected. As the conductivity of the earth materials increases, the attenuation of the GPR signal increases thereby reducing the signal penetration depth. In Florida, the typical soil conditions that severely limit GPR signal penetration are near-surface clays and/or organic materials.

The depth of penetration of the GPR signal is also reduced as the antenna frequency is increased. However, as antenna frequency is increased the resolution of the GPR data is improved. Therefore, when designing a GPR survey a tradeoff is made between the required depth of penetration and desired resolution of the data. As a rule, the highest frequency antenna that will still provide the desired maximum depth of penetration should be used. For outside areas, a low-frequency (250 MHz) antenna is used. This allows for maximum signal penetration and thereby maximum depth from which information will be obtained.

A GPR survey is conducted along survey lines (transects) that are measured paths along which the GPR antenna is moved. An integrated survey wheel electronically records the distance of the GPR system along the transect lines.

For geological characterization surveys, the GPR survey is conducted along a set of perpendicularly orientated transects. The survey is conducted in two directions because subsurface features such as sinkholes are often asymmetric. Spacing between the transects typically ranges from 10 to 50 ft. Closely spaced grids are used when the objective of the GPR survey is to identify all sinkhole features within a project site. Coarser grids are used when the objective is to provide a general overview of site conditions. After completion of a survey using a given grid spacing, additional more-closely spaced GPR transects are often performed to better characterize sinkhole features identified by the initial survey. This information can be used to provide recommended locations for geotechnical borings.

Depth estimates to the top of lithological contacts or sinkhole features are determined by dividing the time of travel of the GPR signal from the ground surface to the top of the feature by the velocity of the GPR signal. The velocity of the GPR signal is usually obtained from published tables of velocities for the type and condition (saturated vs. unsaturated) of soils underlying the site. The accuracy of GPR-derived depths typically ranges from 20 to 40 percent of the total depth.

Interpretation and Limitations of GPR data

The analysis and collection of GPR data is both a technical and interpretative skill. The technical aspects of the work are learned from both training and experience. Having the opportunity to compare GPR data collected in numerous

settings to the results from geotechnical studies performed at the same locations develops interpretative skills for geological characterization studies.

The ability of GPR to collect interpretable information at a project site is limited by the attenuation (absorption) of the GPR signal by underlying soils. Once the GPR signal has been attenuated at a particular depth, information regarding deeper geological conditions will not be obtained. In addition, GPR data can only resolve subsurface features that have a sufficient electrical contrast between the feature in question and surrounding earth materials. If an insufficient contrast is present, the subsurface feature will not be identified. GeoView can make no warranties or representations of geological conditions that may be present beyond the depth of investigation or resolving capability of the GPR equipment or in areas that were not accessible to the geophysical investigation.

A2.3 Electrical Resistivity

Electrical resistivity surveying is a geophysical method in which an electrical current is injected into the earth; the subsequent response (potential) is measured at the ground surface to determine the resistance of the underlying earth materials. The resistivity survey is conducted by applying electrical current into the earth from two implanted electrodes (current electrodes C_1 and C_2) and measuring the associated potential between a second set of implanted electrodes (potential electrodes P_1 and P_2). Field readings are in volts. Field readings are then converted to resistivity values using Ohm's Law and a geometric correction factor for the spacing and configuration of the electrodes. The calculated resistivity values are known as "apparent" resistivity values. The values are referred to as "apparent" because the calculations for the values assume that the volume of earth material being measured is electrically homogeneous. Such field conditions are rarely present.

Resistivity of earth materials is controlled by several properties including composition, water content, pore fluid resistivity and effective permeability. For this study the properties that had the primary control on measured resistivity values are composition and effective permeability. The general geological setting of this project area is clay overlain by limestone.

For this study a dipole-dipole combined with an inverse Schlumberger resistivity array configuration was used. The dipole-dipole array is different that most other resistivity arrays in that the electrode and current electrodes are kept together using a constant spacing value referred to as an "a spacing". The current and potential electrode sets are moved away from each other using multiples of the

"a spacing" value. The number of multiples is referred to as the "n value". For example, an array with an "a spacing" of 5 ft and a "n value" of 6 would have the current and potential electrode sets spaced 30 ft apart with a separation between the two electrodes in the set of 5 ft. By sampling at varying "n values", greater depth measurements can be achieved. Inverse Schlumberger data is collected with the current set of electrodes being kept with a fixed separation (L spacing) and the potential electrodes a minimum distance of 5L from the inner current electrodes. Dipole-dipole resistivity data is usually presented in a two-dimensional pseudo-section format. Inverse Schlumberger data is usually presented as a vertical profile of resistivity distribution below the center point between the two current electrodes. The dipole-dipole and inverse Schlumberger data is combined and presented as either a contour of the individual data points (using the calculated apparent resistivity values) or as a geological model using least squares analysis. Such least squares analysis was used for this study using the computer software program (EarthImager 2D) developed for the equipment manufacturer. Apparent resistivity values are calculated using the following formula for a dipole-dipole configuration: $\gamma_a=\pi(b^3/a^2-b)\nabla V/I$:

Where:

γ_a= apparent resistivity
π= 3.14
a= "a spacing"
b= "a spacing" x "n value"
∇V= voltage between the two potential electrodes
I= current (in amps)

For a Schlumberger configuration the apparent resistivity is calculated using: $\gamma_a=\pi([s^2-a^2]/4)\nabla V/aI$:

Where:

γ_a= apparent resistivity
π= 3.14
a= spacing between the inner set of electrodes"
s= distance between the outer electrode and nearest inner electrode
∇V= voltage between the two potential electrodes
I= current (in amps)

A2.3.1 Inversion Modeling of ERI Data

The objective for inversion modeling of resistivity data is to create a description of the actual distribution of earth material resistivity based on the subsurface geology that closely matches the resistivity values that are measured by the instrumentation. This modeling is done through the use of EarthImager™, a proprietary computer program developed by the equipment manufacturer. When evaluating the validity of the inversion model several factors need to be considered. The RMS, or root mean square error, expresses the quality of fit between the actual and modeled resistivity values for the given set of points in the model. The lower the RMS error the higher the quality of fit between the actual and modeled data sets. In general, inversion models with an RMS error of less than 5 to 10 percent are acceptable. The size of the RMS error is dependent upon the number of bad data points within a data set and the magnitude of how bad the data points are. As part of the modeling process bad data points are typically removed, which decreases the RMS error and improves (with limitations) the quality of the model. The quality of fit between the actual and modeled resistivity values is also expressed as the L-2 norm. When the modeled and actual data sets have converged, the L-2 norm reduces to unity (1.0 or smaller).

However, as the number of data points is reduced, the validity of the inversion model is diminished. Accordingly, when interpreting a particular area of an inversion model the number of data points used to create that portion of the model must be taken into consideration. If very few points are within a particular area of the model, then the modeled solution in that area should be considered suspect and possibly rejected.

The entire ERI transect should be considered suspect if a model has a high RMS error and a large number of removed data points. It is likely that sources of interference have affected the field readings and rendered the modeled solution invalid. Such sources of interference can include buried metallic underground utilities, reinforced concrete slabs, septic leach fields or electrical grounding systems. Accordingly, all efforts need to be made in the field to locate, to the degree possible, the ERI transect lines away from such features. The locations of such features also need to be mapped in the field so their potential effects can be considered when interpreting the modeled results.