HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
Purchasing Department
600 S. Commerce Avenue
Sebring, Florida 33870
Purchasing Main Line: (863) 402-6500
Purchasing Designated Contact: Kelli Bronson, Procurement Analyst
Email: kbronson@HighlandsFL.Gov
Direct Line: (863) 402-6528

INVITATION TO BID

ITB No: 23-030-KSB Highlands County Solid Waste Management Center Class I Cell 5 Landfill Expansion Highlands County Project No. 21078

✓	**Non-Mandatory Pre-Solicitation Meeting:**	**Tuesday, March 5, 2024, 1:30 PM**
	Location:	**LOCATION/ADDRESS** **Landfill Conference Room** **12700 Arbuckle Creek Road, Sebring, FL 33870**
✓	**Request for Information Deadline:**	**Thursday, March 28, 2024, prior to 5:00 PM**
✓	**Submission Deadline:**	**Wednesday, April 10, 2024, prior to 3:30PM**

Advertised Date: February 24, 2024, and March 2, 2024

PROHIBITED SUBMISSION TO THIS SOLICITATION/PROPOSAL/QUOTE. **Any party who is in active litigation with Highlands County on the due date for responses to this solicitation/proposal/quote or who has received notice from Highlands County that the party is in breach of a contractual obligation under a contract with Highlands County and where such breach has not been resolved to the satisfaction of Highlands County on the due date for responses to this solicitation/proposal/quote, shall not submit a response to this solicitation/proposal/quote. In the event of a submission by such a party as described hereinabove, the submission shall be considered non-responsible and shall be rejected.**

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CLASS I CELL 5 LANDFILL EXPANSION
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TECHNICAL SPECIFICATIONS

HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
Purchasing Division and Engineering Department

DIVISION 0 - SECTION 00010
INVITATION TO BID ("ITB")

The Board of County Commissioners ("Board") of Highlands County, Florida ("County") will receive sealed Bids in the Highlands County Purchasing Division ("Purchasing Division") for:

ITB NO. 23-030-KSB Highlands County Solid Waste Management Center Class I Cell 5 Landfill Expansion Highlands County Project No. 21078

Specifications may be obtained by downloading from our website: www.highlandsfl.gov, or on www.VendorRegistry.com. Questions can be directed at Purchasing Designated Contact noted on the cover page of this solicitation.

A **NON-MANDATORY PRE-BID meeting will be held at 1:30 P.M. on Tuesday; March 5, 2024,** in the Highlands County Landfill Conference Room. Location Address: 12700 Arbuckle Creek Rd, Sebring, FL 33870.

The purpose of this meeting is to provide a forum where the Bidders can further familiarize themselves with the Specifications of the ITB. The public is invited to attend this meeting.

SUBMISSIONS and original BID BOND, if applicable, MUST BE DELIVERED to the Purchasing Department, 600 S. Commerce Avenue., Sebring, FL 33870 to reach said office no later **than 3:30 P.M., Wednesday, April 10, 2024**, at which time they will be opened. Responses may be submitted by one of the following methods:

 Electronic submission to the County website, www.highlandsfl.gov linking to VendorRegistry.com in **one all-inclusive adobe file** of all documents and, if applicable, **additionally one Excel file containing the Price Sheet**. **Label each "23-030-KSB Bidder Name-Submission" and "23-030-KSB Bidder Name-Bid Form"**
OR
 Hard Copy submission in a sealed and marked package. Affix the supplied "Sealed Solicitation Label" with the name of the Proposer, solicitation number, and title to the exterior of the package so as to identify the enclosed response. A hard copy response is to include the following: **one (1) original all-inclusive paper copy** (signed in blue ink)**,** of the response, and electronic copy containing **one all-inclusive Adobe file** of all documents and **additionally, if applicable, one Excel file containing the Price Sheet**. **Label each "23-030-KSB Bidder Name Submission" and "23-030-KSB Bidder Name Bid Form"** (Thumb drive) of the original response.
NOTE: Original Bid Bond (hard copy,) as required, are to be physically received by Purchasing prior to the submission deadline provided on the cover page or as revised via Addendum.

LATE SUBMISSIONS: Submissions received later than the date and time as specified will be rejected. The Board shall not be responsible for delays caused by the method of delivery such as, but not limited to;

Internet, United States Postal Service, overnight express mail service(s), or delays caused by any other occurrence.
One or more County Commissioners may be in attendance at meetings.

Highlands County's Local Preference Policy and Women/Minority Business Preference Policy will apply to the award of this Bid. Please see the Highlands County Board of County Commissioners Purchasing Manual with an effective date of June 21, 2022.

The County reserves the right to accept or reject any or all Bids or any parts thereof, and the determination of this Award, if an Award is made, will be made to the most responsive and responsible Bidder whose Bid and qualifications indicate that the Award will be in the best interest of the County. The County reserves the right to waive irregularities in the Bid.

To receive consideration, a Bidder must submit a Bid on all Work. A Bid Bond in an amount of five percent (5%) of the Bid must be included on Bids over one hundred thousand dollars ($100,000.00). If the successful Bid is greater than two hundred thousand dollars ($200,000.00), a Public Construction Bond will be required. An Irrevocable Letter of Credit may be considered in lieu of the Public Construction Bond depending on its verbiage. The Bidder must be a Licensed to do this work in the State of Florida. The Bid must be accompanied by evidence of the Bidder's qualifications to do business in the State of Florida.

The principal features of the Project are:
To install an approximately 17-acre double-liner system for the Class I Cell 5 Expansion project including ancillary work associated with the cell construction. The successful bidder shall be responsible for providing all materials, equipment, and labor for performing all work necessary and as required by the contract documents. The principal features of this project include performing earthwork, installing a geosynthetic bottom-liner system, drainage cover soil, and leachate collection and removal system; dewatering and installing a bentonite slurry wall; installing ground water monitoring wells and gas probes; and performing ancillary work associated with the landfill cell.

The County does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of the Board's functions, including one's access to, participation, employment or treatment in its programs or activities. Anyone requiring reasonable accommodation as provided in the Americans with Disabilities Act or Section 286.26, Florida Statutes, should contact Human Resources, ADA Coordinator at: 863-402-6500 (Voice), or via Florida Relay Service 711, or by e-mail: hrmanager@highlandsfl.gov. Requests for CART or interpreter services should be made at least 24 hours in advance to permit coordination of the service.

Board of County Commissioners, Highlands County, FL **http://www.highlandsfl.gov**

-END OF SECTION-

DIVISION 0 - SECTION 00100
INSTRUCTIONS TO BIDDERS
ITB 23-030-KSB

Article 1 - Defined Terms

1.01 Terms used in these Instructions to Bidders have the meanings indicated below and in Section 00700 of this ITB which are applicable to both the singular and plural thereof:

A. Alternative – Amount proposed by Bidder and stated on the Bid Form that will be added to or deducted from the base Bid amount if Engineer decides to accept a corresponding change in either Scope of Work or in products, materials, equipment, systems or installation methods described in Construction Documents.

B. Award – The selection by the County of the lowest responsible and responsive Bidder to perform the Work.

C. Bid – The Bid Form and other documents submitted by a Bidder in response to this ITB.

D. Bidder – The individual or entity who submits a Bid directly to the County.

E. Bid Form – Section 00300 of this ITB, which shall be used to submit a Bid. This section may or may not include an Excel Itemized Bid Form.

F. Bidding Documents – This ITB, all Addenda to this ITB, and the Construction Documents.

G. Board – County's Board of County Commissioners.

H. Construction Documents – The Construction Drawings and Specifications for the "HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER CLASS I CELL 5 LANDFILL EXPANSION, Highlands County Project No. 21078", dated September 2023, consisting of fifty-eight (58) sheets.

I. County Attorney – Highlands County's Attorney.

J. County Engineer – Highlands County's Engineer or Critical Infrastructure Director.

K. County or Owner – Highlands County, a political subdivision of the State of Florida.

L. Engineer – The Engineer of Record.

M. Project Manager – Highlands County's Project Manager

N. Purchasing Division - Highlands County's Purchasing Division, which issues Bidding Documents and administers the bidding procedures.

O. Site – The Site described and depicted in the Construction Documents.

P. Solicitation Package – Consist of all published Bid Documents. To include, but not limited to; Invitation to Bid, Itemized Bid Form, Addenda, and Plans.

Q. Work – The Work described and depicted in the Construction Documents.

Article 2 - Copies of Bidding Documents

2.01 Complete sets of the Solicitation Package in the number and for the deposit sum, if any, stated in the Advertisement or this ITB may be obtained from the Purchasing Division.

2.02 The official Solicitation Package is available for download through the County's website HighlandsFL.Gov through VendorRegistry.com the County's official advertising mechanism. Information obtained from other sites are to be considered UN-official and possibly incomplete.

2.03 Complete a complete Solicitation Package must be used in preparing Bids; neither Owner nor Project Manager assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.04 Owner and Project Manager in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

Article 3 - Qualifications of Bidders

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit detailed written evidence with the Bid Form as follows:

A. **Contractor License Requirements**: The Contractor must have a State of Florida Certified General Contractor's License. A copy of the current license is to be provided. All Contractors performing construction and related work in Highlands County must comply with Highlands County Ordinances, codes, rules and regulations, Florida law, and the requirements of any and all other governmental agencies which have jurisdiction over the work being performed.

B. **Experience:** The contractor shall submit with the bid evidence that the Contractor is experienced and competent to construct a Class I landfill as described herein. Please note that the items required below are the minimum requirements required to be submitted and verified with their bid. Additional requirements are identified in the technical specifications to which the Contractor will be required to meet during execution of the project.

The Contractor shall submit with their bid at least two (2) examples of landfill construction projects of similar design and scope completed by the Contractor within the last ten (10) years.

The Contractor Example Projects shall meet the following minimum requirements:

a. Each of the 2 Contractor Example Projects shall be:
   (1) Either a geomembrane lined Class I landfill bottom liner project, or a geomembrane lined Class III landfill bottom line project (1 example project).
   (2) Either a geomembrane lined Class I landfill bottom liner project, a geomembrane lined Class III landfill bottom liner project, or a geomembrane lined landfill closure project (1 example project).
b. Each of the 2 example projects shall include a minimum of 5 acres of 60 mil high density polyethylene (HDPE) geomembrane liner installation.

3.02 Each Bid is to contain proof of enrollment in E-Verify.

3.03 Provide a printout of the SunBiz.Org registration for your EIN as evidence of Bidder's qualification to do business in the State.

3.04 In addition, the bidder may be requested to demonstrate Bidder's qualifications to perform the Work, within ten (10) days and prior to Notice of Award,

A. listing of all Subcontractors is required when the subcontract value exceeds ten percent (10%) of the total contract amount.

Article 4 - Examination of Bidding Documents, Other Related Data, and Site

4.01 Subsurface and Physical Conditions known to Owner are shown in the Construction Documents. No Site-specific subsurface studies have been done.

4.02 Underground Facilities known to Owner are shown on the Construction Documents. No Site-specific utility locates have been done.

4.03 No Hazardous Environmental Condition has been identified at the Site.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Paragraphs 5.03, 5.04 and 5.05 of Section 00700 Standard General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to Hazardous Environmental Conditions at the Site, if any, and possible changes in the Contract Documents due to Hazardous Environmental Conditions uncovered or revealed at the Site which were not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 5.06 of Section 00700 Standard General Conditions.

4.05 On request, the Purchasing Division will provide Bidder access to Site to conduct such examinations, investigations, explorations, tests, and studies, as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.06 On request, the Purchasing Division will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Solicitation Package, including any Addenda and the other related data identified in the Bidding Documents;

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. Carefully study all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site;

E. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, test, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. Promptly give Engineer and the Purchasing Division written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer and the Purchasing Division is acceptable to Bidder; and

J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer and the Purchasing Division written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer and the Purchasing Division are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

Article 5 - Pre-Bid Meeting

5.01 Pre-Bid Meeting are as specified on the cover page of this solicitation and may be revised via addenda.

Article 6 - Site and Other Areas

6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work is to be obtained and paid for by the Contractor. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents.

Article 7 - Interpretation and Addenda

7.01 All questions about the meaning or intent of the Bidding Documents are to be directed to the Purchasing Division. Interpretations or clarifications considered necessary by the Purchasing Division and Project Manager in response to such questions will be issued by Addenda and will be posted on the website under this solicitation by the Purchasing Division. Requests for Information (RFI) received after the set date may not be answered. Only RFI answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner, Engineer or the Purchasing Division.

7.03 Addenda will be posted to the County's website; www.highlandsfl.gov. It is the sole responsibility of the Bidder to frequently check the County's website for notifications such as Addendums, meeting notifications.

Article 8 - Bid Security

8.01 **Bid Bond**: A Bid Bond in the amount of five percent (5%) of the Bid, must be included on each Bid over one hundred thousand dollars ($100,000.00). The **Original Bid Bond (hard copy**,) as required, are to be physically received by Purchasing prior to the submission deadline provided on the cover page or as revised via Addendum.

8.02 **Public Construction Bond**: If the successful Bid is greater than two hundred thousand dollars ($200,000.00), a "Public Construction Bond" of not less than one hundred percent (100%) of the Awarded Bid amount will be required. All Bonds must be in a form acceptable to Owner and County Attorney. Awarded Bidder must record Public Construction Bond at the Clerk's Recording Department and comply with Section 255.05, Florida Statutes.

Article 9 - Contract Times

9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and, (b) final completion and ready for final payment are set forth in the Bid Form.

Article 10 - Liquidated Damages

10.01 Owner and Contractor recognize that time is of the essence of this Agreement, Section 00500, to be provided to the awarded Bidder, and that Owner will suffer financial loss if the Work is not completed within the times specified In agreeing upon the daily liquidated damages amount stated in this paragraph, Owner and Contractor have considered the original Contract Price, the average construction, engineering, and inspection costs experienced by Owner, and anticipated costs of project-related delays and inconveniences to Owner and the public. Owner and Contractor also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (and not as a penalty) Contractor shall pay Owner **liquidated damages as shown on the Bid Form, Section 00300** for each calendar day that expires after the time specified as Final Completion on the Bid Form, Section 00300 until the Work is completed and ready for final payment. Liquidated damages shall be deducted by Owner from any balance due Contractor or, if the balance due Contractor is less than the amount of liquidated damages, Contractor shall pay to Owner the remaining unpaid liquidated damages within thirty (30) days after Owner's invoice is sent to Contractor.

10.02 Owner does not waive its right to liquidated damages due under this Agreement by allowing Contractor to continue and to finish the Work, or any part of it, after the expiration of the Contract Time.

10.03 In the case of a default of this Agreement and the completion of the Work by Owner, Contractor and Contractor's surety are liable for the liquidated damages under this Agreement, but Owner will not charge liquidated damages for any delay in the final completion of Owner's performance of the Work due to any unreasonable action or delay on the part of Owner.

Article 11 - Substitute or "Or-Equal" Items

11.01 The Contract, if awarded, will be on the basis of materials and equipment described in the Bidding Documents with consideration of possible substitute or "or-equal" items if allowed within the Bidding Documents. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer. **Application for such acceptance will be considered by Engineer during the allotted time frame for Request for Information (RFI).**

Article 12 - Subcontractors, Suppliers and Others

12.01 The apparent Successful Bidder, and any other Bidder so requested, shall within five (5) days after Bid opening, submit to Owner a list of all proposed contractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identifications are required. Such list shall be accompanied by an Experience Statement with pertinent information regarding similar projects and other evidence of qualification for each Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner, Project Manager or the Purchasing Division after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

12.02 If the apparent Successful Bidder declines to make any such substitution, Owner may Award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner, Project Manager or the Purchasing Division makes no written objection prior to giving of the Notice of Award will be deemed acceptable to all indicated parties subject to revocation of such acceptance after the Effective Date of the Contract.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

12.04 The Contractor is responsible to ensure all Subcontractors comply with all insurance requirements.

Article 13 - Bid Form

13.01 Bidder shall use and/or make necessary copies of Section 00300 “Bid Form” of this ITB for their Submittal Document(s). Should the task itemization portion of the “Bid Form” be provided in Excel format it is to be completed and returned in an unlocked Excel document.

13.02 All blanks on the Bid Form shall be completed by printing in black ink or by typewriter and the Bid Form shall be signed by a person with authorization pursuant to Florida law to represent the Bidder. A Bid Price shall be indicated for each unit price item listed therein, if applicable, or the words “No Bid”, “No Change”, or “Not Applicable” entered. All names shall be typed or printed below the signature line with all signatures in blue ink.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership and state of organization and type of partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

13.06 A Bid by an individual shall show the Bidder’s name and official address, telephone number, fax number, and email address.

13.07 A Bid by a joint venture shall be executed by each participant in the joint venture in accordance with the signature requirements stated in the preceding paragraph and in the manner indicated on the Bid Form. The official address of the joint venture must be shown below the signature.

13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.09 All Bid Forms shall have the name, official address, telephone number, fax number, and email address for communications regarding the Bid.

13.10 Attachments to the Bid Form shall include the following:

A. Documentation as required in Article 3 of this Section including a copy of Contractors License.

B. All certificates of insurances from the Contractor required to fulfill the obligations of this Project.

C. Certifications from Section 00160, signed and notarized.

D. Section 200 documents, signed and notarized, if applicable.

Article 14 - Basis of Bid; Evaluation of Bids

14.01 Bidders shall submit a Bid on a Lump Sum and Unit Price basis as noted on the Bid Form for the Work listed in these Bid Documents.

14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances.

Article 15 - Submittal of Bids

15.01 Each prospective Bidder's to submit the requested documents and if required, the original hard copy Bid Bond Section 00410 of this ITB. ***Any blank spaces on the form(s), qualifying notes or exceptions, counter offers, lack of required submittals, or signatures, on County's Form may result in the submission being declared non-responsive by the County. Any form not applicable is to be returned marked "N/A"***

The list of forms below is meant only as a guide. It is the <u>Bidder's responsibility</u> to review and include all requested and required documentation.

Forms		
LOCAL COMPLIANCE FORMS		
Proposal Form, include acknowledgement of all addenda, signed	**YES**	**NO**
Drug-Free Workplace Certification, F.S. 287.087	**YES**	**NO**
Public Entity Crimes Sworn Statement, F.S. 287.133	**YES**	**NO**
Discrimination Certification, F.S. 287.134	**YES**	**NO**
Scrutinized Companies Certification, F.S. 287.135	**YES**	**NO**
Contracting with entities of foreign countries, F.S. 287.138	**YES**	**NO**
E Verify Certification	**YES**	**NO**
Indemnification Statement	**YES**	**NO**
Sub-Contractor List	**YES**	**NO**
Trench Safety Certification	**YES**	**NO**

Bid Security in the form of _____, as required Bid Bond Form Section 00410 Original Hard Copy of Bond sent to Purchasing to arrive prior to the submission deadline.	**YES**	**NO**
REQUESTED DOCUMENTATION		
WWW.Sunbiz.org Print out for Proposer FEI/EIN Number	**YES**	**NO**
Acord Insurance Form (sample copy from proposer)	**YES**	**NO**
Women / Minority Business Enterprise Certification, if applicable	**YES**	**NO**
List two (2) jobs similar in scope and size completed in the last 10 years	**YES**	**NO**
Licenses, Certifications	**YES**	**NO**
One (1) Original Submission Package, PAPER COPY and one (1) exact electronic copy, on thumb drive, of the Submission package in a single unlocked Adobe file. Titled "23-030-KSB Bidder Name", additionally if applicable, the Excel Bid form is to be titled "23-030-KSB Bidder Name." OR Upload one (1) all-inclusive adobe file of the Submission package to the County Website via VendorRegistry.com. Titled "23-030-KSB Bidder Name", additionally if applicable, the Excel Bid form is to be titled "23-030-KSB Bidder Name"	**YES**	**NO**
Sealed Submittal Label (affix to outside of submittal package)	**YES**	**NO**
Statement of No Bid	**YES**	**NO**

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or Invitation to Bid and shall be enclosed in a sealed opaque envelope or package, plainly marked with the Bid #23-030-KSB Highlands County Solid Waste Management Center Class I Cell 5 Landfill Expansion; (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the bid security and other required documents. The enclosed "Sealed Submission Label" it so be affixed to the exterior of the sealed hard copy submission package.

15.03 Responses may be submitted prior to the submission deadline date and time by either:

☐ Electronic submission to the County website using VendorRegistry.com.

OR

☐ Hard Copy submission in a sealed and marked package with the name of the Respondent, solicitation number, and title so as to identify the enclosed response. A hard copy submission shall include one (1) original and one (1) exact electronic copy (thumb drive) of the Submission packet.

Original Bid Bonds (hard copy), as required, are to be received by Purchasing by the deadline provided on the cover page.

Article 16 - Modification and Withdrawal of Bids

16.01 Prior to the date and time for the opening of the Bids, a Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted.

Article 17 - Opening of Bids

17.01 Bids will be opened at the time and place indicated in the advertisement or ITB Section 00010 or as revised via Addenda, and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids by means of a copy of the “Bid Opening Sheet.” The public is invited to attend this meeting.

Article 18 - Bids to Remain Subject to Acceptance

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form and as allowed by Section 119.071, Florida Statutes, but Owner may, in its sole discretion, release any Bid and return the bid security prior to the end of this period.

Article 19 - Award of Contract

19.01 Owner reserves the right to reject any or all Bids, including without limitation, non-conforming, non-responsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder that it finds, after reasonable inquiry and evaluation, to be non-responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an Award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause of disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternatives, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. In the comparison of Bids, alternatives will be applied in the same order of priority as listed in the Bid Form. For comparison purposes alternatives may be accepted until doing so would cause the budget to be exceeded. After determination of the successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to the successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

C. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

D. In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or the entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as required by Article 12 of this Section 00100. The County reserves the right to approve subcontractors, Suppliers or the entities proposed for this project.

E. PROHIBITED SUBMISSION TO THIS SOLICITATION Any party who is in active litigation with Highlands County on the due date for responses to this solicitation or who has received notice from Highlands County that the party is in breach of a contractual obligation under a contract with Highlands County and where such breach has not been resolved to the satisfaction of Highlands County on the due date for responses to this solicitation, shall not submit a response to this solicitation. In the event of a submission by such a party as described hereinabove, the submission shall be considered non-responsible and shall be rejected.

19.04 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.05 If the Contract is to be awarded, Owner will Award the Contract to the Bidder whose Bid is determined to be the most advantageous to Owner, taking into consideration those Bids in compliance with the requirements as set forth in this ITB.

19.06 The acceptance of the Bid will be by written Notice of Intent of Award posted in the County's website HighlandsFL.Gov through VendorRegistry.Com. In the event of failure of the lowest responsible qualified Bidder to perform, as prescribed herein, Owner may Award to the next lowest responsible and responsive qualified Bidder.

Article 20 - Insurance

20.01 The successful Bidder shall provide the required Certificate of Insurance within 15 calendar days from the Notice of Intent to Award or prior to commencement of work whichever is sooner.

Article 21 - Signing of Agreement

21.01 When Owner gives a Notice of Award to the successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents, which are identified in the Agreement attached thereto. Within fifteen (15) days thereafter, successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached Contract Documents to Owner. Within thirty (30) days thereafter, Owner shall deliver one fully signed counterpart to successful Bidder.

Article 22 - Retainage

22.01 Provisions concerning retainage are set forth in the Contract Documents.

Article 23 - Designated Contacts and Request for Information (RFI) Deadline

23.01 All questions regarding this ITB must be submitted in writing:

F. To the Purchasing Designated Contact (identified on the cover page of this solicitation).

G. Prior to the deadline provided on the cover**.**

H. The County will release responses in the form of an Addendum. Addendums will be posted to the County's website: www.highlandsfl.gov via www.VendorRegistry.com.

I. It is the Contractor's responsibility to obtain and review all Addendums prior to bid submittal.

DIVISION 0 - SECTION 00160

DRUG FREE WORKPLACE CERTIFICATION

CERTIFICATION PURSUANT TO SECTION 287.087, FLORIDA STATUTES
PREFERENCE TO DO BUSINESS WITH DRUG FREE WORKPLACE PROGRAMS
THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION
Bidder hereby certifies that at the time of its Bid the Bidder has a drug free workplace program in place. The program meets the requirements of Section 287.087, Florida Statutes.

THIS CERTIFICATION IS MADE PURSUANT TO SECTION 287.087, FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD.

_____
Print Name: _____ Date: ____/____/___

STATE OF FLORIDA
COUNTY OF _____

The foregoing Certification was sworn to before me this ___ day of _____, 20___, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [ ] or has produced _____ as identification [ ].

Signature: _____
Print Name: _____
(AFFIX NOTARY SEAL) Notary Public, State of_____
Commission No. _____
My Commission Expires: _____

PUBLIC ENTITY CRIMES CERTIFICATION

SWORN STATEMENT UNDER SECTION 287.133(3)(a), FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

DESCRIPTION OF CONTRACT: _____

STATE OF FLORIDA }ss
COUNTY OF _____ }

Before me, the undersigned authority, personally appeared _____ who, being by me first duly sworn, made the following statement:

1. The business address of _____(name of bidder or contractor), is _____

2. I understand that a public entity crime as defined in Section 287.133 of the Florida Statutes includes a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity in Florida or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid or contract for goods or services to be provided to any public entity or such an agency or political subdivision and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy or material misrepresentation.

3. I understand that "convicted" or "conviction" is defined by the statute to mean a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilt or nolo contendere.

4. I understand that "affiliate" is defined by the statute to mean (1) a predecessor or successor of a person or a corporation convicted of a public entity crime, or (2) an entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime, or (3) those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate, or (4) a person or corporation who knowingly entered into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months.

5. Neither the bidder or contractor nor any officer, director, executive, partner, shareholder, employee, member or agent who is active in the management of the bidder or contractor nor any affiliate of the bidder or contractor has been convicted of a public entity crime subsequent to July 1, 1989.

(Draw a line through paragraph 5 if paragraph 6 below applies.)

6. There has been a conviction of a public entity crime by the bidder or contractor, or an officer, director, executive, partner, shareholder, employee, member or agent of the bidder or contractor who is active in the management of the bidder or contractor or an affiliate of the bidder or contractor. A determination has been made pursuant to 287.133(3)

by order of the Division of Administrative Hearings that it is not in the public interest for the name of the convicted person or affiliate to appear on the convicted vendor list. The name of the convicted person or affiliate is _____.

A copy of the order of the Division of Administrative Hearings is attached to this statement.

(Draw a line through paragraph 6 if paragraph 5 above applies.)

THIS SWORN STATEMENT IS MADE PURSUANT TO SECTION 287.133(3)A, FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD

Signature: _____

Print Name: _____

Print Title: _____

On _____ day of _____, 20_____.

Sworn and subscribed before me in the State and County first mentioned above on the _____ day of _____, 20_____.

Signature: _____

Print Name: _____

(AFFIX NOTARY SEAL)

Notary Public, State of_____

Commission No. _____

My Commission Expires: _____

DISCRIMINATION CERTIFICATION

CERTIFICATION PURSUANT TO SECTION 287.134, FLORIDA STATUTES
DISCRIMINATION; DENIAL OR REVOCATION OF THE RIGHT TO TRANSACT BUSINESS WITH PUBLIC ENTITIES
THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION
Bidder hereby certifies that at the time of its Bid the Bidder has not been placed on the discriminatory vendor list by the Department of Management Services.

THIS CERTIFICATION IS MADE PURSUANT TO SECTION 287.134, FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD.

_____
Print Name: _____ Date: ____/____/___

STATE OF FLORIDA
COUNTY OF _____

The foregoing Certification was sworn to before me this ___ day of _____, 20_____, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [ ] or has produced _____ as identification [ ].

Signature: _____
Print Name: _____
(AFFIX NOTARY SEAL) Notary Public, State of_____
Commission No. _____
My Commission Expires: _____

SCRUTINIZED COMPANIES CERTIFICATION

CONTRACTING WITH SCRUTINIZED COMPANIES
CERTIFICATION PURSUANT TO SECTION 287.135, FLORIDA STATUTES

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION

Bidder hereby certifies that at the time of its Bid the Bidder is not on the Scrutinized Companies that Boycott Israel list created pursuant to Section 215.4725, Florida Statutes, is not participating in a boycott of Israel, is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List and that it does not have business operations in Cuba or Syria.

THIS CERTIFICATION IS MADE PURSUANT TO SECTION 287.135(5), FLORIDA STATUTES, AND IS, UPON DELIVERY, A PUBLIC RECORD.

_____

Print Name:_____

STATE OF _____
COUNTY OF _____

The foregoing Certification was sworn to before me this ___ day of _____, 20____, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [ ] or has produced _____ as identification [ ].

(AFFIX NOTARY SEAL)

_____
Print Name: _____
Notary Public, State of Florida
Commission No. _____
My Commission Expires: _____

FLORIDA STATUTES, SECTION 287.138
CERTIFICATION

I, _____ , as the _____
Person Title

of _____ do hereby certify that
Entity

_____ : (i) is not owned by the government of a
Entity

Foreign country of concern as defined by Florida Statutes, Section 287.138; (ii) does not have the government of a foreign country of concern, as defined by Florida Statutes, Section 287.138, as a controlling interest owner; (iii) is not organized under the laws of a foreign country of concern, as defined by Florida Statutes, Section 287.138; and (iv) does not have its principal place of business in a foreign country of concern as defined by Florida Statutes, Section 287.138.

Signature: _____

Print Name: _____

Title: _____

State of Florida
County Of _____
The foregoing instrument was acknowledged before me by means of
☐ physical presence or ☐ Online notarization of _____
Signatory Name

he/she is authorized to execute this Oath and who is personally known to me or who produced _____ as identification, and who did/did not take an oath this

_____ Day of _____ 2023.

_____ _____
(Stamp) **NOTARY PUBLIC**, State of Florida

E-VERIFY CERTIFICATION

CERTIFICATION OF PARTICIPATION IN THE UNITED STATES CITIZENSHIP AND IMMIGRATION SERVICE BUREAU'S E-VERIFY PROGRAM

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to the HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS

by _____
[Print individual's name and title]

for _____
[Print name and state of incorporation or other formation of the entity submitting this sworn statement]

whose business address is _____ and

whose Federal Employer Identification Number (FEIN) is _____ (hereinafter referred to as "Bidder")

2. CERTIFICATION

Bidder hereby certifies that at the time of its Bid the Bidder participates in the United States Citizenship and Immigration Services Bureau's E-Verify Program, and does not knowingly employ, hire for employment, or continue to employ an unauthorized alien.

Bidder's E-verify Company ID #: _____

THIS CERTIFICATION IS, UPON DELIVERY, A PUBLIC RECORD.

_____
Print Name: _____ Date: ____/____/___

STATE OF FLORIDA
COUNTY OF _____

The foregoing Certification was sworn to before me this ___ day of _____, 20_____, by _____, as _____, the duly authorized officer of _____, on its behalf, who is either personally known to me [ ] or has produced _____ as identification [ ].

(AFFIX NOTARY SEAL)

Signature: _____
Print Name: _____
Notary Public, State of_____
Commission No. _____
My Commission Expires: _____

STATEMENT OF INDEMNIFICATION

The CONTRACTOR agrees to be liable for any and all damages, losses, and expenses incurred, by the COUNTY and Florida Department of Transportation (FDOT,) in any way related to the services provided herein and this Agreement, caused by the acts and/or omissions of the CONTRACTOR, or any of its employees, agents, sub-contractors, representatives, volunteers or the like. The CONTRACTOR agrees to indemnify, defend and hold the COUNTY and FDOT harmless for any and all such claims, suits, judgments or damages, losses and expenses, including but not limited to, court costs, expert witnesses, consultation services and attorney's fees, arising from any and all acts and/or omissions of the CONTRACTOR, or any of its employees, agents, sub-contractors, representatives, volunteers, or the like through and including any appeals in any way related to the services provided herein and this Agreement. Said indemnification, defense, and hold harmless actions shall not be limited by any required insurance coverage amounts set forth herein and shall survive termination or natural termination of this Agreement.

It is agreed by the undersigned Contractor that they accept the above conditions:

FOR THE CONTRACTOR:

_____

BY_____

_____
Printed Name and Title

STATE OF FLORIDA, COUNTY OF _____

Sworn to and subscribed before me this on this_____day of_____, 20____.

Personally known_____OR Produced identification_____(Type of Identification)

_____ **SEAL** _____
(Signature of Notary Public) **(Commission Expiration Date)**

SUB-CONTRACTOR LIST

Sub-contractor Name	Area of Work	Point of Contact or Project Supervisor	Phone Number and Email	Qualified DBE Yes/No	Amount or Percentage of Total

Include sub-contractors name, area of work (i.e. mechanical, electrical, etc.) and a **valid** phone number and email. Also include the dollar value or percentage that the sub-contractor will be performing. For bidding purposes enter "TBD" (to be determined) for sub-contractor name, if unknown, then complete "Area of Work and Amount or Percentage" sections. Sub-contractor(s) are subject to approval by the County. If sub-contractors qualify as Disadvantaged Business Enterprise (**DBE**) contractors attach a current certificate.

TRENCH SAFETY CERTIFICATION

FLORIDA TRENCH SAFETY ACT CERTIFICATION
AND DISCLOSURE STATEMENT (MANDATORY)

The undersigned acknowledges the requirements of the Florida Trench Safety Act and hereby certifies that the undersigned is an authorized representative of the bidder and in that capacity commits the bidder to the following in the performance of the work in the event that the subject contract is awarded to and executed by said bidder.

I. The bidder acknowledges the Florida Trench Safety Act and the requirements established herein.

2. The bidder further acknowledges that the aforementioned Act established the Federal excavation safety standards set forth at 29 CFR Part 1926.650, Subpart P as the interim State standard until such time as the State of Florida, through its Department of Labor and Employment Security, or any successor agency, adopts, updates or reviews said interim standard. This State of Florida standard may be supplemented by special shoring requirements established by the State of Florida or any of its political subdivisions.

3. The bidder, as Contractor, shall comply with all applicable excavation/trench safety standards.

4. The Contractor shall consider the geotechnical information available from the County, its own sources and all other relevant information in its design of the trench safety system it will employ on the subject project. The Contractor acknowledges that it is solely responsible for the selection of the data on which it relies in designing said safety system, as well as for the system itself.

5. The amount the bidder has set forth in the requirement titled "Florida Trench Safety Act" includes the following excavation/trench safety measures and the linear feet of trench excavated under each safety measure. These units, cost and the unit prices inferred shall be disclosed solely for the purpose of compliance with the procedural requirements of the aforementioned Act. No adjustment to the Contract Time or Price shall be made for any difference in the number of linear feet of trench excavation, except as may otherwise be provided in these Contract Documents.

Trench Safety Measure (Description)	Unit (QTY)	Unit of Measure (LF, SY)	Unit Cost	Extended Cost
A.			$	$ _____
B.			$	$ _____
C.			$	$ _____
D.			$	$ _____
			TOTAL	$

Total above must be identical to cost shown in the requirement titled "Florida Trench Safety Act". (Use additional blank sheets to further itemize if more room is required.)

6. This amount disclosed as the cost of compliance with the applicable trench safety requirement does not constitute the extent of the Contractor's obligation to comply with said standards. Contractor shall expend additional sums, at no additional cost to the County (except as may otherwise be provided), which are necessary to so comply.

7. Acceptance of the bid to which this certification and disclosure applies in no way represents that the County or its representatives has evaluated and thereby determined that the above costs are adequate to comply with the applicable trench safety requirements nor does it in any way relieve the bidder, as Contractor, of its sole responsibility to comply with the applicable trench safety requirements.

_____
(Authorized Signature)

_____
(Typed name of firm, corporation, business or individual)

Sealed Submission Label

Cut along the outer border and affix this label to your sealed submission envelope to identify it as a "Sealed Bid/Proposal"

Deliver to: **Highlands County Purchasing Department**
600 S. Commerce Ave., 2nd Floor
Sebring, FL 33870

Contact Information: **Lori DeLoach, Purchasing Director**
(863) 402-6504

PLEASE PRINT CLEARLY

SEALED BID/PROPOSAL DOCUMENTS
• DO NOT OPEN •

SOLICITATION NO.:	ITB 23-030 - KSB
SOLICITATION TITLE:	**HCSWMC Class I Cell 5 Landfill Expansion (Project# 21078)**
DATE DUE:	Wednesday, April 10, 2024
TIME DUE:	Prior to: 3:30 PM
SUBMITTED BY:	

(Name of Company)

e-mail address | Telephone

DELIVER TO: Highlands County Board of County Commissioners
Attn: Purchasing Department
600 South Commerce Avenue, 2nd Floor
Sebring, Florida 33870

Note: submissions received after the time and date above will not be accepted.

***Notice: The Date Due/Submission Deadline Date/Opening Date as stated on this label and other forms contained herein may have been updated via issuance of Addenda. It is the sole responsibility of the Contractor/Vendor to monitor the County webpage for any updates. Contractor/Vendor may strike through and update Date Due/Submission Deadline Date/Opening Date to match any updates to this date that have been published via Addenda.**

DIVISION 0 - SECTION 00250

GENERAL TERMS AND CONDITIONS FOR CONSTRUCTION PROJECTS

A. All Bidding Documents shall become the property of the County.

B. Compliance with Florida Statutes Section 287.087, on Drug Free Workplace, Section 287.133(2)(a), on Public Entity Crimes, Section 287.134, on Discrimination, and Section 287.135, Prohibiting contracting with scrutinized companies is required.

C. Bids are due and must be received in accordance with the instructions given in Section 00010 and 00100 of this ITB.

D. Owner will not reimburse Bidder(s) for any costs associated with the preparation and submittal of any Bid.

E. Bidders, their agents and associates shall NOT solicit any County official. Bidders, their agents and associates shall NOT contact any County official other than the Purchasing Designated Contact listed on the cover page of this ITB for additional information and clarification.

F. Due care and diligence has been exercised in the preparation of this ITB and all information contained herein is believed to be substantially correct; however, the responsibility for determining the full extent of the service required rests solely with those making response. Neither Owner nor its representatives shall be responsible for any error or omission in the Bids submitted, nor for the failure on the part of the Bidders to determine the full extent of the exposures.

G. All timely responses meeting the specifications set forth in this ITB will be considered. However, Bidders are cautioned to clearly indicate any deviations from these specifications. Any deviations are to be submitted in writing prior to the RFI deadline and approved via addendum to be acceptable. The terms and conditions contained herein are those desired by Owner and preference will be given to those Bids in full or substantially full compliance with them.

H. Each Bidder is responsible for full and complete compliance with all laws, rules and regulations including those of the Federal Government, the State of Florida and the County of Highlands. Failure or inability on the part of the Bidder to have complete knowledge and intent to comply with such laws, rules and regulations shall not relieve the Bidder from its obligation to honor its Bid and to perform completely in accordance with its Bid.

I. County, at its discretion, reserves the right to waive minor informalities or irregularities in any Bids, to reject any and all Bids in whole or in part, with or without cause, and to accept that Bid, if any, which in its judgment will be in its best interest.

J. Award will be made to the Bidder whose Bid is determined to be the most advantageous to Owner, taking into consideration those Bids in compliance with the requirements as set forth in this ITB. The Board reserves the right to reject any and all Bids for any reason or make no Award whatsoever or request clarification of information from the Bidders.

K. Any interpretation, clarification, correction or change to this ITB will be made by written addendum issued by the Purchasing Division. Any oral or other type of communication concerning this ITB shall not be binding.

L. Bids must be signed by an individual of the Bidder's organization legally authorized to commit the Bidder to the performance of the product(s) and/or service(s) contemplated by this ITB.

M. The awarded Contractor shall comply with the County's insurance requirements.

Contractor's Liability Insurance

1. The Contractor shall not commence any work in connection with an agreement until it has obtained all of the following types of insurance and has provided proof of same to the Owner, in the form of a certificate prior to the start of any work, nor shall the Contractor allow any subcontractor to commence work on its subcontract until all similar insurance required of the subcontractor has been so obtained and approved. All insurance policies shall be with insurers qualified and doing business in Florida.

2. The Contractor and/or subcontractor shall maintain the following types of insurance, with the respective minimum limits:

   a. GENERAL LIABILITY – Five Million Dollars ($5,000,000) any single occurrence;

      1) Damage to Rented Premises – Fifty Thousand Dollars ($50,000) any single occurrence;

      2) Medical Expense – Five Thousand Dollars ($5,000) Any one person;

      3) Personal & Advertising Injury – One Million Dollars ($1,000,000)

   b. AUTOMOBILE PUBLIC LIABILITY - $1,000,000 Combined Single Limit

   c. GENERAL AGGREGATE – Five Million Dollars ($5,000,000);

   d. EXCESS/UMBRELLA COVERAGE – Ten Million Dollars ($10,000,000);

   e. PRODUCTS - COMPLETED OPERATIONS LIABILITY AGGREGATE – Five Million Dollars ($5,000,000); and,

   f. POLLUTON LIABILITY – Five Million Dollars ($5,000,000)

   g. WORKER'S COMPENSATION – covering the statutory obligation for all persons engaged in the performance of the work required hereunder and Employers' Liability insurance with limits not less than $1,000,000 per occurrence. Evidence of qualified self-insurance status will suffice for this subsection (self-insurance is prohibited on Federal aid funded projects). In case any class of employees engaged in hazardous work under an agreement at the site of the project is not protected under the Worker's Compensation statute, the Contractor shall provide, and cause each subcontractor to provide, adequate insurance, satisfactory to the COUNTY, for the protection of its employees not otherwise protected.

3. Certificates of Insurance: The Contractor shall provide the COUNTY's Procurement Services Department with a Certificate of Insurance evidencing such coverage for the duration of the awarded agreement. Said certificate shall be dated and show:

   a. The name of the insured Contractor,

   b. The specified job by name and job number,

   c. The name of the insurer,

   d. The number of the policy

e. The effective date

f. The termination date

g. A statement that the insurer will mail notice to the COUNTY at least thirty (30) days prior to any material changes in the provisions or cancellation of the policy

4. County and State of Florida, Department of Transportation as Additional Insured:

   a. Additional insured verbiage: "Highlands County, a Political Subdivision of the State of Florida and its elected officials, its agents, employees, and volunteers" shall be named as an "Additional Insured" on all policies except Worker's Compensation and Professional Liability and include as "Additional Insureds" Engineer (Jones Edmunds & Associates, Inc) and Engineer's Consultants (Madrid Engineering Group, Inc.)

5. Certificate Holder:

   Highlands County Board of County Commissioners, 600 Commerce Ave., Sebring FL 33870.

6. Waiver: Receipt of certificates or other documentation of insurance or policies or copies of policies by the COUNTY, or by any of its representatives, which indicates less coverage than is required, does not constitute a waiver of the Contractor's obligations to fulfill the insurance requirements specified herein.

7. Loss Deductible Clause: The COUNTY shall be exempt from, and in no way liable for, any sums of money which may represent a deductible in any insurance policy. The payment of such deductible shall be the sole responsibility of the Contractor and/or subcontractor providing such insurance.

8. Additional Requirements: All insurance carriers shall have an AM Best Rating of at least A- and a size of VII or larger. The General Liability and Workers' Compensation policies shall have a waiver of subrogation in favor of Highlands County. The liability policies shall be Primary/Non-Contributory.

Property Insurance

1. The Contractor shall purchase and maintain Builders Risk Insurance for all work at the Project site to the full insurable value thereof. This Insurance shall insure against the perils of extended coverage and shall include "all risk" insurance for physical loss or damage including, without duplication of coverage, vandalism, flood, earthquake, sink holes, and malicious mischief. If any damages are not covered under the "all risk" insurance, the Contractor, at its cost shall affect and maintain similar property insurance for materials or other equipment for the Project which are stored off site or in transit for use as part of the Project or to be included in an Application for Payment.

2. Any loss insured under the property insurance policy required by this section is to be made payable to the Owner as Trustee for the insured.

3. The Owner as Trustee shall deposit in a separate account any money received as a result of an insured loss and it shall distribute it in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made, replacement of damaged work shall be covered through change order if necessary.

4. The Owner as Trustee shall have power to adjust and settle any loss with the insurers.

Notice of Occurrence, Accident, Injury or Damage

1. The Contractor shall promptly notify the County Contact Person, in writing, of any accident or occurrence involving injury to persons or damage of property during the course of construction. The report shall be made notwithstanding the fact that no injury or damage may be apparent at the time of the accident or occurrence. The Contractor shall also provide any supporting documentation reasonably requested by the Owner or the County Contact Person.

N. If submitting a Bid for more than one ITB, each Bid must be in a separate envelope and correctly marked. Only one (1) Bid per project shall be accepted from any person, corporation or firm. Modifications will not be accepted or acknowledged.

O. Bond requirements as stated in Section 00100, Article 8 Bonding Security.

P. Each Bid is to contain proof of enrollment in E-Verify.

Q. Board policy prohibits any County employee or members of their family from receiving any gift, benefit, and/or profit resulting from any contract or purchase. Board policy also prohibits acceptance of gifts of any kind with the exception of advertising novelties valued less than ten dollars ($10.00).

R. Construction Projects that are awarded for less than two hundred thousand dollars ($200,000.00) and without a Public Construction Bond require the following provisions:

1. At any time prior to final completion of the Contract, Owner will not authorize or make payment to the Contractor in excess of ninety-five percent (95%) of the amount due on the Contract on the basis of the Work suitably completed.

2. In case of the default by the Contractor, the laborers, materialmen, and Subcontractors, as defined in Section 713.01, Florida Statutes, making claims for unpaid bills, may be paid from the five percent (5%) retainage.

3. The final payment of retainage shall not be made until: (1) the Project has been inspected by the Project Manager or other person designated by the County for the purpose; (2) Project Manager or other designated person has issued a written certificate that the Project has been constructed in accordance with the approved Construction Documents and approved Change Orders; (3) the County has accepted the Project; and (4) the Contractor has supplied the County with signed and dated statements from all laborers, materialmen, and subcontractors as defined in Section 713.01, Florida Statutes, and identified under subparagraph (d) of this paragraph 2, that they have no claims against the Contractor for the Work under the Contract. Said statements shall identify the Project by name and Project number.

(remainder of page intentionally left blank)

4. The Contractor, before beginning Work or within two (2) workdays, thereafter, shall post in a conspicuous place on the Site the following notice.

"Notice is hereby made to all those concerned and affected that

CONTRACTOR'S NAME is performing the

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER CLASS I CELL 5 LANDFILL EXPANSION

Highlands County Project No. 21078

All parties furnishing labor and/or materials to said project must, within twenty (20) days of first providing such labor and/or materials, deliver notice of such in writing, by certified mail, returned receipt requested, to:

HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS
CRITICAL INFRASTRUCTURE DIVISION
ATTN: **Clinton Howerton, P.E., Critical Infrastructure Director**
505 S. COMMERCE AVE., SEBRING, FLORIDA 33870

5. The Contractor shall provide a certified list of all Subcontractors, laborers, and material suppliers to the Owner or Designee within thirty (30) days of receiving the Notice to Proceed with the Work. This list shall be updated thereafter each month with a certified statement that the list and its updates include the names and address of all Subcontractors, laborers, and material suppliers furnishing labor and/or material for the Project.

6. The Contractor shall provide a written statement with each pay request to the Project Manager which indicates how each payment will be distributed. This pay request breakdown shall define the disbursement intended for all the funds requested. When the Contractor receives any payment, it shall pay such moneys received to each Subcontractor and material supplier as set forth in that written statement.

7. The Contractor shall provide a written statement with all but the first payment request from each of the Subcontractors, laborers, and material suppliers indicated in paragraph 5 of this Section R that they have in fact received payment as indicated in paragraph 6 of this Section R. In the event a payment is not made as indicated on a prior written statement provided pursuant to paragraph 6 of this Section R, the Contractor shall furnish an explanation as to the reasons for such deviation and shall request approval from the Project Manager.

S. Late Bids will not be accepted under any circumstances. If Bids are received after the scheduled time of the Bid Opening Meeting, the Bidder will be contacted for disposition. The Purchasing Division, at the Bidder's expense, can return the unopened envelope, or, at the Bidder's request, in writing, can destroy it.

T. Faxed Bids will not be accepted. Any blank spaces on the required Bid Form or the absence of required submittals or signatures may cause the Bid to be declared non-responsive.

U. The County is not responsible for correcting any errors or typos made on the Bid response. Incorrect calculations may cause the Bid to be declared non-responsive. Where applicable, unit pricing will prevail in determining the extended price.

V. Minority Owned and Women owned businesses are encouraged to submit a bid.

W. The Bidder shall comply with the Florida Sales and Use Tax Law as it may apply to this Contract. The quoted amount(s) shall include any and all Florida Sales and Use Tax payment obligations required by Florida Law of the successful Bidder and/or its Subcontractors or material suppliers. The County reserves the right to obtain materials by Direct Purchase method.

X. Public Records: Any material submitted in response to this ITB will become Public Record pursuant to Section 119(1)(b) and (c), Florida Statutes

1.1 Pursuant to Florida Statutes, Section 119.0701:

IF YOU HAVE QUESTIONS REGARDING THE APPLICATION OF FLORIDA STATUTES, CHAPTER 119, TO YOUR DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE COUNTY'S CUSTODIAN OF PUBLIC RECORDS:
COUNTY CLERK: GLORIA RYBINSKI
COUNTY PUBLIC INFORMATION OFFICER
600 SOUTH COMMERCE AVENUE
SEBRING, FLORIDA 33870
TELEPHONE NUMBER: (863) 402-6832
HCBCCRECORDS@HIGHLANDSFL.GOV

1.2 Consultant**/Contractor** agrees to comply with public records laws, specifically to:

1.1.1. Keep and maintain public records required by the County to perform the services set forth herein.

1.1.2. Upon request from the County's custodian of public records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Florida Statutes, Chapter 119, or as otherwise provided by law.

1.1.3. Ensure that public records which are exempt or confidential and exempt from public records disclosure requirements are not disclosed, except as authorized by law, for the duration of the contract term and following completion of the contract if the Consultant**/Contractor** does not transfer the records to the County.

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

Y. All pages included in or attached by reference to this ITB shall be called and constitute the Invitation to Bid.

Z. The Contractor agrees to comply with s.20.055(5), Florida Statutes, and to incorporate in all subcontracts the obligation to comply with s.20.055(5), Florida Statutes as shown below.

(5) It is the duty of every state officer, employee, agency, special district, board, commission, contractor, and subcontractor to cooperate with the inspector general in any investigation, audit, inspection, review, or hearing pursuant to this section. Beginning July 1, 2015, each contract, bid, proposal, and application or solicitation for a contract shall contain a statement that the corporation, partnership, or person understands and will comply with this subsection.

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DIVISION 0 - SECTION 00300

BID FORM

THIS BID IS SUBMITTED TO: Highlands County Board of County Commissioners
Attn: Purchasing Division
600 S Commerce Ave., Sebring, FL 33870

SOLICITATION IDENTIFICATION: **ITB 23-030-KSB**

SOLICITATION NAME: **Highlands County Solid Waste Management Center Class I Cell 5 Landfill Expansion**
Highlands County Project No. 21078

SUBMITTED BY:

_____
Bidder's Name

_____
Bidder's Authorized Representative's Name and Title

_____
Bidder's Address 1

_____
Bidder's Address 2

_____
Contact's Name and Title (Print)

_____
Contact's E-mail Address

_____
Contact's Phone Number

_____
Dun's Number

_____
Employer Identification Number/Federal Employer Identification (as shown on Sunbiz.org)

BIDDER IS: (CHECK ONE)

☐ Individual ☐ Partnership ☐ Corporation
☐ Limited Liability Company ☐ Joint Venture*

*Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above for an individual or the appropriate form of entity.)

A. The Bidder proposes and agrees, if this Bid is accepted, to furnish all labor, materials, and equipment to construct and complete the Work according to and as specified or indicated in the solicitation identified above and the Bidding Documents for the Bid Price and within the time periods stated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

B. Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for thirty (30) days after the day of Bid opening. Bidder will sign and deliver the required number of the other documents required by this ITB within fifteen (15) days after the date of County's Notice of Award.

C. ACKNOWLEDGEMENT OF ADENDA Bidder/Proposer represents that:

- It is the sole responsibility of the bidder/proposer to check the Purchasing web-site for any addenda issued for this solicitation.
- Bidder/Proposer acknowledges they have examined and carefully studied this solicitation and the following Addenda (receipt of all which is hereby acknowledged):

Addenda Number	Date Issued	Addenda Number	Date Issued	Addenda Number	Date Issued	Addenda Number	Date Issued

1. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, performance, and furnishing of the Work;
2. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.
3. Bidder acknowledges that County and Project Manager do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the Site. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site or otherwise which may affect cost progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto. Bidder does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price, and other terms and conditions of the Contract Documents.
4. Bidder is aware of the general nature of the Work to be performed by County and others at the Site that relates to the Work.
5. Bidder has correlated information known to Bidder, information and observations obtained from visits to the Site and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
6. Bidder has given Project Manager written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Bidding Documents and the written resolution thereof by Project Manager is acceptable to Bidder, and the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.
7. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid. Bidder has not solicited or induced any person, firm or corporation to refrain from Bidding; Bidder is not privy to any information or have any

knowledge of any information pertaining to this ITB to which other Bidders do not have access; and Bidder has not sought by collusion or any other means to obtain for itself any advantage over any other Bidder or over County.

D. Pricing

1. This is a Lump Sum and Unit Price Bid. Bidder will complete the Work in accordance with the Contract Documents for the following Lump Sum and Unit Price Bid items. Award will be based on the total Lump Sum Bid Price, sum of Unit Price items, and requirements of Bidder. All work for this ITB will be awarded to one (1) Bidder. Bidder agrees to hold pricing for 120 calendar days from the solicitation deadline.

COSTS:

Insert Itemized Bid Form (in Excel Format) Attachment Here

E. **Term**: Bidder agrees that the Work will be **substantially complete** within **three hundred (300) calendar days** and achieve **final completion** and ready for final payment within **three hundred thirty (330) calendar days** after the date when the Contract Times commence to run. The Contract Times will commence to run on the thirteenth (13^{th}) day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the Effective Date of the Agreement.

F. **Liquidated Damages**: Owner and Contractor recognize that time is of the essence of this Agreement, and that Owner will suffer financial loss if the Work is not completed within the times specified. In agreeing upon the daily liquidated damages amount stated in this paragraph, Owner and Contractor have considered the original Contract Price, the average construction, engineering, and inspection costs experienced by Owner, and anticipated costs of project-related delays and inconveniences to Owner and the public. Owner and Contractor also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (and not as a penalty) Contractor shall pay Owner **One-Thousand Five Hundred Dollars ($1,500.00)** for each calendar day that expires after the time specified in paragraph 3.01 of this Article until the Work is completed and ready for final payment. Liquidated damages shall be deducted by Owner from any balance due Contractor or, if the balance due Contractor is less than the amount of liquidated damages, Contractor shall pay to Owner the remaining unpaid liquidated damages within thirty (30) days after Owner's invoice is sent to Contractor.

Owner does not waive its right to liquidated damages due under this Agreement by allowing Contractor to continue and to finish the Work, or any part of it, after the expiration of the Contract Time including granted time extensions.

In the case of a default of this Agreement and the completion of the Work by Owner, Contractor and Contractor's surety are liable for the liquidated damages under this Agreement, but Owner will not charge liquidated damages for any delay in the final completion of Owner's performance of the Work due to any unreasonable action or delay on the part of Owner.

G. Bidder shall coordinate with the Project Manager in order to comply with all applicable quality control testing in accordance with the Drawings and Specification.

H. **Statement of Acknowledgement: The Contractor agrees to comply with s.20.055(5), Florida Statutes, and to incorporate in all subcontracts the obligation to comply with s.20.055(5), Florida Statutes as shown below.**

> **(5) It is the duty of every state officer, employee, agency, special district, board, commission, contractor, and subcontractor to cooperate with the inspector general in any investigation, audit, inspection, review, or hearing pursuant to this section. Beginning July 1, 2015, each contract, bid, proposal, and application or solicitation for a contract shall contain a statement that the corporation, partnership, or person understands and will comply with this subsection.**

I. Communications concerning this Bid have been addressed only to the contacts listed in Article 23 of Section 00100 of ITB 23-030-KSB.

Submitted on: _____, 20_____.

State Contractor License No. _____.

If Bidder is an Individual:

(SEAL)

Individual's name: _____

Signature: _____

Doing business as: _____

Business address: _____

Phone No.: _____

If Bidder is a Partnership:

(SEAL)

Partnership's name: _____

State in which organized: _____

Type of partnership: _____

Name of general partner: _____

Signature: _____

Business address: _____

Phone No.: _____

If Bidder is a Corporation:

(SEAL)

Corporation's name: _____

State of incorporation: _____

Name of authorized person to sign: _____

Title: _____

Signature: _____

Date of qualification to do business: _____

Attest: _____

Business address: _____

Phone No.: _____

If Bidder is a Limited Liability Company:

Limited Liability Company's name: _____

State in which registered: _____

Type of limited liability company (member managed or manager managed) _____

Name of manager or authorized member to sign: _____

Signature: _____

Business address: _____

Phone No.: _____

If Bidder is a Joint Venture:

(SEAL)

Name 1: _____

Signature 1: _____

Address 1: _____

Name 2: _____

Signature 2: _____

Address 2: _____

Address for receipt of official communications: _____

Phone number for official communications: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above for an individual or the appropriate form of entity.)

G:\COUNTY\PURCHASING DEPT\ITB 19-018\19-018 - ITB - SECTION 00300 Bid Form -061119.docx

DIVISION 0 – SECTION 00410
BID BOND
ITB 23-030-KSB

STATE OF FLORIDA COUNTY OF
HIGHLANDS

KNOW ALL MEN BY THESE PRESENTS, that we _____

(hereinafter called "Principal"), and _____as Surety, (hereinafter called "Surety"), are held and firmly bound unto the Highlands County, a political subdivision of the State of Florida (hereinafter called "Owner"), in the sum of _____Dollars ($_____), lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents:

WHEREAS, the "Principal" contemplates submitting or has submitted to bid to the said "Owner" for Bid No. ITB 23-030-KSB:

Highlands County Solid Waste Management Center Class I Cell 5 Landfill Expansion
Highlands County Project No. 21078

WHEREAS, it was a condition precedent to the submission of said bid that a certified check or bid bond in the amount of not less than five percent (5%) of the amount of bid be submitted with said bid as a guarantee that the Bidder would, if awarded the contract, enter into a written contract with the "Owner" within fifteen (15) consecutive calendar days after having been given notice of award of the contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that if the bid of the "Principal" herein be accepted and said "Principal", within fifteen (15) consecutive calendar days after notice being given of such acceptance, enter into a written contract with the "Owner", then this obligation shall be void; otherwise, the sum herein stated shall be due and payable to the "Owner", and the "Surety" herein agrees to pay said sum immediately upon demand of said "Owner", in good and lawful money of the United States of America; as liquidated damages for failure thereof said "Principal".

IN WITNESS WHEREOF, the said _____, as “Principal” herein, has caused these presents to be signed in its name by its _____and attested by its _____ under its corporate seal, and the said _____ as “Surety” herein, has caused these presents to be signed in its_____and attested by its _____ under its corporate seal, this_____day of_____, A.D. 20__.

ATTEST:

_____

Title:_____

CONTRACTOR, AS PRINCIPAL:

_____

By:_____(Seal)

Title: _____

ATTEST:

_____

Title:_____

AS SURETY:

_____

By:_____(Seal)

Title: _____

DIVISION 0 - SECTION 00600
PUBLIC CONSTRUCTION BOND
ITB 23-030-KSB

Bond No. _____

BY THIS BOND, we, _____, whose principal business address is _____ and whose telephone number is (___) _____, ("**Principal**") and _____, whose principal business address is _____ and whose telephone number is (___) _____, ("**Surety**"), are bound to Highlands County, a political subdivision of the State of Florida, whose principal business address is 600 South Commerce Avenue, Sebring, Florida 33870 and whose telephone number is (863) 402-6500, in the sum of _____ ($_____), for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the contract between Principal and Owner dated _____, for construction of the **Highlands County Solid Waste Management Center Class I Cell 5 Landfill Expansion**, **Highlands County Project No.: 21078**, ("**Contract**"), the Contract being made a part of this Bond by reference, at the times and in the manner prescribed in the Contract; and

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

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

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

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

In the event Principal fails or refuses to satisfactorily complete the construction within the time prescribed in the Contract, Principal shall be declared in default by the Owner and the Surety shall have thirty (30) days from the date of receiving notice of default within which to take any action it deems necessary in order to ensure performance under the Contract. If, at the expiration of thirty (30) days from the date of receiving notice of default, no arrangements have been made by the Principal or Surety satisfactory to the Owner for the completion of the construction required by the Contract, then the Owner shall have the right to have the construction completed in any manner which it deems necessary and/or appropriate in its sole discretion. In such case, the Principal and Surety shall be jointly and severally liable hereunder to indemnify and pay to the Owner, all costs the Owner incurs for completing the construction,

including but not limited to engineering, legal and other costs, together with any damages, either direct or consequential, which the Owner may sustain on account of the Principal defaulting.

Surety stipulates and agrees that no change, extension of time, alteration, addition or deletion to the Contract shall in any way affect its obligation on this Bond, and Surety hereby waives notice of any such changes, extension of time, alteration, addition or deletion to the Contract. It is expressly agreed that this Bond shall be deemed amended automatically and immediately, without formal and separate amendments hereto, so as to bind the Principal and Surety to the full and faithful performance of the Contract.

EXECUTED this _____ day of _____, 202__.

Principal

By: _____

Print: _____

Title: _____

Surety

By: _____

Print: _____

Title: _____

INSTRUCTIONS FOR PUBLIC CONSTRUCTION BOND

1. A good and sufficient Public Construction Bond, in the penal sum of not less than one hundred percent (100%) of the Contract Price, with a Surety Company satisfactory to the County, will be required of Contractor guaranteeing that the contract, including the various guarantee periods thereunder will be faithfully performed; and that Contractor will promptly make payment to all persons supplying Contractor labor, materials, supplies and services used directly or indirectly by Contractor in the prosecution of the work provided for in the Contract.

2. The Surety Company furnishing this Bond shall be authorized to do business in the State of Florida, shall be in compliance with the provisions of the Florida Insurance Code, shall have twice the minimum surplus and capital required by the Florida Insurance Code, and shall hold a currently valid certificate of authority issued by the United States Department of Treasury pursuant to Title 31, Sections 9304-9308, of the United States Code. Surety Company must have a rating of not less than "A-X" by the latest edition of the KEY RATING GUIDE as published by A.M. Best Company, Inc., A.M. Best Road, Oldwick, NJ 08858.

3. The Attorney-in-Fact (Resident Agent) who executes the Public Construction Bond on behalf of the Surety Company must attach a notarized copy of his or her power-of-attorney as evidence of his or her authority to bind the Surety Company on the date of execution of the bonds. All signatures must be original. No copied or facsimile signatures will be accepted. All Contracts, Public Construction Bond, and respective powers-of-attorney will have the same date.

4. In the event the Surety Company becomes unsatisfactory to the County, County may at its discretion, require from Contractor an additional or new bond in the same or lessor penal sum, satisfactory to the County, and to be conditioned as above required. Upon Contractor's failure to furnish such additional or new bond within ten (10) days from the date of written notice to do so, all payments under the Contract will be withheld until such additional bond is furnished.

DIVISION 1

GENERAL REQUIREMENTS

DIVISION 0 - SECTION 00700

GENERAL CONDITIONS

TABLE OF CONTENTS

ARTICLE 1: DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

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

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
5. *Bidder*—An individual or entity that submits a Bid to Owner.
6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
7. *Bidding Requirements*—The Advertisement or Invitation to Bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic

Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 12.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*— Charges, security, interests, or encumbrances upon Contract – related funds, real property, or personal property and claims delivered to Owner by laborers, Subcontractors, and Suppliers who have not been paid by Contractor.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. Intent of Certain Terms or Adjectives:

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 9 or any other provision of the Contract Documents.

C. Day:

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective:

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

   a. does not conform to the Contract Documents; or

   b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

   c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.03 or 14.04).

E. Furnish, Install, Perform, Provide:

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well- known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2: PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner unexecuted copies of the bonds and related powers of attorney that Contractor will be required to furnish. Within 10 days after execution of the Agreement by Owner, Contractor shall deliver to Owner fully executed bonds, accompanied by a certified copy of the signing individual’s authority to bind the surety establishing that it is effective on the date the agent or attorney-in-fact signed the accompanying bond, as provided in Section 0100, Article 8 Bonding Security.

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Section 00250.

2.02 Copies of Documents

A. Owner shall furnish Contractor with 1 printed copy of the fully executed Contract Documents. and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 Before Starting Construction

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 Preconstruction Conference; Designation of Authorized Representatives

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records. Contractor shall be ready, willing, and able to attend this conference within 10 calendar days after the date of award. The date, time, and place of this conference will be set by Engineer.

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

2.05 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 Electronic Transmittals

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings,

information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3: DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

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

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

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

3.02 Reference Standards

A. Standards Specifications, Codes, Laws and Regulations

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

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

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with

any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 10.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 10.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. Resolving Discrepancies:

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

   a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

   b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Requirements of the Contract Documents

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

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to the Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 11.

3.05 Reuse of Documents

A. Contractor and its Subcontractors and Suppliers shall not:

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

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

ARTICLE 4: COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

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

4.02 Starting the Work

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

4.03 Reference Points

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

4.04 Progress Schedule

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 10.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 15.04, or as Owner and Contractor may otherwise agree in writing.

4.05 Delays in Contractor's Progress

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

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

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
2. abnormal weather conditions;
3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 7); and
4. acts of war or terrorism.

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

E. Paragraph 7.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

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

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

4.06 Progress Meetings

A. The Owner will conduct progress meetings at least once per month to discuss the progress of the Work. The Contractor and any Subcontractors the Contractor deems necessary shall attend these meetings. At the Owner's discretion, the frequency of the meetings may be increased if the Owner determines that a higher frequency of meeting is necessary to properly cover the work, if progress of the Work is not satisfactory, or if coordination problems arise.

ARTICLE 5: AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein.

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

5.02 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 6.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

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

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

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

E. Contractor shall at all times control dust and keep the Sites free from accumulation of waste materials or rubbish caused by Contractor's employees or subcontractors, and at the completion of the Work, Contractor shall remove all Contractor's rubbish from and about the Sites and all Contractor's tools and surplus materials and shall leave Contractor's Sites and any other Work area clean. Owner may remove the rubbish and charge the cost to Contractor as the Engineer may determine to be just. In the event that Contractor does not keep the Sites and any other Work area free of rubbish or accumulations of waste materials and control dust, Owner will withhold an additional 5% from any pay request, above and beyond the standard 10% retainage.

5.03 Subsurface and Physical Conditions

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

C. Subsurface Conditions Known to Owner: The subsurface conditions at or contiguous to the Site known to Owner are shown on the Drawings and Specifications that are Exhibit "A" of the Contract Documents. Contractor is not entitled to rely upon any other information and data known to or identified by Owner or Project Manager.

D. Unforeseen Physical Conditions: Contractor shall notify Engineer in writing of any subsurface or latent physical condition at the Site differing materially from those indicated in the Contract Documents. Engineer shall promptly investigate those conditions and advise Owner in writing if additional information shall be required. Owner shall then obtain such information, and if deemed necessary, shall issue written orders to perform necessary revisions.

5.04 Differing Subsurface or Physical Conditions

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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

D. Possible Price and Times Adjustments:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
    b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 12.03; and,
    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
    a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
    b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 Underground Facilities

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. Protection of Underground Facilities.

1. Existing utilities and other facilities such as drainage structures have been indicated on the Drawings and Specifications only to the extent that such information was made available to Owner. There is no guarantee as to the accuracy or completeness of this information, and Owner will not be responsible for such accuracy or completeness.

2. Contractor shall be responsible for protecting all such utilities indicated in the manner determined necessary by the owner of such utilities. Any utilities not indicated on the Drawings and Specifications, which do not require relocation, shall be protected by Contractor. The Work shall be performed at the original Contract Price. All visible surface facilities or underground utilities shown on the Drawings and Specifications, whether or not shown to be relocated, shall be protected or relocated by Contractor at its expense.

3. Abandoned utilities, when encountered, shall be severed and plugged at Contractor's expense.

4. the utility during relocation.

5. Contractor shall be responsible for discovery of existing underground installations, in advance of excavating or trenching, by contacting all local utilities and by prospecting and pot holing. Any damage to facilities not shown shall be solely the responsibility of Contractor.

5.06 Hazardous Environmental Conditions at Site

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

C. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

D. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

E. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

F. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

G. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 10. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

H. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to

Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6: CONTRACTOR'S RESPONSIBILITIES

6.01 Supervision and Superintendence

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

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 Labor; Working Hours

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

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

C. In all cases, local labor shall be given preference when available.

D. Whenever Owner shall notify Contractor that any man on the Work is, in his opinion, incompetent, unfaithful, or disorderly, or who uses threatening or abusive language to any person representing Owner when on the Work, such man shall be immediately discharged from the Work and shall not be re-employed thereon except with the consent of Owner.

6.03 Services, Materials, and Equipment

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

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

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

D. The responsibility for the protection and safekeeping of equipment and materials on or near the Site will be entirely that of Contractor and that no Claim shall be made against Owner by reason of any act of an employee or trespasser. Should an occasion arise necessitating access to the sites occupied by the stored materials and equipment, Contractor shall immediately move same. No

materials or equipment may be placed upon the property of Owner until Owner has approved the location contemplated by Contractor to be used for storage.

6.04 "Or Equals"

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

   a. in the exercise of reasonable judgment Engineer determines that:

      1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

      2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

      3) it has a proven record of performance and availability of responsive service; and

      4) it is not objectionable to Owner.

   b. Contractor certifies that, if approved and incorporated into the Work:

      1) there will be no increase in cost to the Owner or increase in Contract Times; and

      2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and

binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 6.05.

6.05 Substitutes

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

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
2. The requirements for review by Engineer will be as set forth in Paragraph 6.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
   a. shall certify that the proposed substitute item will:
      1) perform adequately the functions and achieve the results called for by the general design,
      2) be similar in substance to that specified, and
      3) be suited to the same use as that specified.
   b. will state:
      1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
      2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
      3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
   c. will identify:
      1) all variations of the proposed substitute item from that specified, and available engineering, sales, maintenance, repair, and replacement services.
   d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's

review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 6.05.D, by timely submittal of a Change Proposal.

6.06 Concerning Subcontractors, Suppliers, and Others

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and

Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. Prior to submitting the first Application for Payment and within 3 workdays after any change, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

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

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

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

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

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

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

6.07 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys,

and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 Permits

A. Unless otherwise provided in the Contract Documents or Section 218.80, Florida Statutes, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 Taxes

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

B. Owner is exempt from payment of sales and compensating use taxes of the State of Florida and of cities and counties thereof on all materials to be incorporated into the Work.

C. Direct Purchase: Contractor shall provide assistance to Owner for Direct Purchases to enable Owner to purchase tangible personal property needed for this Project which Owner intends to purchase in order to realize savings of sales tax on all tangible personal property needed for this Project. Contractor will recommend direct purchases for items where those direct purchases will result in significant tax savings to Owner. Owner will either accept or reject Contractor's recommendations, and purchases will be made according to Owner's decision. Owner retains the absolute right, with or without Contractor's recommendation, to purchase any or all tangible personal property needed for this Project.

D. Contractor will provide detailed scoping and pricing for purchase orders with a minimum value of Five Thousand Dollars ($5,000.00), in harmony with the Subcontractors to Owner for the incorporation in Owner's purchase orders.

E. Owner will issue purchase orders within three (3) workdays from the date of receipt of requisition, directly to the vendors and provide a copy of each purchase order to Contractor.

F. Contractor will be responsible for the materials until they are incorporated into the Project and will purchase and/or have ample Builder's Risk insurance for the direct purchased materials.

G. Contractor will issue a deductive subcontract adjustment to the Subcontractor which will account for the value of the material and the sales tax as it pertains to that Subcontractor's contract. All subcontracts shall include a clause incorporating, by reference, the provisions of this Paragraph 6.09.

H. As the material is delivered to the Site, the Subcontractor will sign off on the delivery receipt/invoice for the material delivered, store and secure the material adequately at the Site, and forward the invoice to Contractor who will review, approve and forward the invoice to Owner's Representative for approval and processing.

I. Owner will draft a check for the approved invoice amount and mail that check directly to the vendor. A list of the check numbers with related dates of issue, names of vendors, amounts paid, and paid invoice numbers will be forwarded to Contractor in order that Contractor can accurately track payment.

J. Contractor and Owner are encouraged to take advantage of all discounts available.

K. Owner will issue to Contractor a deductive Change Order in the amount of the direct purchased materials. The amount equal to the sales tax which would have been paid if those materials had been purchased by Contractor will be credited to Owner through a Contingency line item on the pay application's schedule of values, and the Contract Price specified in Article 4 of the Agreement shall be reduced by an amount equal to the amounts paid directly by Owner for direct purchases made pursuant to this Article, plus an amount equal to the sales tax that would have been paid if those materials had been purchased by Contractor.

6.10 Laws and Regulations

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

B. It shall be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations. Contractor shall bear all costs and losses, and shall indemnify and hold harmless Owner and Owner's officers and employees from and against all liabilities, damages, losses, and costs, including, but not limited to, reasonable attorney's fees arising out of or relating to Work or other action that is contrary to Laws or Regulations.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

6.11 Record Documents

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

6.12 Safety and Protection

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and

maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

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

E. All damage, injury, or loss to any property referred to in Paragraph 6.12.A.2 or 6.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

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

H. Contractor shall pay for all damages to private property, public property, and any public utilities.

6.13 Safety Representative

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

6.14 Hazard Communication Programs

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

6.15 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.16 Shop Drawings, Samples, and Other Submittals

A. Shop Drawing and Sample Submittal Requirements:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. Shop Drawings:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.16.D.

2. Samples:

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.16.D.

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

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

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the

design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 6.16.D.4.

E. Resubmittal Procedures:

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

6.17 Contractor's General Warranty and Guarantee

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

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

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

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

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

E. All materials incorporated in the Work shall comply with the requirements of the Construction Documents. Any Defective Work which develop within 1 year after the date of final acceptance shall be promptly repaired by or replaced to "as new" condition by Contractor without any additional expense to Owner.

6.18 Indemnification

The following "Statement of Indemnification" will be incorporated in the contract entered into in connection with this ITB.

A. County Indemnification:

"The CONTRACTOR agrees to be liable for any and all damages, losses, and expenses incurred, by the COUNTY, in any way related to the services provided herein and this Agreement, caused by the acts and/or omissions of the CONTRACTOR, or any of its employees, agents, sub-contractors, representatives, volunteers or the like. The CONTRACTOR agrees to indemnify, defend and hold the COUNTY harmless for any and all such claims, suits, judgments or damages, losses and expenses, including but not limited to, court costs, expert witnesses, consultation services and attorney's fees, arising from any and all acts and/or omissions of the CONTRACTOR, or any of its employees, agents, sub-contractors, representatives, volunteers, or the like through and including any appeals in any way related to the services provided herein and this Agreement. Said indemnification, defense, and hold harmless actions shall not be limited by any required insurance coverage amounts set forth herein and shall survive termination or natural termination of this Agreement. All pages included in or attached by reference to this ITB shall be called and constitute the Invitation to Bid as stated on the front page of this ITB."

B. In any and all claims against Owner or any of its officers or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly utilized by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor,

Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.18.A shall be limited to $1,000,000 per occurrence.

6.19 Delegation of Professional Design Services

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

F. If Contractor provides professional design services as a design professional, as that term is defined in Section 725.08(4), Florida Statutes, Contractor shall indemnify and hold harmless Owner and Owner's officers and employees, from liabilities, damages, losses, and costs, including, but not limited to reasonable attorneys' fees, to the extent caused by the negligence, recklessness, or intentionally wrongful conduct of Contractor providing professional design services as a design professional and other persons employed or utilized by Contractor in the performance of the professional design services.

6.20 Storage of Materials

A. The responsibility for the protection and safekeeping of equipment and materials on or near the Site will be entirely that of Contractor, and no claim shall be made against Owner by reason of any act of an employee or trespasser. Should an occasion arise necessitating access to the Sites occupied by these stored materials and equipment, Contractor shall immediately move same. No materials or equipment may be placed upon the property of Owner until Owner has approved the location contemplated by Contractor to be used for storage.

6.21 Erosion and Drainage Control

A. Contractor shall implement Best Management Practices (BMP's) to provide for drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site and adjacent property.

B. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris or other substances resulting from this work. Contractor shall clean up and isolate such materials on a continuing basis to prevent risk of washing into such drainage ways.

C. Contractor shall determine if a Stormwater Discharge Permit or a Construction Dewatering Discharge Permit applies to the Work. Contractor shall obtain required permit(s) if necessary for completion of the Work.

6.22 Protection of Trees and Natural Conditions

A. No trees or shrubs shall be damaged or removed beyond delineated limits of disturbance except those flagged by Owner. No areas shall be disturbed beyond the designated limits indicated by Owner. Contractor shall install orange safety fence to delineate limits of disturbance, and Contractor shall be responsible for damage mitigation beyond these limits.

6.23 Dewatering

A. If dewatering is required at the Site, Contractor shall comply with all dewatering requirements of governmental agencies.

6.24 Protection of Public and Private Property

A. Contractor shall protect, shore, brace, support and maintain all underground pipes, conduits, drains, and other underground or above ground structures uncovered or otherwise affected by the construction of the Work performed by Contractor. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, guard posts, and other surface structures affected by construction operations, together with all trees, sod and shrubs in yards and parking lots removed or damaged, shall be restored to their original condition or replaced as determined and approved by Owner, whether within or outside Owner's right-of-way. All replacements shall be made with new materials.

B. Contractor shall be responsible for all damages to streets, roads, highways, shoulders, ditches, embankments, culverts, facilities and utilities, bridges, property corners and monuments and other public or private property, regardless of location or character, which may be caused by construction of the Work or by transporting equipment, materials or men to or from the Work or any part or site thereof, whether by Contractor or Contractor's Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

C. All fire hydrants and water control valves shall be kept free from obstruction and for use at all times.

D. Contractor shall be responsible for any damage to existing structures during the course of the Work.

6.25 Maintenance of Traffic

A. Contractor shall provide traffic control plans as required by the controlling highway, street or road authority. Contractor shall perform the Work so as to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever necessary to cross, use, obstruct or close roads, driveways and walks, whether public or private, Contractor shall, at its own expense, provide and maintain suitable and safe bridges, detours or other temporary expedients, for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction

over the public property involved, to obstruct traffic at the designated point. Obstructions, such as material piles and equipment, shall be provided with appropriate warning signs and lights.

B. After completion, the roadway shall be restored to original condition, and disturbed areas shall be restored to original condition.

6.26 Testing

A. Contractor shall be responsible for all testing required for sampling and testing of materials to prove compliance with the Contract Documents. This shall include, but not be limited to mix design approvals for concrete and asphalt, pipe bedding gradations and Proctor tests and gradations for imported granular fill materials. Specific requirements shall be included in the applicable specification sections.

B. Tests required to monitor control performance of the Work in accordance with the Contract Documents such as concrete cylinder tests and compaction tests shall be ordered and paid for by Contractor. Any retesting required as a result of the first test failure will be at Contractor's expense. Contractor will assist in providing locations and allowing the tests to be conducted without obstructions and in accordance with all Laws and Regulations. Contractor shall correct or modify its operations where indicated necessary by the test results.

6.27 Unfavorable Construction Conditions

A. During unfavorable weather, wet ground or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

6.28 Notices to Owners and Authorities

A. Contractor shall notify owners of adjacent property and utilities when prosecution of Work may affect them.

B. Utilities and other concerned agencies shall be contracted at least 48 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or pole lines.

6.29 Storage of Fuel or Hazardous Materials

A. No fuel or other hazardous materials shall be stored on the Site. Extreme care and compliance with all regulations shall be required when handling all such materials.

ARTICLE 7: OTHER WORK AT THE SITE

7.01 Other Work

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all

cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 Coordination

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
2. an itemization of the specific matters to be covered by such authority and responsibility; and
3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 Legal Relationships

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 8: OWNER'S RESPONSIBILITIES

8.01 Communications to Contractor

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 Replacement of Engineer

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

8.03 Furnish Data

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 Pay When Due

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

8.05 Lands and Easements; Reports, Tests, and Drawings

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 Insurance

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Section 00250.

8.07 Change Orders

A. Owner's responsibilities with respect to Change Orders are set forth in Article 10.

8.08 Inspections, Tests, and Approvals

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.02.B.

8.09 Limitations on Owner's Responsibilities

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 Undisclosed Hazardous Environmental Condition

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

8.11 Evidence of Financial Arrangements

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

8.12 Safety Programs

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 9: ENGINEER'S STATUS DURING CONSTRUCTION

9.01 Owner's Representative

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

9.02 Visits to Site

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any

failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 Project Representative

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 Rejecting Defective Work

A. Engineer has the authority to reject Work in accordance with Article 13.

9.05 Shop Drawings, Change Orders and Payments

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 6.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 6.19.

C. Engineer's authority as to Change Orders is set forth in Article 9.

D. Engineer's authority as to Applications for Payment is set forth in Article 13.

9.06 Determinations for Unit Price Work

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 12.03.

9.07 Decisions on Requirements of Contract Documents and Acceptability of Work

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

9.08 Limitations on Engineer's Authority and Responsibilities

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.08 shall also apply to the Resident Project Representative, if any.

9.09 Compliance with Safety Program

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 10: AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

10.01 Amending and Supplementing Contract Documents

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order if approved, in writing, by Owner.

1. Change Orders:

   a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

   b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 10.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

10.02 Owner-Authorized Changes in the Work

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

10.03 Unauthorized Changes in the Work

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 6.15 or in the case of uncovering Work as provided in Paragraph 13.05.

10.04 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 10.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 11.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 12.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 10.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 12.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 10.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. for costs incurred under Paragraphs 12.01.B.1 and 12.01.B.2, the Contractor's fee shall be 15 percent;

   b. for costs incurred under Paragraph 12.01.B.3, the Contractor's fee shall be five percent;

   c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 10.01.C.2.a and 10.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 12.01.A.1 and 12.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier

higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 12.01.B.4, 12.01.B.5, and 12.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 10.04.C.2.a through 10.04.C.2.e, inclusive.

10.05 Change of Contract Times

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 10.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 11.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

10.06 Change Proposals

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 11.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 11.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other

engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 11.

10.07 Execution of Change Orders

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 10.02, (b) required because of Owner's acceptance of defective Work under Paragraph 13.04 or Owner's correction of defective Work under Paragraph 13.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 10.06, or Article 11.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 10.07, it shall be deemed to be of full force and effect, as if fully executed.

10.08 Notification to Surety

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 11: CLAIMS

11.01 Claims

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by

mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. Mediation:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 16 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 16 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 12: COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

12.01 Cost of the Work

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 12.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 12.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 12.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Section 00250), provided such losses

and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written

consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 12.01.B.1 or specifically covered by Paragraph 12.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 12.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 10.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 12, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

12.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

12.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 13: TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Access to Work

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.02 Tests, Inspections, and Approvals

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and Contractor shall pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 13.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

13.03 Defective Work

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed,

or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 14.

13.04 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 14. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

13.05 Uncovering Work

A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 14.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

13.06 Owner May Stop the Work

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor,

any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.07 Owner May Correct Defective Work

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.07 will be charged against Contractor as set- offs against payments due under Article 14. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.07.

ARTICLE 14: PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

14.01 Progress Payments

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 12.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. Applications for Payments:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale,

invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner. If the payment and performance of the Work is not secured by a payment and performance bond, all applications for payment shall include a written statement that indicates how the payment will be distributed. Contractor shall disburse the payment as provided in that written statement.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

4. *If Requested by Owner:*

   a. Contractor shall deliver a certified list of all Subcontractors, laborers, and material suppliers to Owner within 30 days of receiving the request. This list shall be updated by Contractor thereafter each month with a certified statement by Contractor that the list and its updates include the names and address of all of Subcontractors, laborers, and Suppliers furnishing labor and/or material for the Project.

   b. Contractor shall provide a written statement with each pay request to the Owner which indicates how each payment will be distributed. This pay request breakdown shall define the disbursement of all the funds requested.

   c. When Contractor receives any payment pursuant to this Contract, Contractor shall pay laborers and each Subcontractor and Supplier the amounts stated in Contractor's written statement delivered to Owner for that pay request.

   d. Contractor shall provide a written statement with all but the first payment request from each of the Subcontractors, laborers, and Suppliers identified in Paragraph 14.01.B.4.b., that they have in fact received payment as provided in Paragraph 14.01.B.4.c. In the event a payment will not made as stated on a prior written statement delivered pursuant to Paragraph 14.01B.4.b., Contractor shall furnish an explanation as to the reasons for such deviation and shall request approval from the Engineer.

C. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of

quantities and classifications for Unit Price Work under Paragraph 12.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in the Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 13.07, or has accepted defective Work pursuant to Paragraph 13.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
    a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
    b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
    c. Contractor has failed to provide and maintain required bonds or insurance;
    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
    e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
    f. the Work is defective, requiring correction or replacement;
    g. Owner has been required to correct defective Work in accordance with Paragraph 13.07, or has accepted defective Work pursuant to Paragraph 13.04;
    h. the Contract Price has been reduced by Change Orders;
    i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
    j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
    k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
    l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.01.C.1 and subject to interest as provided in the Agreement.

14.02 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

14.03 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

14.04 Partial Use or Occupancy

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Section 00250 regarding builder's risk or other property insurance.

14.05 Final Inspection

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.06 Final Payment

A. Application for Payment:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 6.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are

   necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 14.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

14.07 Waiver of Claims

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 16.

14.08 Correction Period

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

   1. correct the defective repairs to the Site or such other adjacent areas;
   2. correct such defective Work;
   3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
   4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

14.09 Local Government Prompt Payment Act

A. If the total cost of the construction services purchased by Owner pursuant to this Contract exceeds $200,000, the provisions of this Article are subject to the provisions of the Local Government Prompt Payment Act, Sections 218.70 through 218.79, inclusive, Florida Statutes, except to the extent provided therein and in that event provisions of this Article are modified and amended to the extent required to be consistent with the Local Government Prompt Payment Act.

14.10 Interest

A. All moneys not paid when due as provided in Paragraph 14 shall bear interest at the maximum rate of six (6) percent per annum, simple.

ARTICLE 15: SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

15.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
4. Contractor's repeated disregard of the authority of Owner or Engineer; or

5. Contractor becomes involved as a debtor in a bankruptcy proceeding, or becomes involved in a reorganization, dissolution, or liquidation proceeding, or if a trustee or receiver is appointed over all or a substantial portion of the property of Contractor under federal bankruptcy law or any state insolvency law.

B. If one or more of the events identified in Paragraph 15.02.A occurs, then after giving Contractor (and any surety) ten (10) days written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, give Contractor (and any surety) notice that the Contract is terminated, and enforce the rights available to Owner under any applicable payment and performance bond; or

2. notify Contractor of the deficiency with a requirement that the deficiency be corrected within a specified time, otherwise the Contract will be terminated at the end of such time; or

3. take whatever action is deemed appropriate by Owner.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Section 00250, the provisions of that bond shall govern over any inconsistent provisions of Paragraph 15.02.B.

15.03 Owner May Terminate for Convenience

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

15.04 Contractor May Stop Work or Terminate

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 16: FINAL RESOLUTION OF DISPUTES

16.01 Methods and Procedures

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
2. agree with the other party to submit the dispute to another dispute resolution process; or
3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 17: MISCELLANEOUS

17.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

17.02 Computation of Times

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 Limitation of Damages

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

17.05 No Waiver

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

17.06 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.07 Controlling Law

A. This Contract is to be governed by the law of the state in which the Project is located.

17.08 Headings

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

DIVISION 0 - SECTION 00800
SUPPLEMENTARY CONDITIONS
ITB 23-030-KSB

These Supplementary Conditions amend or supplement the Section 00700, General Conditions.

The address system used in these Supplementary Conditions is the same as the address system used in Section 00700, General Conditions, with the prefix “SC-“added thereto.

SC-4.06 *Progress Meetings*

Add the following new paragraph to Article 4.0 after paragraph 4.05.G:

4.06 Progress Meetings

A. The Owner will conduct progress meetings at least once per month to discuss the progress of the Work. The Contractor and any Subcontractors the Contractor deems necessary shall attend these meetings. At the Owner’s discretion, the frequency of the meetings may be increased if the Owner determines that a higher frequency of meeting is necessary to properly cover the work, if progress of the Work is not satisfactory, or if coordination problems arise.

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DIVISION 0 - SECTION 00836
WAIVER OF RIGHT TO CLAIM AGAINST THE PUBLIC CONSTRUCTION BOND (FINAL PAYMENT)
ITB 23-030-KSB

The undersigned, in consideration of the final payment in the amount of $ _____, hereby waives its right to claim against the Public Construction Bond for labor, services, or materials furnished to _____ _____ on the job of Highlands County, a political subdivision of the State of Florida, for improvements to the following described project: "HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER CLASS I CELL 5 LANDFILL EXPANSION, Highlands County Project No. 21078."

DATED ON _____, 20____.

By:_____

IN WITNESS WHEREOF _____ have (has) hereunto set hand and seal this _____day of _____, 20____.

WITNESS:

_____ (Seal)

Print Name: _____

SWORN AND SUBSCRIBED TO BEFORE ME THIS _____day of _____, 20____.

_____
Notary Public
State of Florida-at-Large

My Commission Expires: _____

WAIVER OF RIGHT TO CLAIM AGAINST THE PAYMENT BOND (PROGRESS PAYMENT)
ITB 23-030-KSB

The undersigned, in consideration of the sum of $_____, hereby waives its right to claim against the Public Construction Bond for labor, services, or materials furnished through (insert date) to (insert the name of your customer) on the job of (Highlands County, a political subdivision of the State of Florida), for improvements to the following described project: "HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER CLASS I CELL 5 LANDFILL EXPANSION, Highlands County Project No. 21078". This waiver does not cover any retention or any labor, services, or materials furnished after the date specified.

DATED ON _____, 20 ____.

By:_____

IN WITNESS WHEREOF _____ have (has) hereunto set hand and seal this _____day of _____, 20____.

WITNESS:

_____ (Seal)

Print Name:_____

SWORN AND SUBSCRIBED TO BEFORE ME THIS _____day of _____, 20____.

_____
Notary Public
State of Florida-at-Large

My Commission Expires: _____

TECHNICAL SPECIFICATIONS

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT FACILITY
CLASS I CELL 5 LANDFILL EXPANSION
TECHNICAL SPECIFICATIONS
CERTIFICATION PAGES

GEORGE A. REINHART III, FLORIDA PROFESSIONAL ENGINEER
LICENSE NO. PE66516
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY
GEORGE A. REINHART, III, PE, ON THE DATE INDICATED HERE.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

JONES EDMUNDS
730 NE WALDO ROAD
GAINESVILLE, FLORIDA 32641
E.O.R.: GEORGE A. REINHART, III, PE, No. PE66516

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR THE FOLLOWING DIVISIONS IN ACCORDANCE WITH RULE 61G15-23.004, FAC: DIVISIONS 0, 1, 2, 9, 11, AND 15.

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT FACILITY
CLASS I CELL 5 LANDFILL EXPANSION
TECHNICAL SPECIFICATIONS
CERTIFICATION PAGES

MICHAEL L. CLARK, FLORIDA PROFESSIONAL ENGINEER
LICENSE NO. PE49909
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY
MICHAEL L. CLARK, PE, ON THE DATE INDICATED HERE.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

JONES EDMUNDS
730 NE WALDO ROAD
GAINESVILLE, FLORIDA 32641
E.O.R.: MICHAEL L. CLARK, PE, No. PE48898

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR THE FOLLOWING DIVISION IN ACCORDANCE WITH RULE 61G15-23.004, FAC: DIVISIONS 13 AND 16.

SECTION 01000
PROJECT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Owner – The term "Owner" when used in the Technical Specifications refers to the entity with whom the Contractor has entered into the Agreement for this project and for whom the Work is to be performed. The term "Owner" also encompasses representatives of the Owner including the Engineer.

1.02 SCOPE OF WORK

A. The Work to be done consists of the furnishing of all labor, materials, and equipment and the performance of all Work included in this Contract. The summary of the Work is presented in Section 01100, Summary of Work.

B. Work Included

1. The Contractor shall furnish all labor, superintendence, materials, plant 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 necessary local building permits. The Contractor shall perform and complete the Work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Owner and in strict accordance with the Contract Documents. The Contractor shall clean up the Work and maintain it during and after construction, until accepted, and shall do all Work and pay all costs incidental thereto. The 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 Project 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 therefor.
3. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Owner, 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 approval of the Owner notwithstanding.

C. Public Utility Installations and Structures

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies, or privately owned by individuals, firms, or corporations used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water, or other public or private property which may be affected by the Work shall be deemed included hereunder.

   a. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition, and extent of all such installations and structures as may be encountered and as may affect the construction operations.
   b. The Contractor shall protect all public utility installations and structures from damage during the Work. Access across any buried public utility installation or structure shall be made to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor shall be repaired by the Contractor, at his expense. No separate payment shall be made for such protection or repairs to public utility installations or structures.
   c. Public utility installations or structures owned or controlled by the Owner 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.
   d. Where public utility installations of structures owned or controlled by the Owner or other governmental body are encountered during the Work and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Owner, 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 Owner, 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.

e. At all times in performance of the Work the Contractor shall employ acceptable 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 cooperate fully with the owners thereof to that end.

f. The Contractor shall give written notice to the Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations at least 48 hours in advance of breaking ground in any area or on any unit of the Work.

g. 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.

1.03 DRAWINGS AND PROJECT MANUAL

A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions and large-scale drawings in preference to small-scale drawings.

B. Supplementary Drawings

1. When, in the opinion of the Owner, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes that may be required, the Owner will prepare drawings known as Supplementary Drawings, with specifications pertaining to such Drawings, and the Contractor will be furnished one complete set of reproducible black-line prints (22 inches by 34 inches) and one reproducible copy of the specifications, or alternatively may be provided electronic files in PDF format, at the Contractor’s option.
2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the Owner or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

C. 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 Owner, and shall notify the Owner 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 his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Owner should such errors or omissions be discovered.
2. All schedules are given for the convenience of the Owner and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for making estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under the Contract.

D. Specifications: The Technical Specifications each consist of three parts: General, Products, and Execution. The General part of a Specification contains General Requirements that govern the Work. The Products and Execution parts modify and supplement the General Requirements by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.

E. 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 in either 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. The interpretation of these Specifications shall be made upon that basis.

1.04 MATERIALS AND EQUIPMENT

A. Manufacturer

1. All transactions with the manufacturers or subcontractors shall be through the Contractor unless the Contractor shall request and at the Owner's option that the manufacturer or subcontractor deal directly with the Owner. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
2. 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 in ample quantities to ensure the most speedy and uninterrupted progress of the Work to complete the Work within the allotted time.
2. The Contractor shall also coordinate deliveries to avoid delay in or impediment of the progress of the work of any related Contractor.

C. Tools and Accessories

1. Unless otherwise stated in the Contract Documents, the Contractor shall furnish each type, kind, or size of equipment one complete set of suitably marked high-grade special tools and appliances that may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted-steel cases, properly labeled, and equipped with good-grade cylinder locks and duplicate keys.
2. Spare parts shall be furnished as specified herein and as recommended by the manufacturer necessary for the operation of the equipment, not including materials required for routine maintenance.
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 help the Contractor, when required, install, adjust, test, and place in operation the equipment in conformity with the Contract Documents.

2. After the equipment is placed in permanent operation by the Contractor, the manufacturer's engineer or superintendent shall make all adjustments and tests required by the Owner to prove that the equipment is in proper and satisfactory operating condition and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

1.05 INSPECTION AND TESTING

A. General

1. 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. Reports shall be submitted and authoritative certification thereof must be furnished to the Owner as a prerequisite for the acceptance of any material or equipment.
2. If, in the making of any test of any material or equipment, the Owner ascertains 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 Owner.
3. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with the recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.
4. The Contractor shall be fully responsible for the proper operation of equipment during testing and instruction periods and shall neither have nor make any claim for damage that may occur to the equipment before the time when the Owner formally takes over the operation thereof.

B. Costs

1. The Contractor shall provide all inspection and testing of materials furnished under this Contract, unless otherwise expressly specified.
2. The Contractor shall bear the cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents, and such costs shall be deemed to be included in the Contract Price.
3. The Owner may test materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests of materials and equipment that are rejected for non-compliance.

C. Certificate of Manufacture

1. The Contractor shall furnish the Owner with authoritative evidence in the form of a 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 or on similar products of the manufacturer.

D. Shop Tests

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner that shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.
2. Manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be submitted to the Owner for approval.
3. The Contractor shall bear the cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment.

E. Start-up Tests

1. As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make start-up tests of equipment.
2. If the start-up tests disclose any equipment furnished under this Contract that does not comply with the requirements of the Contract Documents, the Contractor shall, before demonstration tests, make all changes, adjustments, and replacements required. The furnishing Contractor shall assist in the start-up tests as applicable.

F. Demonstration Tests

1. Before the Contractor's request for a Substantial Completion inspection, all equipment and piping installed under this Contract shall be subjected to demonstration tests as specified or required to prove compliance with the Contract Documents.
2. The Contractor shall furnish labor, fuel, energy, water, and all other materials, equipment, and instruments necessary for all demonstration tests at no additional cost to the Owner. The Contractor shall assist in the demonstration tests as applicable.

1.06 LINES AND GRADES

A. Grade

1. All Work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings or as given by the Owner. The full responsibility for keeping alignment and grade shall rest upon the Contractor.
2. The Contractor will establish benchmarks and coordination points using Surveys, where provided in the Contract Drawings. Where not provided in the Contract Drawings, the benchmarks and coordination points will be established by the Contractor at no additional cost to the Owner. Reference marks for lines and grades as the Work progresses will be located by the Contractor to cause as little inconvenience to the prosecution of the Work as possible. The Contractor shall place excavation and other materials so as to cause no inconvenience in the use of the reference marks provided. He shall remove any obstructions he places contrary to this provision.

B. Surveys

1. At his own expense, the Contractor shall furnish and maintain stakes and other such materials.
2. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Owner’s attention to any inaccuracies.
3. At his own expense, the Contractor shall establish all working or construction lines and grades as required from the reference marks set by the Contractor and shall be solely responsible for the accuracy of these lines and grades. He shall, however, be subject to check and review by the Owner.

C. Safeguarding Marks

1. The Contractor shall safeguard all points, stakes, grade marks, monuments, and benchmarks made or established on the Work; bear the cost of re-establishing them if disturbed; and bear the entire expense of rectifying Work improperly installed due to not maintaining or protecting or removing without authorization such established points, stakes, and marks.
2. The Contractor shall safeguard all existing and known property corners, monuments, and marks adjacent to but not related to the Work and shall bear the cost of re-establishing them if they are disturbed or destroyed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01100
SUMMARY OF WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

Unless otherwise expressly provided in the Contract Documents, the Work must be performed in accordance with best modern practice, with materials and workmanship of the highest quality to the satisfaction of the Engineer.

A. The Project title is Highlands County Solid Waste Management Facility Class I Cell 5 Landfill Expansion (County Project No. 21078, ITB 23-030-KSB).

B. The principal Work of this Project is the following:

1. To install an approximately 17-acre double-liner system for the Class I Cell 5 Expansion project including ancillary work associated with the cell construction. The Contractor shall be responsible for providing all materials, equipment, and labor for performing all work necessary and as required by the Contract Documents. The principal features of the project include performing earthwork; installing a geosynthetic bottom-liner system, drainage cover soil, and leachate collection and removal system; dewatering and installing a bentonite slurry wall; installing groundwater monitoring wells and gas probes; and performing ancillary work associated with the landfill cell.

C. The Specification divisions and Drawings are an integrated part of the Contract Documents and, as such, will not stand alone if used independently as individual sections, divisions, or drawing sheets. The Drawings and Specifications establish minimum standards of quality for this project. They do not purport to cover all details entering into the design and construction of materials and equipment.

D. The Project is in Highlands County, Florida, at the Highlands County Solid Waste Management Facility. The Contractor shall be aware of the nature of the activities at a landfill that may restrict access to the portions of the site due to general landfill operations and may require certain health and safety measures during construction. The Contractor shall coordinate with the Engineer to determine when certain areas of the site may be unavailable for work.

E. The Contractor shall not interfere with landfill operations. If asphalt paving requires closing any paved on-site roads, the Contractor shall set up a detour and coordinate scheduling with the landfill Operations Manager. Signs and traffic control personnel shall be provided by the Contractor.

1.02 REFERENCE STANDARDS

Reference standards and recommended practices referred to herein shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Association of State Highway and Transportation Officials (AASHTO) Formerly (AASHO)
B. American Concrete Institute (ACI)
C. American Institute of Steel Construction (AISC)
D. American Iron and Steel Institute (AISI)
E. American National Standards Institute (ANSI)
F. American Standards Association (ASA)
G. American Society of Mechanical Engineers (ASME)
H. American Society for Testing and Materials (ASTM)
I. American Water Works Association (AWWA)
J. American Welding Society (AWS)
K. Anti-Friction Bearing Manufacturer's Association (AFBMA)
L. Building Officials and Code Administrators International, Inc. (BOCA)
M. Construction Specifications Institute (CSI)
N. Federal Specification (FS)
O. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, Latest English Edition (Standard Specifications)
P. FDOT Roadway and Traffic Design Standards Latest English Edition (FDOT Index)
Q. Geosynthetics Institute (GSI)
R. National Bureau of Standards (NBS)
S. National Electrical Manufacturer's Association (NEMA)
T. National Fire Protection Association (NFPA)
U. Portland Cement Association (PCA)
V. Occupational Safety and Health Act (Public Law 91-596), U.S. Department of Labor (OSHA)
W. Steel Structures Painting Council (SSPC)
X. Southern Standard Building Code (SSBC)
Y. Underwriters' Laboratories, Inc. (UL)
Z. United States of America Standards Institute (USASI)
AA. Regulations of Florida Industrial Commission Regarding Safety
BB. All local, state, county, or municipal building codes requirements of the Owner's Insurance

1.03 GENERAL REQUIREMENTS

A. Unless otherwise specified on the Construction Drawings or Specifications, all work and the quality of materials shall conform to the referenced sections of the Florida Department of Transportation (FDOT) *Standard Specifications for Road and Bridge Construction, Supplementary Specifications*, and *Roadway and Traffic Design Standards*. The Contractor shall retain on the job site copies of these standard FDOT documents. The basis of payment shall conform to Section 01200, Measurement and Payment, of the General Requirements.

1.04 WORKING HOURS

A. Normal landfill hours are 7:30 am to 5:00 pm, Monday through Friday, and 7:30 am to 12:00 pm on Saturdays.

B. Allowable work times shall be Monday through Friday from 7:00 am to 5:30 pm, and Saturdays from 7:00 am to 12:00 pm. Work under this contract shall not be prosecuted on Sundays or on County, State, and/or National holidays, including but not limited to New Year's Day, Fourth of July, Thanksgiving Day, and Christmas Day, except in time of emergency, and then only under written permission from the Engineer who shall be the sole judge as to the urgency of the situation.

1. Construction personnel may access the site through the front gate 30 minutes before allowable work times and must exit the site through the front gate within 30 minutes of the end of the allowable work times.
2. The Contractor's Project Manager, Superintendent, Engineer, and up to three assistant personnel working under their direct supervision will be granted access to the site outside these hours at the Engineer's discretion to inspect/maintain erosion control measures, dewatering pumps, and other essential equipment; perform essential maintenance activities; fuel equipment; and stage construction materials when necessary to limit impacts to site operations. Clarifications to permitted activities, access times, and access procedures should be requested for approval by the Contractor during bidding if specific details are essential to the Contractor's schedule or bid price.
3. If the Contractor wishes to work outside the allowable work times, Sundays, or holidays, they shall reimburse the Owner for additional Field Representative and County staff costs in accordance with Article 1.05 of this Section. Requests for work outside these hours shall be submitted to the Engineer in writing 7 days in advance of the desired work period and granting of extended hours are at the Engineer's discretion.

1.05 REIMBURSEMENT FEES

A. The following rates shall be applied as the Owner's reimbursement of the Engineer's fee to be paid by the Contractor for all Contractor back charges by the Owner.

1.	Senior Field Representative (Construction):	$109
2.	Senior Construction Administrator:	$166
3.	Senior Engineer (Project Manager):	$239
4.	Senior Administrative Assistant:	$99

1.06 OWNER OCCUPANCY AND LANDFILL OPERATIONS

A. The Contractor shall cooperate with the Owner and Engineer during construction operations to minimize conflicts with Owner work and facilitate Owner usage. The Contractor shall perform the Work so as to not interfere with the Owner's operations, maintenance, environmental monitoring, and other Owner activities at the site.

B. Contractor Staging Area: The Contractor staging area shall be as indicated in the Bid Documents. The Contractor shall record pre-construction photographs of this area and shall be required to restore this area to its pre-construction condition. Ponded water shall not be allowed in this area.

1.07 SITE CONDITIONS

A. The Contractor shall field verify the location of existing features before beginning construction.

B. The Contractor shall enforce safety procedures to minimize hazards to workers, the public, and the environment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01200
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section covers methods of measurement and payment for items of work under this Contract.

B. The total Contract Price shall cover all work required by the Contract Documents. All cost in connection with the proper and successful completion of the work including furnishing all materials, equipment, and tools and performing all necessary labor and supervision to fully complete the work, shall be included in the unit price and lump-sum Bid prices. All work not specifically set forth as a pay item in the Bid Form or Bid Schedule shall be considered a subsidiary/ ancillary obligation of the Contractor and all costs in connection with these subsidiary/ancillary obligations shall be included in the Bid(s) to provide a complete and functional Project.

1.02 EXCAVATION, TRENCHING, AND CLEARING

A. Except where otherwise specified, the unit price or lump-sum price bid for each item of work which involves excavation, trenching, clearing, grubbing, or disposal of cleared and grubbed materials shall include all costs for such work. No direct payment shall be made for clearing, grubbing, disposal of cleared or grubbed materials, excavation, trenching, disposal of surplus excavated material, handling water (and groundwater), and purchasing and hauling of required fill material. All excavation and trenching shall be unclassified as to materials which may be encountered; in addition, trenches shall be unclassified as to depth, unless otherwise stated.

1.03 LUMP SUM

A. For lump-sum items, payments shall be made to the Contractor in accordance with an accepted Progress Schedule of Values on the basis of actual work completed and accepted by the Owner at the final completion of the Project.

1.04 UNIT PRICE

A. For unit price items, payment shall be made based on the actual amount of work accepted by the Engineer and for the actual amount of materials in place at the final completion of the Project, as confirmed by the final measurements.

B. After the work is completed and before final payment is made, the Engineer will make final measurements, with all required assistance from the Contractor, to determine the quantities of various items of work accepted as the basis for the final unit price payment.

1.05 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

A. When alterations in the quantities of unit price work not requiring a Change Order(s), as herein provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract unit price multiplied by the actual quantities of work constructed and accepted by the Engineer at the completion of the project.

B. The actual percentage of each lump-sum bid item completed by the Contractor and accepted by the Engineer at the final completion of the Project will be paid to the Contractor.

1.06 DELETED ITEMS

A. The Engineer may at any time order deletions or revisions in the work. This action shall in no way invalidate the Contract and no financial allowance or compensating payment for anticipated profit, overhead, etc., will be made for items so eliminated in making final payment to the Contractor.

1.07 PARTIAL PAYMENTS

A. Partial payments shall be made monthly as the work progresses. Partial payment shall be made subject to the provisions of the Part B, Conditions of the Contract.

1.08 PAYMENT FOR STORED MATERIAL DELIVERED TO THE PROJECT

A. When requested by the Contractor and at the discretion of the Owner and Engineer, payment may be made for all or part of the value of acceptable materials and equipment to be incorporated into bid items, which have not been used, and which have been delivered to the construction site or placed in storage places acceptable to the Engineer. The Contractor shall provide receipts for all stored material items requested for reimbursement which clearly identify the stored material item, where it is to be constructed, the unit cost of the item, as well as the total cost of the delivered item(s), the quantity of the item, the brand name of the item, and the supplier. Note that there are additional documentation requirements and storage requirements within the Contract Documents that must also be met before the Contractor can be reimbursed for these stored materials.

B. No payment shall be made for fuels, supplies, installation or connection hardware, lumber, false work, or other similar materials or on temporary structures or other work (items) of any kind which are not a permanent part of the Contract. Items having a value of less than $2,500 shall not be compensated for as a stored material item.

1.09 FINAL PAYMENT

A. If requested by the Engineer, the Contractor shall field verify all quantities in dispute by using visual observation, taped measurements, or other methods designated by the Engineer. The field verification shall be made in the presence of the Engineer and agreed to by both the Engineer and the Contractor. The Engineer will prepare a final adjusting Change Order that will adjust the final quantities of the project Bid Schedule to reflect the actual work accepted by the Engineer and for which the Contractor will be compensated.

1.10 SCHEDULE OF VALUES

A. A schedule of values for the lump-sum bid items and some of the unit-price bid items as required by the Engineer shall be submitted and accepted before the Notice to Proceed. The schedule of values shall be based on the prices bid in the Bid Schedule(s). Prices bid in the Bid Schedule(s) cannot be changed in the schedule of values; they can only be broken down into more detail so that the Engineer can more accurately review and approve the Contractor's pay application for the completed work.

1.11 MISCELLANEOUS CONSTRUCTION ITEMS

A. The Contractor shall take all precautions necessary to protect existing utilities, roads, and miscellaneous items from damage during construction.

B. The Contractor shall repair, relocate, or replace existing utilities, roadways, and miscellaneous items to pre-construction conditions. The repair of asphalt roads includes but is not limited to supplying, hauling, and placing stabilized subgrade, asphalt, limerock, traffic signs, and roadway markings.

C. All repairs, relocations, and replacements necessary are considered incidental to the work and will be at the Contractor's cost, with no cost to the Owner.

D. The lump-sum bid items for all pipe items shall constitute full compensation for furnishing, laying, jointing, and testing of pipe; dewatering; excavation and backfill; and cleanup.

PART 2 PAY ITEM DESCRIPTIONS

2.01 BID

The descriptions provided in the following Paragraphs are to be used by the Bidder in preparing the Bid Schedule(s). They generally indicate how the major workscope items and their respective costs are to be separated into the line items listed in the Bid Schedule(s). These descriptions are not fully representative nor all-inclusive of the work required to complete the project in accordance with the Contract Documents. It is the Bidder's responsibility to include all required costs within the most appropriate line item(s).

GENERAL

Item 1. Mobilization and Demobilization

a. This item includes all costs for construction preparatory operations including but not limited to moving personnel and equipment to and from the site, field offices, sanitary facilities, project administration and management, insurance, bonds, Owner and Engineer indemnification, temporary utilities, permits related to construction, and all other similar activities and facilities necessary for executing this project.
b. This item also includes all costs for establishing, maintaining, and monitoring a complete and comprehensive site health and safety program during the execution of the Contract that complies with all local, state, and federal safety guidelines and laws.
c. This item shall not exceed 5% of the total Contract Amount.
d. This item is lump sum.
e. The Contractor will be paid 40% of this item on completing mobilization and 10% on demobilization; the remainder will be paid on a prorated basis equally over the remaining scheduled construction duration.

Item 2. Environmental Protection

a. This item includes but is not limited to:
    i. All costs for providing and implementing a comprehensive environmental protection program for the project site and areas affected by the construction whether or not it is specifically delineated in the Drawings and stated in the Specifications.
    ii. Providing all labor, equipment, and materials necessary to prevent environmental damage to the soil, water, and air in conformance with all local, state, and federal laws.

iii. Examples include controlling stormwater, erodible soils, noise, dust, pollutants, trash, waste, pumping discharge, and any other substance or activity that may adversely impact the environment.
iv. Performing and obtaining required permits identified by the Contractor, monitoring, maintaining, and restoring the site.

b. This item is lump sum.

c. The Contractor will be paid 30% of this item upon Environmental Protection and Dewatering Plan(s) approval, establishing environmental protection as determined by the Engineer, and submitting the Florida Department of Environmental Protection (FDEP) National Pollutant Discharge Elimination System (NPDES) Construction General Permit Notice of Intent, and the remainder will be paid on a prorated basis equally over the remaining construction duration.

Item 3. Construction Surveying and Record Drawings

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to perform construction surveying and provide Record Surveys and Record Drawings.
   ii. Establishing vertical control and horizontal control, staking out and re-staking construction, and performing record surveying throughout the construction duration.
   iii. Updating the electronic copy of the Record Drawings, identifying items that were revised during the project, and providing electronic (.pdf and .dwg) and paper copies.
   iv. Providing all required surveys signed and sealed by a Florida-licensed professional engineer or professional surveyor and mapper, in electronic (.pdf and .dwg) and paper formats.
   v. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.

c. A maximum of 60% of this item will be paid on a prorated basis equally over the construction duration. Once the Record Drawings and Record Surveys have been determined to be complete by the Engineer in accordance with the requirements of the Specifications, the entire lump sum will be paid to the Contractor.

Item 4. Clearing, Grubbing, and Stripping

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to clear, grub, and strip the limits of clearing, grubbing, and stripping.
   ii. Clearing vegetation, grubbing soil, stripping topsoil, stripping mulch, and loading, hauling, and unloading material at a location designated by the Engineer.

iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.

c. Partial payments will be paid based on the percentage of clearing, grubbing, and stripping completed and accepted as determined by the Engineer.

Item 5. Site Demolition

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to demolish existing site infrastructure and roadways within the project limits.
   ii. Demolishing, excavating, loading, hauling, stockpiling, and disposing.
   iii. Performing all related work as shown on the Drawings, stated in the Specifications, and as can be reasonably determined based on the scope and nature of the proposed construction work.

b. This item is lump sum.

c. Partial payments will be paid based on the percentage of demolition completed and accepted as determined by the Engineer:
   i. Earthwork required for site demolition shall be considered incidental to the work and payment for this earthwork shall not be made under any other pay item.

Item 6. Stormwater Management System

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to construct the stormwater management system.
   ii. Furnishing and installing drainage structures, drainage pipe, mitered end sections, concrete ditch pavement, and riprap with bedding stone and filter fabric.
   iii. Excavating, installing, and compacting backfill for drainage improvements; and furnishing and installing all appurtenances, fittings, and fasteners to complete the work.
   iv. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.

c. Partial payments will be paid based on materials stored and the percentage of work completed and accepted as determined by the Engineer.

Item 7. Seeding and Sodding

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services required to furnish and install sod and to mulch and seed.

ii. Preparing topsoil (excluding the drainage soil stockpiles) and fertilizing, watering, and mowing until established.
iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.
c. Partial payments will be paid based on the percentage of work completed and accepted as determined by the Engineer.

Item 8. Dewatering

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to permit, design, construct, implement, maintain, and operate a dewatering system and surface-water management system.
   ii. Developing dewatering and effluent disposal plans and surface-water management plans, constructing the systems, operating and maintaining the systems, and preventing surface-water discharge from other locations onto the project site.
   iii. Obtaining permits, including applicable permit fees, from all regulatory agencies with jurisdiction to operate and maintain the dewatering system and discharge dewatering effluent as required.
   iv. Field monitoring and testing of the dewatering discharge/effluent related to permit and regulatory requirements as needed.
   v. Evaluating the depth to the cemented silt layer into which the environmental cutoff wall will be keyed.
   vi. All piping, fittings, pumps, connections, and associated infrastructure required to pump the dewatering effluent to the leachate storage tank for disposal by the Owner.
   vii. Producing required documentation and performing all related work as shown on the Drawings and as stated in the Specifications.
b. This item does not include:
   i. The cost for off-site disposal of the dewatering effluent requiring off-site disposal from the point that the Contractor delivers the effluent to the leachate storage tanks. This disposal cost shall be borne by the Owner.
   ii. The cost for installing the environmental cutoff wall.
c. This item is lump sum.
d. The Contractor will be paid 60% of this item upon installing and starting up an approved dewatering system, surface-water management system, and dewatering effluent requiring an off-site disposal system and 10% upon removing dewatering equipment including abandoning associated components and removing the temporary portions of the surface-water management system as determined by the Engineer. The remainder will be paid on a prorated basis equally over the duration of construction.

Item 9. Bentonite Slurry Wall

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services associated with installing the environmental cutoff wall and reinforcing the bridging layer above the wall.
    ii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of work completed and accepted as determined by the Engineer.

Item 10. Groundwater Monitoring Wells and Gas Probes

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services required to furnish and install the groundwater monitoring wells and gas probes.
    ii. Supplying, installing, constructing, and developing the monitoring wells, drilling, surveying, permitting, and providing concrete pads, bollards, and signage.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. The Contractor will be paid 100% of this item upon installing, developing, and completing the groundwater monitoring wells and gas probes as determined by the Engineer.

Item 11. Earthwork – Excavate to Backfill and to Stockpile

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services associated with excavating the project subgrade, backfilling to construct the project subgrade, and stockpiling the remaining material where directed by the Owner, including preparing the subgrade for installing the geosynthetic clay liner (GCL), all aspects of the bottom-liner systems and stormwater systems, and all earthwork not included under other pay items as presented in the Contract Documents or as directed by the Engineer.
    ii. Excavating, loading, hauling, unloading, and stockpiling, compacting, grading, quality-control (QC) testing, reworking and retesting, maintaining, and protecting the completed earthwork; correcting wind and stormwater impacts; and assisting with manufacturer's quality assurance (MQA) and Contractor's quality assurance (CQA) testing and retesting.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of project work completed, tested, and approved as determined by the Engineer.

Item 12. Earthwork – Supply and Install Drainage Soil

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services associated with supplying and installing drainage soil for the drainage soil layer from the Contractor's source.
    ii. Excavating from the Contractor's source, loading, hauling, unloading, placing, installing, compacting, grading, QC testing, reworking and retesting, maintaining, and protecting the completed earthwork; correcting wind and stormwater impacts; and assisting with MQA and CQA testing and retesting.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of the drainage soil layer completed, tested, and approved as determined by the Engineer.

Item 13. Geosynthetic Clay Liner

a. This item includes but is not limited to:
    i. All labor, equipment, incidental materials, and services necessary to furnish and install the GCL.
    ii. Procuring, testing, transporting, unloading, storing, handling, and installing the GCL.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of the area of the GCL completed, tested, and approved for overlying geomembrane placement as determined by the Engineer.
d. The quantity of primary geomembrane required for testing, overlapping, tying-in, anchoring, and waste shall be incidental to this work.

Item 14. Secondary Geomembrane

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to furnish and install the secondary geomembrane.
    ii. Procuring, testing, transporting, unloading, storing, handling, uncovering existing geomembrane at tie-in locations, and installing.

iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of the secondary geomembrane completed, tested, and approved for overlying the secondary geocomposite placement as determined by the Engineer.
d. The quantity of secondary geomembrane required for testing, overlapping, tying-in, anchoring, and waste shall be incidental to this work.

Item 15. Secondary Geocomposite

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to furnish and install the secondary geocomposite.
   ii. Procuring, testing, transporting, unloading, storing, handling, and installing the secondary geocomposite.
   iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of the secondary geocomposite completed, tested, and approved for overlying the primary geomembrane placement as determined by the Engineer.
d. The quantity of secondary geocomposite required for testing, overlapping, tying-in, anchoring, and waste shall be incidental to this work.

Item 16. Primary Geomembrane

a. This item includes but is not limited to:
   i. All labor, equipment, materials, and services necessary to furnish and install the primary geomembrane.
   ii. Procuring, testing, transporting, unloading, storing, handling, uncovering existing geomembrane at tie-in locations, and installing the primary geomembrane.
   iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of the primary geomembrane completed, tested, and approved for overlying the primary geocomposite placement as determined by the Engineer.
d. The quantity of primary geomembrane required for testing, overlapping, tying-in, anchoring, and waste shall be incidental to this work.

Item 17. Primary Geocomposite

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to furnish and install the primary geocomposite.
    ii. Procuring, testing, transporting, unloading, storing, handling, and installing the primary geocomposite.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of the primary geocomposite completed, tested, and approved for overlying the drainage soil layer placement as determined by the Engineer.
d. The quantity of primary geocomposite required for testing, overlapping, tying-in, anchoring, and waste shall be incidental to this work.

Item 18. Rain Tarp

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to furnish and install the rain tarp.
    ii. Procuring, testing, transporting, unloading, storing, handling, installing, and ballasting the rain tarp.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the percentage of area of the rain tarp completed, tested, and approved as determined by the Engineer.
d. The quantity of rain tarp required for testing, overlapping, tying-in, anchoring, and waste shall be incidental to this work.

Item 19. Anchor Trenches

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to construct the landfill anchor trenches and supply and install the edge-of-liner markers.
    ii. Excavating, loading, hauling, placing, compacting, grading, QC testing, reworking and retesting, maintaining, and protecting the completed earthwork; correcting wind and stormwater impacts; and assisting with MQA and CQA testing and retesting.
    iii. Procuring, testing, transporting, unloading, storing, handling, and installing the anchor trench materials.
    iv. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.
c. Partial payments will be paid based on the percentage of the anchor trench completed, tested, and approved as determined by the Engineer.
d. The quantity of materials required for testing, overlapping, and waste shall be incidental to this work.

Item 20. Leachate-Collection and Leak-Detection Trenches

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to construct the leachate collection and leak-detection trenches.
    ii. Procuring, testing, transporting, installing, and inspecting the separation geotextile, cushioning geotextile, trench gravel, perforated high-density polyethylene (HDPE) pipe, solid-walled HDPE pipe, clean-outs, and boots.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be paid based on the linear feet of trench completed, tested, and approved as determined by the Engineer.

Item 21. Leachate Pump Stations

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services associated with the leachate pump stations, sumps, and side-slope riser systems.
    ii. Supplying, loading, transporting, unloading, fabricating, excavating, backfilling, and testing the leachate pump stations and side-slope riser systems, concrete slabs and subgrade, asphalt paving with stabilized subgrade and limerock base, bollards, piping, fittings, control panels, riser pipes, gravel sumps, and appurtenances.
    iii. Furnishing and installing the leachate-removal pumping systems, controls, and associated work, pumps, discharge line, pull cable; connecting to the blind flange adaptor, control panel, junction boxes, power transfer switch; providing electrical power to the control panel, electrical services; installing conduit, valves, meters, level sensors, and piping; and testing, startup, and training.
    iv. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments for this item will be paid based on the percentage of completed and approved work as determined by the Engineer.
d. The maximum amount paid will be 80% of the lump-sum price until the pump stations are demonstrated to be fully functional, Record Documents are approved,

startup is completed, and all work for this item is accepted as determined by the Engineer.

Item 22. Leachate Force Main

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to supply, install, and construct the leachate force main and discharges to the existing leachate storage ponds.
    ii. Excavating, backfilling, road crossings, pipe testing, and providing and installing all piping, fittings, valves, and appurtenances including tank discharges.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments for this item will be paid based on the percentage completed and approved as determined by the Engineer.

Item 23. Cell 3 Piping Modifications

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to supply, install, and construct the modifications to the Cell 3 piping discharging to the Cell 1B pump station.
    ii. Demolishing the existing metering system, excavating, backfilling, pipe testing, and providing and installing all piping, fittings, valves, and appurtenances.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments for this item will be paid based on the percentage completed and approved as determined by the Engineer.

Item 24. Paved and Unpaved Site Roads

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services necessary to construct stabilized subgrade, limerock base, and paved surface where applicable for the paved and unpaved site roads.
    ii. Excavating from the Contractor's source, loading, hauling, installing, grading, and testing.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.

b. This item is lump sum.
c. Partial payments will be paid based on the percentage of completed and approved work on a square-yard basis as determined by the Engineer.

DEDUCTIVE ALTERNATE

Item 25. Earthwork – Excavate Drainage Soil from Onsite and Install

a. This item includes but is not limited to:
    i. All labor, equipment, materials, and services related to earthwork necessary to excavate sand drainage layer material onsite from the stockpiled material excavated for landfill construction or from the proposed borrow area if the material meets the requirements of the Technical Specifications and installing to construct the drainage sand layer including the diversion berms within the lined cell limits and all other earthwork above the liner system.
    ii. Excavating onsite, loading, hauling, stockpiling, placing, compacting, grading, QC testing, reworking and retesting, maintaining, and protecting the completed earthwork; correcting wind and stormwater impacts; and assisting with MQA and CQA testing and retesting.
    iii. Producing required documentation and performing all related work as shown on the Drawings and stated in the Specifications.
b. This item is lump sum.
c. Partial payments will be based on the percentage of completed, installed, tested, and approved drainage soil as determined by the Engineer.
d. This item replaces all work specified under *Item 12: Earthwork – Supply and Install Drainage Soil.*

END OF SECTION

SECTION 01290
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. To the Engineer, a proposed Schedule of Values allocated to the various portions of the Work, in accordance with Section 01000, Project Requirements, and Section 01200, Measurement and Payment.

B. Upon request of the Engineer, supporting data, which will substantiate the values' correctness.

C. The accepted Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment.

D. An update and resubmittal of the Schedule of Values when Change Orders affect the listing or when the actual performance of the Work involves necessary changes of substance to values previously listed and approved.

E. Schedule of Values

1. Submit typed schedule on forms provided by the Engineer. The Contractor's standard form or electronic media printout will be considered.
2. Submit Schedule of Values in duplicate within 10 days after the date of Owner-Contractor Agreement.
3. Format – Use the schedule of prices in the Bid Proposal. Show the cost breakdown for each lump-sum item. The lump-sum breakdown shall, at a minimum, use the Table of Contents of this manual outline. Identify each line item with the number and title of the major Specification Section. Identify site mobilization and demobilization, bonds and insurance, Record Drawings, photographs, and operations and maintenance manuals, etc.
4. For unit cost allowances, identify quantities taken from the Contract Documents multiplied by the unit cost to achieve the total for the item.
5. Include within each line item a direct proportional amount of the Contractor's overhead and profit.

6. Revise the schedule to list approved Change Orders with each Application for Payment.

1.02 CASH ALLOWANCES

A. Costs Included in Allowances—The cost of the product to the Contractor or subcontractor, less applicable trade discounts and including applicable taxes.

B. Costs Not Included in the Allowance, but Included in the Contract Price—Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage and labor for installation and finishing.

C. Contractor Responsibilities:

1. Execute purchase agreement with designated supplier.
2. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
3. Promptly inspect products upon delivery for completeness, damage, and defects.

D. Differences between allowance amounts and actual costs will be adjusted by Change Order before final payment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01310
CONSTRUCTION COORDINATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall coordinate Work with that of other construction projects as needed.

B. Before starting Work and from time to time as the Work progresses, the Contractor and each subcontractor shall examine the work and materials installed by others as it applies to its own work and shall notify the Engineer immediately in writing if any conditions exist which will prevent satisfactory results in the installation of the system. Should the Contractor or subcontractor start work without such notification, it shall be construed as an acceptance of all claims or questions as to the suitability of the work of others to receive its Work. The Contractor shall remove and/or replace, at its own expense, all work under this Contract that may have to be removed on account of such defects or omissions.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. The Contractor shall ensure that all drawing, product data, and samples comply with Contract Documents and field dimensions and clearances.

B. The Contractor shall submit requests for interpretation of Contract Documents in a timely fashion to ensure there are no disruptions with the Work as scheduled. Obtain instructions through the Engineer to resolve all queries.

C. Process requests for substitutions and Change Orders through the Engineer.

D. Deliver close-out submittals to the Engineer.

1.03 WORK SEQUENCE

A. The Contractor shall submit a preliminary Progress Schedule, in accordance with Section 00700, General Conditions, to the Engineer. After review, the Contractor shall revise and resubmit the Progress Schedule to comply with requested revisions.

1.04 CONSTRUCTION MOBILIZATION

The Contractor shall do the following:

A. Cooperate with the Engineer in allocating mobilization areas on site for field offices and sheds, access, traffic, and parking facilities. During construction, the Contractor shall coordinate the use of the site and facilities through the Engineer.

B. Comply with the Engineer's procedures for intra-project communications: submittals, reports and records, schedules, coordination drawings, recommendations, and resolution of ambiguities/conflicts.

C. Comply with the Engineer’s instructions for use of temporary utilities and construction facilities.

D. Coordinate field engineering and layout work under instructions of the Engineer.

E. Coordinate scheduling, submittals, and work of the various sections of Contract Documents to ensure the efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

F. Coordinate the sequence of Work to accommodate the Owner occupancy as specified in the Contract Documents.

G. In addition to Progress Meetings specified in Section 00800, Supplementary Conditions, hold pre-construction conferences with personnel and Subcontractors to ensure coordination of Work. The Engineer shall be informed of such meetings and shall be allowed to attend.

H. Coordinate the Work of various sections having interdependent responsibilities for installing equipment, connecting equipment, and placing such equipment in service.

I. Coordinate the use of project space and the sequence of installing civil, mechanical, structural, instrumentation, systems, and electrical work. Follow practicable routings for pipes and conduits with due allowance for available physical space. Use space efficiently to maximize accessibility for other installations, maintenance, and repairs.

J. Coordinate Work at existing facilities to minimize disruption of the Owner’s operations.

K. Assemble and coordinate close-out submittals specified in Section 01770, Project Closeout.

1.05 COORDINATION DRAWINGS

A. The Contractor shall provide information required by the Engineer for preparing coordination drawings.

B. The Contractor shall review drawings before submitting them to the Engineer.

1.06 CLOSE-OUT PROCEDURES

The Contractor shall do the following:

A. Notify the Engineer when Work is considered ready for Substantial Completion.

B. Comply with the Engineer's instructions to correct items of Work listed in executed Certificates of Substantial Completion.

C. Notify the Engineer when Work has reached Final Completion.

D. Comply with the Engineer's instructions for completing items of Work found incomplete in the Engineer's final inspection.

E. Comply with Section 01770, Project Closeout.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. All vehicles on the property or easement must be operational.

3.02 UTILITIES

A. The Contractor shall coordinate the activities of all utility companies with equipment in the construction area with the Contractor’s and Subcontractor’s Work.

3.03 CUTTING AND PATCHING

A. No cutting and patching of new Work will be accepted. All Work must be new and continuous in its final form.

END OF SECTION

SECTION 01325
CONSTRUCTION PHOTOS AND VIDEOS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall have digital photos and videos made of the Work from views and at such times as directed by the Owner. The photos and videos shall represent a visual history of the Project, from Contract Award through Contract Completion.

B. The requirements of this Section constitute a minimum requirement, but the Owner may request additional photos or videos at their discretion for complete documentation of the work performed.

C. The Contractor shall also use additional digital photography as necessary to record and facilitate resolution of on-site issues through the transmission of photos by email or other electronic submittal forum from the site to the Owner's offices.

1.02 SUBMITTALS

A. Aerial Photos and Video Plan.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DIGITAL PHOTO REQUIREMENTS

A. Digital photos shall be in color. Provide one copy of each digital photo via electronic submittal to the Owner.

B. Provide photos taken of each of the major items during construction.

C. View and Quantities Required: A minimum of 30 photos per month clearly showing project status and key elements of construction.

D. Deliver digital photos to the Owner with every pay request.

E. Photos shall be from locations to illustrate the condition of construction and the state of progress adequately.

F. The Contractor shall provide before, during, and after photos of the project site. The photos shall cover aboveground and belowground conditions and improvements before, during, and after construction. Include photos of all equipment, slabs, precast structures, piping, valves, fittings, utility crossings, new connection points, directional drills and tie-together arrangements, electrical equipment, generators, driveways, stormwater systems, paving, fencing, site restoration, and any other work listed in Section 01200, Measurement and Payment.

G. All photos shall be submitted electronically in ascending date order to show the Work as it progresses.

3.02 DIGITAL VIDEO RECORDING REQUIREMENTS

A. The Contractor shall provide to the Owner color digital video of each major facility and structures and facilities adjacent to the construction before construction starts, during construction, and when construction has been completed. Videos shall include the entire site and areas of adjacent properties within 100 feet of the limit of the Work. Special effort shall be made to show the existing improvements and features affected by the work.

3.03 AERIAL PHOTOS

A. The Contractor shall obtain digital, true-color, aerial photos and aerial videos using aerial drones or other approved means of the entire project site before construction begins, monthly during construction, and at final completion showing the entire completed construction project.

B. The Contractor is required to secure all permits and approvals from authorities having jurisdiction before any aerial or drone flights and shall have licensed pilots/drone pilots performing the flights in accordance with applicable regulations.

C. From each flight, provide a minimum of four aerial digital photos of the project area.

3.04 PHOTO AND VIDEO INFORMATION

A. Each digital photo and video file shall be digitally tagged with the following data or the file name shall be referenced from a log that contains the following information for each photo and video:

1. Digital photo or video digital file name/number.
2. Project name.
3. Contract number.

4. Name of Contractor.
5. Date photo or video was taken.
6. Photographer name.
7. Description of location, view, and construction items the photo displays.

B. All photos and videos shall be clear, unobstructed, sharply focused, and free of distortion.

END OF SECTION

SECTION 01330
SUBMITTALS AND ACCEPTANCE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall submit documentation that describes the Work to be performed under the Contract as required in this Section. This documentation will be for the Engineer's review and use. The documentation furnished by the Contractor must enable the Engineer to verify the Contractor's performance and compliance with Contract requirements. The documentation shall cover all services and deliverables required and secured by the Contract Documents.

1.02 SUBMITTALS

A. General—The Contractor shall submit the following:

1. Project documentation: For the Engineer's internal use and shall include all information that will be essential for the facility's operations, maintenance, training, and repair of equipment and facilities supplied by the Contractor. The Contractor shall submit all documentation necessary to ascertain compliance with technical/contractual provisions.
2. Shop drawings: Drawings, schedules, diagrams, warrants, and other data prepared specifically for this Contract by the Contractor or through the Contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower-tier contractor to illustrate a portion of the Work.
3. Product data: Preprinted materials such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate a portion of the Work, but not prepared exclusively for this Contract.
4. Samples: Physical examples of products, materials, or workmanship that are physically identical to portions of the Work, illustrating portions of work, or establishing standards for evaluating appearance of finished work or both.
5. Installation Lists: All manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Owner with the required Shop Drawings. The installation list shall include all installations where identical equipment has been installed and has been operating for at least 1 year.
6. Administrative submittals: Data presented for reviews and acceptance to ensure that administrative requirements of the project are adequately met

but not to ensure directly that work is in accordance with the design concept and in compliance with Contract Documents.

B. Coordination

1. Submittals and schedules shall be checked and coordinated with the Work of all trades involved before they are submitted 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.

C. Start of Work

1. Within 30 calendar days after the notice to proceed for the project, the Contractor shall submit to the Engineer a Contract Data Requirements List that defines all data to be submitted under this Contract. Included in this list shall be the names of all proposed manufacturers furnishing specified items to the extent known. Review of this list by the Engineer shall in no way relieve the Contractor from providing materials, equipment, systems, and structures fully in accordance with the Specifications.

D. General Requirements

1. The Contractor shall prepare, assemble, and submit all documents as described herein. The Contractor shall submit certification that the documents prepared conform to the Contract requirements and will result in a complete and operable project. The Engineer shall review the Contractor’s documents for conformance to the Contract requirements and may comment on the documents.
2. The Contractor shall approve and certify all project documents. The Contractor’s failure to certify the documents or failure to provide documents that demonstrate conformance to the Contract requirements are grounds for rejection. The Contractor shall be responsible for and bear all costs for proceeding with any part of the Work that fails to meet the Contract requirements.
3. Submittal of documents for the Engineer’s review shall in no way relieve the Contractor of full responsibility for providing a complete, safe, reliable, operating, and coordinated Work (system/equipment/facilities) that comply with these Contract documents.

E. Requests for Substitution

1. All requests for substitution shall clearly and specifically indicate any and all differences or omissions between the products specified as basis of

design and the product proposed for substitution. Data shall include but not be limited to differences as follows for both the specified and substituted products:

a. Principle of operation.
b. Materials of construction or finishes.
c. Thickness or gauge of materials.
d. Weight of item.
e. Deleted features or items.
f. Added features or items.
g. Changes in other work caused by the substitution.
h. If the substitution contains differences or omissions not specifically called to the attention of the Engineer, the Engineer reserves the right to require equal or similar features to be added to the substituted product at the Contractor's expense.

F. Submittal Requirements and Procedures

1. Drawing Formats and Requirements

a. Drawings—All Drawings and Shop Drawings shall be prepared in 11-x-17-inch or larger format and shall have a blank area of 3 x 4 inches in the lower right hand corner above the title block. Each Drawing shall indicate the following information in the title block:

(1) Title and Drawing Number.
(2) Date of Drawing or Revision.
(3) Name of Facility.
(4) Name of Contractor or subcontractor.
(5) Drawing contents and locations.
(6) Specification Section and Subsection Numbers.

b. All drawings shall be submitted via electronic transmittal in PDF format or other formats as may be required by the Owner for review.

2. Product Data

a. Requirements—Product data shall include all catalog cuts, performance surveys, test reports, equipment lists, material lists, diagrams, pictures, and descriptive material. All product data shall be submitted in either 8.5-x-11-inch or 11-x-17-inch size formats. The submittal information shall show the standard and optional

product features, as well as all performance data and specifications. The manufacturer's recommendation for special tools shall be supplied.

b. All product data shall be submitted via electronic transmittal in PDF format or other formats as may be required by the Owner for review.

3. Samples—The Contractor shall furnish samples required by the Contract Documents, for review by the Engineer. Samples shall be delivered to the Engineer as specified or directed.

   a. All samples shall be of sufficient size and quantity to illustrate clearly the functional characteristics of the product, with integrally related parts and attachment devices. The samples shall show the full range of color, texture, and pattern.
   b. The Contractor shall submit a minimum of four samples of items submitted. All samples shall be marked with required submittal information, as specified below.

4. Submittal Information Requirements

   a. When used in the Contract Documents, the term "Submittal Information" shall be considered to mean the following information at a minimum:

      (1) Contract Name.
      (2) Contract Number.
      (3) Location within the Facility.
      (4) Date Submitted.
      (5) Specification Section and Subsection Numbers.

   b. Drawings—The Contractor shall mark submittal information on all Drawings in the left half of the 3-x-4-inch block as described above.

   c. Product Data and Manufacturer's Literature—The Contractor shall mark all product data and manufacturer's literature with submittal information and note which item is being furnished. The Contractor shall mark the option and supplies to be furnished with the item. Do not submit the manufacturer's general catalog: submit only items being installed or delivered. When manuals are being submitted, the Contractor shall mark submittal information on both the cover and title page. If manuals being submitted contain more

than just one item, each item must be marked and only Contract name and number are to be marked on the cover and title page.

5. Training, Operation and Maintenance Manuals

a. The Contractor shall submit to the Engineer for review and acceptance of manufacturer's installation, operations, lubrication, maintenance, and training manuals for all equipment installed or delivered under this Contract. All manuals shall have submittal information marked on the front cover, title page, and three places inside the manual. If the manual being submitted is for different components, mark the front cover and title page only. Each component section must be marked with the Specification Section and subsection numbers.

b. Operations and Maintenance Manual shall conform to requirements defined in Section 01830, Operations and Maintenance Manuals.

G. Required Submittals

1. Structural Submittals

a. This Section specifies general procedural requirements for contractual submittals for the following structural schedules, product data, samples, and manufacturer's certificates.

(1) Product Data—The Contractor shall provide product data for all structural items, options, and other data and provide supplemental manufacturer's standard data for information unique to the Work and installation. The submittals shall reflect all items delivered or installed under this Contract.

(2) Samples—The Contractor shall provide all samples required under this Specification including color charts and product samples.

(3) Material, equipment, and installation and demolition Specifications.

2. Mechanical and Electrical System Submittals

a. This Section specifies general procedural requirements for mechanical schedules, performance data, control diagrams, and other submittal data.

b. The Contractor shall submit the following:

(1) Performance Data.

(2) Finished Data—Complete surface preparation and finished data for all mechanical and electrical unit/subsystems shall be provided, including a complete list of cleaning instructions.

(3) Factory Testing—Detailed description of factory testing procedures, reporting procedures and criteria for test passing or failing shall be provided for all mechanical and electrical units/subsystems. Testing shall comply with the General Requirements and Technical Requirements Sections.

(4) Site (Field) Testing and Acceptance—Detailed description of site testing and acceptance tests including descriptions of procedures, testing equipment, reporting procedures, and criteria for passing or failing tests shall be provided for all mechanical and electrical units/subsystems. Testing shall comply with General Requirements and Technical Requirements.

(5) Factory Test Report—After fabrication and testing, the Contractor shall submit the results of tests. No shipment of any mechanical and electrical unit/subsystem shall be allowed without the written certification from the Contractor that the equipment conforms to the Contract requirements.

(6) Site Test and Acceptance Report—Site test and acceptance reports shall be submitted to the Engineer.

(7) Operations and Maintenance Manuals—The Contractor shall furnish manuals for all mechanical and electrical equipment specified under this Contract. Each manual shall include the following at a minimum:

(a) Description of equipment.
(b) Record shop drawing.
(c) Operation and maintenance instructions.
(d) Part lists.
(e) Equipment ratings.

(f) Valve list.
(g) Lubrication and other maintenance instructions.

H. Submittal Review

1. The Engineer's review of the Contractor's documents shall not relieve the Contractor of the responsibility for meeting all of the requirements of the Contract nor of the responsibility for correcting the documents furnished. The Contractor shall have no claim for additional cost or extension in time because of delays due to revisions of the documents that may be necessary for ensuring compliance with the Contract.

2. The Engineer will review a submittal or re-submittal once, after which the cost of review shall be borne by the Contractor. The cost of Engineering review shall be equal to the Engineer's full cost.

3. No partial submittals will be reviewed. A submittal or re-submittal not complete will be returned to the Contractor for completing and re-submittal.

4. Documents submitted by the Contractor for approval by the Engineer will be returned bearing a project-specific stamp bearing the dated signature of the reviewer and one of four boxes checked:

   a. NO EXCEPTIONS NOTED—This indicates that the submittal appears to comply with the requirements of the performance specifications and that the Work may proceed.
   b. MAKE CORRECTIONS NOTED—This indicates that the reviewer has added a minor correction to the submission and that the Work (modified in accordance with the correction comment) may proceed. The Contractor shall accept the responsibility of the modified document and resulting Work with no additional compensation.
   c. AMEND AND RESUBMIT—This indicates that the submittal will require Contractor modifications based on the reviewer's comments that accompanied the returned submittal. The Contractor will be cautioned that work may not proceed under this review status.
   d. REJECTED—This indicates that the submittal is not in conformance with the requirements of the performance Specifications and cannot be modified to gain compliance. A new submittal will be required in the instance of a "reject" status and the Contractor will be cautioned that work may not proceed under this condition.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SUBMITTAL PROCEDURES

A. Before submitting documents for the Engineer's review, the Contractor shall review the documentation for conformance to the Contract requirements. Submittals shall be complete and comprise a logical division of the Contract Work.

B. All documentation submitted by the Contractor to the Engineer shall be accompanied by a letter of transmittal and shall be submitted in a sequence that allows the Engineer to have all of the information necessary for checking and accepting a particular document at the time of submittal.

C. Each document shall be identified by a document number, Contract number, Contract name, location, Specification Section, subsection numbers, and submittal date. Where a manual/drawing is revised to reflect a change in design or a change for any other reason, each such revision shall be shown by a revision number, date, and subject in a revision block. Indication of official approval by the Contractor's Project Manager shall also be included. To permit rapid location of the revision, additional notation shall be made in the manual opposite the line or area where the change was made and identified by the corresponding revision number.

3.02 DOCUMENTATION CONTROL AND SUBMITTAL SEQUENCING

A. The Contract Data Requirements List shall be updated and resubmitted to the Engineer monthly throughout the duration of the Contract. This list shall identify the Contractor's submittal number, proposed and actual submittal date, Contract Specification Section Number, Paragraph, Item of the Work, and type of document.

B. The Contractor shall work with the Engineer to provide a regulated flow of submittals that allows the Engineer to review the submittals in the defined time frame without undue delays. Monthly the Contractor shall provide the Engineer a schedule of the approximate quantities and delivery dates for all submittals due for the next 120 days.

3.03 FINAL RECORD DRAWINGS

A. The Contractor shall submit the Final Record Drawing Package to the Owner for review at Substantial Completion. The Contractor shall be provided with CADD files of the Contract Drawings in AutoCAD, version specified by the Owner. Final Record Drawings shall be prepared in AutoCAD with the same version used for the Contract Drawings and shall be provided electronically in AutoCAD. The Contractor may request to use a different version, but it must be approved by the Owner.

B. Final Record Drawings shall also be provided in hardcopy format, three copies, printed at the full size of the original Contract Drawings.

C. Record Drawings shall be in accordance with Section 01785, Record Documents.

3.04 REQUIREMENTS FOR SUBMITTAL

A. Additional documents, drawings, interface data, and other pertinent project submittal data are listed in specific sections of this Contract.

3.05 RECORD PRINTS

A. The Contractor shall submit one set of all record prints before final completion. The record print or project records shall include submittals, catalog cuts, drawings, calculations, test reports, manufacturer's data, maintenance manuals, installation instructions, and operating manuals. All "record prints" shall be delivered to the Engineer in three-ring binders with dividers and shall be placed in order by Specification Section.

END OF SECTION

SECTION 01350
ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Work covered by this Section consists of furnishing all labor, materials, and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations during and as the result of construction operations under this Contract. In this Section *environmental pollution* is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare, unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires considering air, water, and land and involves managing noise and solid waste as well as other pollutants.

C. The Contractor shall schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the Work. The Contractor shall provide erosion-control measures such as diversion channels, sedimentation or filtration systems, berms, staked silt fence, seeding, mulching or other special surface treatments that are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion-control measures shall be in place in an area before any construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in Section 02370, Erosion and Sedimentation Control.

D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.

E. All phases of sedimentation and erosion control shall comply with and be subject to the laws of the State of Florida and the Project Environmental Resource Permit.

1.02 SUBMITTALS

A. The Contractor shall prepare a Stormwater Pollution and Prevention Plan (SWPPP) and a sedimentation and erosion-control drawing meeting the Florida Department of Environmental Protection (FDEP) and South Florida Water

Management District (SFWMD) requirements. The drawing shall clearly indicate the construction entrance, delivery and storage area, in-stream turbidity controls and proposed locations for soil stockpiles. The Contractor shall furnish two copies to the Engineer and two copies to the Owner.

B. The Contractor shall provide the Engineer with two copies of documentation that the Contractor filed with FDEP a "NOTICE OF INTENT TO USE GENERIC PERMIT FOR STORMWATER DISCHARGE FROM LARGE AND SMALL CONSTRUCTION ACTIVITIES" in accordance with Rule 62-621.300(4), FAC.

C. The Contractor shall submit two copies of approved Spill Prevention Control and Countermeasures (SPCC) plans to the Owner and the Engineer.

D. If the Contractor proposes to construct temporary roads or embankments and excavations for work areas, the Contractor shall submit the following to the Owner for approval at least 10 days before the scheduled start of such temporary work:

1. A layout of all temporary roads, excavations, embankments, and drainage to be constructed within the work area.
2. Details of temporary road construction.
3. Drawings and cross-sections of proposed embankments and their foundations, including a description of proposed materials.
4. Drawings showing the proposed restoration of the area. The proposed removal of any trees and shrubs must be indicated. The Contractor is responsible for obtaining necessary tree clearing permits with the local municipalities.
5. Locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged.
6. The drawings shall provide for the obliteration of construction scars as such and shall provide for a natural appearing and functioning final condition of the area.
7. Modification of the Contractor's approved drawings shall be made only with the written approval of the Owner. No unauthorized road construction, excavation, or embankment construction including disposal areas will be permitted.
8. The Contractor shall mark/flag the proposed temporary work in the field for review by the Owner prior to beginning such work.

1.03 WORK SEQUENCE

A. Before beginning the Work, the Contractor shall meet with the Owner to establish agreed-upon compliance with these provisions and administration of the environmental pollution control program.

B. The Contractor shall remove temporary environmental control features when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

1.04 REFERENCE STANDARDS

A. Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

B. The Contractor shall comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

A. The Contractor shall provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion-control measures, such as temporary vegetation, siltation basins, mulch check dams, mulching, jute netting, and other equivalent techniques shall be used as appropriate. Surface water shall be prevented from flowing into excavated areas. At the completion of the Work, erosion and sedimentation controls shall be removed and the ground surface restored to its original condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

A. Care shall be taken to prevent or reduce to a minimum any damage to any stream or surface water from pollution by debris, sediment, or other material or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing or that contains oils or sediments that will reduce the quality of the water in the stream shall not be directly returned to the stream. Such waters shall be diverted through a settling basin or filter before being directed into streams or surface waters.

B. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by FDEP. The Contractor shall submit two copies of approved contingency plans to the Engineer.

3.03 PROTECTION OF LAND RESOURCES

A. After completion of construction, the Contractor shall restore land resources within the project boundaries and outside the limits of permanent work to a condition that will appear to be natural and not detract from the appearance of the project. All construction activities shall be confined to areas shown on the Drawings.

B. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, the Contractor shall first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.

C. The Contractor shall protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping, or other operations by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Owner will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1 inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and, in the opinion of the Owner, are beyond saving shall be immediately removed and replaced.

E. The Contractor’s storage and other construction buildings required temporarily in the performance of the work shall be located in cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Owner and shall not be within wetlands or floodplains. Preserving the landscape shall be required in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for the Owner’s approval.

F. The Contractor shall remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess waste materials, or any other vestiges of construction as directed by the Engineer. Excavating, filling, and plowing of roadways are expected to be required to restore the area to near natural conditions which will permit the growth of vegetation the roadway areas. The disturbed areas shall be prepared and seeded as approved by the Owner.

G. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

A. Burning—Burning will not be permitted at the project site for the disposal of refuse and debris.

B. Dust Control—The Contractor shall maintain all excavations, embankment, stockpiles, access roads, waste areas, borrow areas, and all other work areas within or outside the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides is prohibited.

D. To be approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the Work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Owner.

3.05 NOISE CONTROL

A. The Contractor shall make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION-CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this Contract, the Contractor shall maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.07 PERMIT COMPLIANCE REQUIREMENTS

A. The Contractor shall comply with all conditions of permits and crossing agreements obtained by the Owner or required to be obtained by the Contractor, including but not limited to:

1. FDEP.
2. SFWMD.

END OF SECTION

SECTION 01400
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. General

1. This Section defines minimum requirements for the Quality Assurance (QA) Program provided by the Contractor. The deliverable documents are defined, along with the method of execution of the Contractor's QA Program.
2. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with the Contract Document requirements.
3. Specified tests, inspections, and related actions do not limit the Contractor's Quality Control (QC) procedures that facilitate compliance with the Contract Documents.

B. Definitions

1. Quality Assurance services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with Contract requirements.
2. Quality Control services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction comply with requirements.

C. Payment

1. Separate payment will not be made for providing and maintaining an effective Quality Assurance and Quality Control Program, and all costs associated with such a program shall be included in the applicable unit prices, lump-sum prices, or allowances contained in the Contract Price Breakdown.

1.02 WORK SEQUENCE

A. Where reference is made to a particular standard, the revision in effect at the time of Bid opening shall apply except where a specific date is established.

B. For products or workmanship specified by association, trades, or other consensus standards, the Contractor shall comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable code.

C. If specified reference standards conflict with the Contract Documents, the Contractor shall request clarification from the Engineer before proceeding.

1.03 QUALITY ASSURANCE

A. The Contractor shall install all materials and equipment in a neat and first-class workman-like manner.

B. The Contractor shall replace all existing paving, stabilized earth, and other improvements with the same type of material that was removed during construction or as directed by the Engineer without increase in the Contract Price or Contract Time.

C. The Engineer reserves the right to direct the removal and replacement of any items that, in the Engineer's opinion, do not present an orderly and reasonably neat or workman-like appearance, provided such an orderly installation can be made using customary trade methods. The removal and replacement shall be done when directed in writing by the Engineer at the Contractor's own expense and without additional expense to the Owner.

1.04 TOLERANCES

A. Monitor tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. If manufacturers' tolerances conflict with Contract Documents, request clarification from the Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor is responsible for quality control and shall establish and maintain an effective QC system in compliance with the Contract Documents. The QC

system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract requirements. The system shall cover all Work and shall be keyed to the proposed design and construction sequence. The project QC Officer will be held responsible for the quality of work on the job and is subject to removal by the Engineer for non-compliance with quality requirements specified in the Contract. The project QC Officer in this context shall mean the individual with the responsibility for the overall management of the project quality.

3.02 QUALITY CONTROL PLAN

A. General: Not later than 30 calendar days after receipt of Notice to Proceed, the Contractor shall furnish for review by the Engineer the QC Plan proposed to implement the requirements of the Contract. The Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Engineer will consider an interim plan for the first 30 calendar days of operation.

B. Content of the QC Plan: The QC Plan shall include, at a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, suppliers, and purchasing agents:

1. A description of the quality control organization, including a chart showing lines of authority for all aspects of the Work specified. The staff shall include a Quality Control Officer who shall report to the Project Manager or executive.
2. The name, qualifications (in résumé format), duties, responsibilities, and authorities of each person assigned a QC function.
3. A copy of the letter to the Quality Control Officer signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the Quality Control Officer, including authority to stop work which is not in compliance with the Contract.
4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents.
5. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will verify that identified deficiencies have been corrected.
6. Reporting procedures, including proposed reporting formats.

C. Acceptance of Plan: Acceptance of the Contractor’s plan is required before the start of Work. Acceptance is conditional and will be predicated on satisfactory performance during the Work. The Engineer reserves the right to require the

Contractor to make changes in its QC Plan and operations, including removing personnel as necessary to obtain the quality specified.

D. Notification of Changes: After acceptance of the QC Plan, the Contractor shall notify the Engineer in writing of any proposed change. Proposed changes are subject to acceptance by the Engineer.

3.03 SUBMITTALS

A. Submittals shall be made as specified in Section 01330, Submittals and Acceptance. The QC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements.

3.04 TESTS

A. Testing Services

1. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to the Engineer. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.
2. Testing services provided by the Engineer are for the sole benefit of the Owner; however, test results shall be available to the Contractor. Testing necessary to satisfy the Contractor's Quality Control Procedures shall be the sole responsibility of the Contractor. The Contractor shall include the cost for collecting samples and testing in the bid for related work and no additional payment will be made for testing.
3. When necessary, the Contractor shall interrupt its Work for Engineer sampling and testing. The Contractor shall have no Claim for increase in Contract Price or Contract Time due to such interruption. The Contractor shall cooperate in these testing activities as needed.
4. Testing, including sampling, will be performed by the testing firm's laboratory personnel in the general manner indicated in the Specifications.

B. Transmittal of Test Reports: Written reports of tests and engineering data furnished by the Contractor for the Engineer's review shall be submitted as specified for Shop Drawings.

C. Manufacturer's Field Services

1. The manufacturer's field services will be specified in the respective equipment sections.

2. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are indicated shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed into operation. The manufacturer's representative shall revisit the site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.
3. Each manufacturer's representative shall furnish to the Engineer, through the Engineer, a written report certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, has been operated under full load conditions, and has operated satisfactorily.

3.05 COMPLETION INSPECTION

A. Final Completion Punch List: Near the completion of all Work, the QC Officer shall inspect the Work and develop a "punch list" of items that do not conform to the approved Drawings and Specifications. Such a list of deficiencies shall be included in the QC documentation and shall include the estimated date by which the deficiencies shall be corrected. The QC Officer or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Engineer that the Facility is ready for the Engineer's final inspection.

B. Final Inspection and Acceptance: The Contractor's QC Officer and the Engineer will attend this inspection. Additional Engineer personnel may also be in attendance. The final acceptance inspection will be formally scheduled by the Engineer when all punch list deficiencies have been corrected. Notice will be given to the Engineer at least 14 days before the final inspection and must include the Contractor's assurance that all punch list items will be complete and acceptable by the date scheduled for the final inspection. Failure of the Contractor to have all Contract Work acceptably complete for this inspection will be cause for noncertification of final payment by the Engineer.

3.06 NOTIFICATION OF NONCOMPLIANCE

A. The Engineer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time

lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

3.07 REPAIR AND PROTECTION

A. On completion of testing, inspection, sampling, and similar services, the Contractor shall repair damaged construction and restore substrates and finishes.

B. The Contractor shall protect all construction exposed by or for Quality Control service activities.

C. The repair and protection are the Contractor's responsibilities, regardless of the assignment of responsibility for Quality Control services.

END OF SECTION

SECTION 01450
TESTING AND TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall engage the services of a soil and geosynthetics laboratory to perform construction quality control (CQC) testing including but not limited to soil density and moisture content, concrete compressive strength, and geosynthetic conformance. Testing necessary to satisfy the Contractor's quality control procedures shall be the sole responsibility of the Contractor in accordance with Section 01400, Quality Requirements.

B. The Engineer may request sampling and testing in addition to that performed by the Contractor. Failed tests will be back-charged to the Contractor at the time of final payment. All soil, and concrete testing shall be coordinated with the Engineer and the laboratory and scheduled by the Contractor. The Owner may select an independent laboratory for Owner-paid testing.

1. The Contractor shall cooperate with the Engineer and the laboratory to facilitate the execution of required services.
2. The Engineer shall approve the selection of the testing laboratory.
3. Employment of a testing laboratory shall in no way relieve the Contractor of the obligation to perform work in accordance with the requirements of the Contract Documents.
4. Testing services may be required by the Engineer for the sole benefit of the Owner and to verify the quality of the work. Owner test results shall be available to the Contractor upon request. If deficient work is discovered, the Contractor shall remedy defective work. The Contractor may retest the defective work discovered by Owner testing.

1.02 RELATED WORK

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders, or approvals of public authorities.

B. Respective Sections:

1. Certification of products.
2. Laboratory tests required and standards for testing.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

B. Submit to the Engineer for review a list and schedule of all tests to be conducted.

C. Describe test procedures along with duration of tests.

D. After each inspection and test, the Laboratory shall promptly submit two copies of the laboratory report to the Engineer, one copy to the Contractor, and one copy to the Engineer.

E. Include the following:

1. Date issued.
2. Project title and number.
3. Name of field testing technician or inspector.
4. Date and time of sampling or inspection.
5. Identification of product and Specifications Section.
6. Location in the Project.
7. Type of inspection or test.
8. Date of test.
9. Results of test.
10. Conformance with Contract Documents.

F. When requested by the Engineer, provide interpretation of test results.

1.04 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM D3740—Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
2. ASTM E329—Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.05 QUALITY ASSURANCE

A. The Laboratory is not authorized to do any of the following:

1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the Work.
3. Perform any duties of the Engineer of Record or the Engineer.

B. The Contractor shall be responsible for the following (including but not limited to):

1. Cooperating with laboratory personnel, providing access to work and to manufacturer's operations.

2. Securing and delivering to the laboratory adequate quantities of representative samples of materials proposed to be used and that require testing.

3. Providing to the laboratory the preliminary design mix proposed to be used for concrete and other materials mixes that require control by the testing laboratory.

4. Furnishing incidental labor and facilities:

   a. To provide access to Work to be tested.
   b. To obtain and handle samples at the project site or at the source of the product to be tested.
   c. To facilitate inspections and tests.
   d. To store and cure test samples.

5. Notifying the Engineer and laboratory sufficiently in advance of operations to allow the laboratory time to assign personnel and schedule tests.

6. Employing and paying for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling, and testing required for the Equipment Supplier or Contractor's (as applicable) convenience.

7. Sampling of soil proposed for use to construct the work.

C. Materials and equipment used in the performance of Work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard requirements for quality and workmanship are indicated in the Contract

Documents. The Engineer may require the equipment supplier or Contractor (as applicable) to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.

D. If the test and any subsequent retest results indicate that the materials or equipment fail to meet the requirements of the Contract Documents, the equipment supplier or Contractor (as applicable) shall pay for the laboratory costs directly to the testing firm and these will not be reimbursable to the equipment supplier or Contractor (as applicable).

1.06 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

1.07 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

1.08 QUALIFICATIONS

A. Comply with requirements of ASTM E329 and ASTM D3740.

B. Laboratory: Licensed to operate in Florida.

C. Laboratory Staff: Demonstrate that qualifications of staff conform to state licensing requirements.

D. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Institute of Standards and Technology (NIST) or accepted values of natural physical constants.

E. Provide qualified personnel at the site. Cooperate with the Engineer and Contractor in performing services.

F. Perform specified inspection, sampling, and testing of products in accordance with specified standards.

G. Ascertain compliance of materials and mixes with requirements of Contract Documents.

H. Promptly notify the Engineer and Contractor of observed irregularities or non-conformance of Work or Products.

I. Perform additional inspections and tests required by Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUBMITTALS

A. The Contractor shall submit a Maintenance of Traffic Plan in accordance with this Section and the Plans and Specifications. Maintenance of Traffic shall be in accordance with FDOT Standard Indexes.

1.02 RESPONSIBILITY

A. This Section specifies the minimum requirements for temporary facilities, utilities, and controls required to provide an adequate and safe work site at every stage during construction of the Project. The Contractor is solely responsible for the requirements set forth in this Section.

1.03 ON-SITE TEMPORARY

A. The Contractor shall submit a layout plan showing the proposed locations of trailers, restrooms, storage trailers, and all other temporary facilities intended to be placed on site. The Contractor shall submit and obtain approval of anchoring details conforming to Building Code requirements.

B. The Contractor shall be responsible for local permits required for facilities proposed to be placed on site.

C. Except as otherwise indicated, the Contractor may, at his option, furnish stand-alone utility plants to provide needed services in lieu of connected services from available public utilities, provided such stand-alone plant facilities comply with all governing regulations. Before availability of temporary utility services, the Contractor will provide trucked-in/trucked-out containerized or unitized services for start-up of construction operations at the site.

1.04 COSTS

A. Except as otherwise indicated, the costs of providing and using temporary utility services are included in the contract sum.

1.05 TEMPORARY FACILITIES

A. The types of utility services required for temporary use at the project site include the following (other specific services may be required for specific construction methods of operations):

1. Electrical Power Service.
2. Water Service (potable for certain uses).
3. Sanitary.
4. Storm Sewer or Open Drainage/Run-off Control.
5. Gas (fuel) Service.

1.06 TEMPORARY ELECTRICITY

A. The Contractor shall make the necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for proper completion of the Work and during its entire progress up to time of final acceptance by the Engineer. The Contractor shall provide and pay for all temporary switches, connections, and meters.

1.07 TEMPORARY WATER

A. The Contractor shall make all necessary application and arrangements and pay all fees and charges for water necessary for the proper completion of the Project up to the time of final acceptance. The Contractor shall provide and pay for any temporary piping and connections.

1.08 TEMPORARY SANITARY FACILITIES

A. The Contractor shall provide adequate sanitary facilities for the use of those employed on the Work. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points and in such manner as may be required or approved.

1.09 CLEANLINESS OF FACILITIES

A. The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or on adjacent property.

1.10 TERMINATION AND REMOVAL

A. At the time the need for a temporary utility service has ended or has been replaced by use of permanent services, or no later than the time of final completion, the Contractor shall promptly remove the installation unless requested by the Engineer to retain it for a longer period. Any work that may have been delayed or affected by the installation and use of the temporary utility, including repairs to construction and grades and restoration and cleaning of exposed surfaces, shall be completed at this time. The Contractor shall replace any work damaged beyond acceptable restoration.

1.11 NOISE CONTROL

A. The Contractor shall provide adequate protection against objectionable noise levels caused by the operation of construction equipment.

1.12 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. The contractor shall maintain a schedule of the frequency of dust control.

1.13 WATER CONTROL

A. The Contractor shall provide for satisfactory disposal of surplus water and shall submit a plan to the Engineer for review before initiating and implementing the plan. Approval shall be obtained from the proper authorities before the use of public or private lands or facilities for such disposal.

1.14 POLLUTION CONTROL

A. The Contractor shall provide for adequate protection against polluting any public or private lands, stormwater system, lakes, ponds, rivers, streams, creeks, and other such areas by the disposal of surplus material in the form of solids, liquids, gases, or from any other cause.

1.15 ADVERSE IMPACT

A. The Contractor shall evaluate and assess the impact of any adverse effects on the natural environment that may result from construction operations and shall operate to minimize pollution of air, ground, or surface waters vegetation, and afford the neighboring community the maximum protection during and up to completion of the construction project.

1.16 STREAMS, LAKES, AND OTHER BODIES OF WATER

A. The Contractor shall take sufficient precautions to prevent pollution of stormwater systems, streams, and lakes with fuels, oils, bitumens, calcium chloride, or other harmful materials. The Contractor shall conduct and schedule operations to avoid or otherwise prevent pollution or siltation of stormwater systems, streams, and lakes.

1.17 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, 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. The Contractor shall provide and maintain at the jobsite a chemical data sheet and a material safety data sheet for each substance.

1.18 EROSION CONTROL

A. The Contractor shall not expose by construction operations a larger area of erosive land at any one time than the minimum necessary for efficient construction operations, and the duration of exposure of the uncompleted construction to the elements shall be as short as practicable. Erosion-control features shall be constructed concurrently with other work and at the earliest practicable time.

1.19 STORAGE FACILITIES

A. All products, materials, and equipment shall be stored in accordance with the manufacturer's instructions, with seals and labels intact and legible. Products subject to damage by the elements shall be stored in weathertight enclosures. Temperature and humidity shall be maintained within the ranges required by the manufacturer's instructions. Fabricated products shall be stored above the ground on blocking or skids. Products that are subject to deterioration shall be covered with impervious coverings with adequate ventilation to avoid condensation. Loose granular materials shall be stored in a well-drained area on solid surfaces to prevent mixing with foreign matter. Any products that will come in contact with water shall be stored off the ground to prevent contamination.

1.20 INSPECTION

A. Storage shall be arranged in such a manner to provide easy access for inspection. Periodic inspections shall be made of all stored products to ensure that they are maintained under specified conditions and free from damage or deterioration.

1.21 TEMPORARY PROTECTION

A. After installation, the Contractor shall provide substantial coverings as necessary to installed products to protect them from damage from traffic and subsequent construction operations. Coverings shall be removed when no longer needed.

1.22 ADJACENT TO WORK

A. The Contractor shall protect from damage all property along the line of the Work or in the vicinity of or in any way affected by the Work, the removal or destruction of which is not called for by the Drawings. Wherever such property is damaged due to the activities of the Contractor, it shall be immediately restored to its original condition by the Contractor at no cost to the Owner.

1.23 REMEDY BY OWNER

A. In case of failure on the part of the Contractor to restore such property or make good such damage or injury, the Engineer may, after 48 hours' notice to the Contractor, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary and the cost of such repairs, rebuilding, or restoration will be deducted from any monies due or which may become due to the Contractor under this Contract.

1.24 PROTECTION FROM DAMAGE

A. The Contractor shall be responsible for protecting property in the areas in the vicinity of the Project and for protecting his equipment, supplies, materials, and work against any damage resulting from the elements, such as flooding, rainstorm, wind damage, or other such damage, and shall be responsible for damage resulting from the same. The Contractor shall provide adequate drainage facilities, tie-downs, or other protection throughout the contract period for the protection of his, the Owner's, and other properties from such damage.

1.25 TRAFFIC REGULATION

A. Signs, marking barricades, and procedures shall conform to the requirements of the Florida Department of Transportation Manual on Traffic Controls and Safe Practices for Street and Highway Construction, Maintenance, and Utility Operations.

1.26 SIGNAGE

A. The Contractor shall provide and maintain adequate barricades around open excavations. The Contractor shall place signs along DeCastro Road and elsewhere onsite as appropriate directing material haulers to the construction site.

1.27 REMOVAL OF SIGNAGE

A. On completion of the Work, the Contractor shall remove all debris, excess materials, barricades, and temporary work, leaving walkways and roads clear of obstructions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01520
FIELD OFFICES

PART 1 GENERAL

A. Within 2 weeks after starting work, the Contractor shall provide a minimum of one field office trailer including space for use of the Owner and Owner's representatives. The Contractor shall maintain the field office until the completion of the work to be done under this Contract.

1. The field office shall be a minimum 8 feet by 28 feet. The Owner's space within the field office shall be a minimum of 8 feet by 8 feet, unless otherwise approved by Owner.
2. Installation of the field office shall meet all local codes and ordinances. At a minimum, the Contractor shall install the structure on a level, well-drained area and secure it against wind in accordance with applicable requirements of the Florida Building Code and ASCE-7.
3. The field office shall be provided with structurally sound and safe steps and landings for each door. The doors shall have secure locks.
4. The field office shall be designated as a "No Smoking Area."
5. The windows shall be arranged for cross ventilation with screens.
6. The Contractor shall provide air conditioning and heating systems with thermostat control.
7. The Contractor shall provide electric power for the duration of the Project.
8. On completion of the Project, the Contractor shall remove the field office and all such temporary facilities from the site at a time discussed and agreed to with the Owner. The Contractor shall remove foundations and debris, remove any temporary pavement, compacted ground, or base materials (such as limerock or stabilized soils created by the Contractor for construction parking or storage), grade the site to required elevations, sod all disturbed areas, and clean and remove all trash and debris. Ensure the soil permeability for stormwater drainage is equivalent to preconstruction conditions or as required by the Contract Documents.

B. In general, at a minimum the Contractor shall provide the following:

1. Electric lights (50-foot candles at desktop height) and power supply outlets (minimum of four).
2. High-speed Internet access with a Wi-Fi router for wireless access and a Wi-Fi password made available to the Owner.
3. Complete toilet facilities within the field office acceptable to the Owner that meet all local and State health codes and regulations including appropriate restroom signage.

4. Fire extinguisher (Halon type, minimum 4-pound capacity).
5. Water coolers, bottled water, and paper cups for the duration of the Project.
6. Table for viewing the Project Drawings.
7. Office furnishings, as described in Article 1.05 below.
8. File cabinets, storage, bookcases, as described in Article 1.05 below.
9. Standard office supplies.
10. Miscellaneous field supplies, as described in Article 1.05 below.
11. Weekly janitorial services.

1.02 REFERENCE STANDARDS

A. Comply with all federal, state, and local codes including the National Electric Code, OSHA, FLOSHA, Florida Building Code, and ASCE-7.

B. Comply with all General Industrial standards and regulations, including but not limited to AWWA, ANSI, NEMA, IEEE, ASHRAE, UL, etc.

1.03 SPECIFIC REQUIREMENTS

Unless otherwise noted, the quantity shall be sufficient for the duration of the Project.

A. Office Furnishings/Equipment: The following furnishings and equipment shall be delivered and placed subject to Owner approval:

1. Owner's Space: One office desk and chair with two guest chairs. Chairs shall be adjustable height and on rollers with arm rests.
2. Chairs in common space: Eight desk-type chairs, adjustable heights, on rollers, with armrests.
3. Drawing Table: One plywood or standard drawing tables, 3 feet by 6 feet, with all required appurtenances.
4. Printer/Copier: One color copier capable of copying, scanning, and printing pages up to and including 11-inch-x-17-inch paper size. All warranties, maintenance, and servicing for the duration of the Work. Sufficient appropriate ink/toner cartridges and paper for the Owner or the Owner's Representatives to print thirty 11-inch-x-17-inch or sixty 8-1/2-inch-x-11-inch color prints per week for the duration of the Work in addition to the Contractor's printing needs.
5. One each: 4.0-cubic-foot or larger refrigerator, microwave, coffee machine, and toaster oven.
6. Other furnishings, storage, or equipment deemed necessary by the Contractor.

B. Miscellaneous Field Supplies

1. One minimum/maximum digital thermometer with batteries for the duration of the Work.
2. Broom, dustpan, and brush.
3. One rain gauge.
4. One 36-inch-x-72-inch table and eight folding chairs.
5. Large wastebasket.
6. Wall clock.

1.04 ELECTRICITY, LIGHTING

A. The Contractor shall obtain and pay for utilities including electrical facilities and water and sanitary facilities. Connections to existing facilities will not be allowed unless properly metered and protected.

1.05 SANITARY FACILITIES

A. The Contractor shall provide suitable and adequate toilet facilities for all employees, subject to the approval of the Owner as to the type, size, and location.

B. The facilities shall be maintained in a sanitary condition, frequently cleaned and disinfected, and promptly removed from the site when directed by the Owner.

1.06 FIRST AID

A. The Contractor shall provide a completely equipped first-aid kit that shall be maintained in a clean and orderly condition in the field office.

B. Telephone numbers for summoning aid from the Police Department, Fire Department, physicians, ambulances, inhalator, and rescue squads from outside sources shall be conspicuously posted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

This Section includes the minimum requirements for the furnished materials and equipment for this project. The more stringent requirements in the Technical Specification sections shall take precedence over these requirements for any conflicts.

A. Materials and equipment furnished by the Contractor shall be new and shall not have been in service at any other installation unless otherwise approved. They shall conform to applicable specifications approved in writing by the Engineer.

B. Manufactured and fabricated products shall be designed, fabricated, and assembled in accordance with the best engineering and shop practices. Like parts of duplicate units shall be manufactured to standard sizes and gauges so as to be interchangeable.

C. Quantities of items that are identical shall be by the same manufacturer, regardless of the Design Package breakdown.

D. Equipment sizes, capacities, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

E. Materials and equipment shall not be used for any purpose other than that for which they are designed or specified.

F. Where materials are specifically shown or specified to be reused in the Work, special care shall be used in removing, handling, storing, and reinstalling.

G. Material and equipment incorporated into the Work:

1. Shall conform to applicable specifications and standards.

2. Shall comply with size, make, type, and quality specified or as specifically approved in writing by the Engineer.

3. Manufactured and fabricated products:

a. Rotating machinery shall be designed and fabricated to provide satisfactory operation without excessive wear and without

excessive maintenance during its operating life. Rotating parts shall be statically and dynamically balanced and shall operate without excessive vibration.

1.02 ACCEPTANCE OF MATERIAL AND EQUIPMENT

A. Only new materials and equipment shall be incorporated in the Work unless otherwise specified to be reused. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Engineer. No material shall be delivered to the site that does not meet the Contract Specifications.

B. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporating in the work. Any delay of acceptance resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of claim against the Owner.

C. The materials and equipment used in the Work shall correspond to the approved samples or other data.

D. If requested, the Contractor shall be required to submit to the Engineer ample evidence that each and every part of the materials, machinery, and equipment to be furnished is of a reliable make and of a type that has been in successful operation within the continental United States. No equipment will be considered unless the manufacturer has designed and manufactured equipment of a comparable type and size for at least 3 years. The Engineer will not allow any experimental or untried type of material or machinery to be installed.

E. The equipment specified shall be carefully designed and installed to ensure that it adequately performs all required functions within the specified degree of precision. Each unit shall operate with each of the other parts of the equipment to provide a completely integrated system that shall operate to the satisfaction of the Engineer.

F. All equipment, machinery, parts, and assemblies of equipment, machinery, or parts entering into the Work shall be tested as specified. Unless waived in writing by the Engineer, all field and operating tests shall be made in the presence of the Engineer or the Engineer's authorized representative. When such a waiver is issued, the Contractor or manufacturer shall furnish sworn statements in duplicate of the tests conducted and the results of the tests to the Engineer.

1.03 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

A. The equipment installation details shall suit the existing and furnished equipment and are subject to acceptance by the Engineer.

B. Any changes or revisions made necessary by the type and dimensions of the equipment furnished shall be made at the expense of the Contractor who shall furnish detailed drawings showing such changes or revision for the acceptance of the Engineer.

C. The installation of all work shall comply with the manufacturer’s printed instructions. The Contractor shall obtain and distribute copies of such instructions to parties involved in the installation, including six copies to the Engineer for distribution. One complete set of instructions shall be maintained at the job site during installation and until the Project is complete.

D. All products and equipment shall be handled, installed, connected, cleaned, conditioned, and adjusted in accordance with the manufacturer’s instructions and specified requirements. Should job conditions or specified requirements conflict with the manufacturer’s instructions, such conflicts shall be called to the Engineer’s attention for resolution and revised instructions.

E. The Contractor shall perform work according to the manufacturer's instructions and not omit any preparatory step or installation procedure unless the instructions are specifically modified or the step or procedure exempted by the Contract Documents.

1.04 INSTALLATION OF EQUIPMENT

A. The cost of the Work shall include the cost of competent manufacturers’ representatives of all equipment to supervise the installation, adjustment, and testing of the equipment as required elsewhere in the specifications and to instruct the Owner's operating personnel on operation and maintenance.

B. A certificate from the manufacturer stating that the installation of the equipment is satisfactory, that the unit has been satisfactorily tested, is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of the unit shall be submitted before Substantial Completion. The Manufacturer’s Certificate of Compliance and Equipment Manufacturer’s Certificate of Installation Testing and Instruction are included in Section 11000, General Equipment Requirements.

C. The Contractor shall furnish the service of competent manufacturers' representatives for Contractor furnished equipment when evident malfunction or

over-heating makes such services necessary or as determined by the Engineer. All such equipment shall be installed by skilled mechanics and in accordance with the instructions of the manufacturer.

D. Special care shall be taken to ensure proper alignment of all equipment with particular reference to mechanical equipment such as pumps. These units shall be carefully aligned on their foundations by qualified millwrights after their sole or base plates have been shimmed to true alignment at the anchor bolts. The anchor bolts shall be set in place and the nuts tightened against the shims. After the manufacturer has approved the foundation alignments, the bedplates or wing feet of the equipment shall be securely bolted in place. The alignment of equipment shall be further checked after securing to the foundations. After all alignments are confirmed, the sole or base plates shall be finally grouted in place. The Contractor shall be responsible for the exact alignment of equipment with associated piping, and under no circumstances will "pipe springing" be allowed. Special installation requirements in the Technical Specifications shall take precedence over the requirements of this Section.

E. The Contractor shall furnish all wedges, shims, filling pieces, keys, packing, grout, or other materials necessary to properly align, level, and secure an apparatus in place. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper alignment after erection shall be done at the expense of the Contractor.

F. The Contractor shall furnish the necessary materials and construct suitable concrete foundations or pads for all equipment installed by the Contractor, even though such foundations or pads may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting.

G. In setting pumps the Contractor shall make an allowance of at least 1 inch for grout under the equipment bases. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and as inconspicuous as possible in the completed work. Unless otherwise permitted, all grout shall be a suitable non-shrinking grout.

1. Grout shall be mixed and placed in accordance with the recommendations of the manufacturer. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.
2. Where such procedure is impracticable, the method of placing grout shall be as permitted. After the grout has hardened sufficiently, all forms, hoppers, and excess grout shall be removed, and all exposed grout

surfaces shall be patched in an approved manner and, if necessary, as required by the Engineer, and given burlap-rubbed finish.

1.05 SPECIAL TOOLS

A. Manufacturers of equipment and machinery shall furnish two sets of any special tools (including grease guns or other lubricating devices) required for normal adjustment, operations and maintenance, and disassembly, together with instructions for their use. The Contractor shall preserve and deliver to the Engineer these tools and instructions in good order before completing the Contract. Tools shall be high-grade, smooth, forged, alloy tool steel. Grease guns shall be lever-type.

B. Special tools are considered to be those tools that because of their limited use are not normally available but that are necessary for the particular equipment.

C. Special tools shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such special tools until completion of the work, at which time they shall be delivered to the Engineer.

1.06 LUBRICATION SYSTEM

A. The minimum design criteria for lubricating moving parts of the equipment shall include 1 week of continuous operation during which no lubricants shall be added to the system.

B. The system shall be designed to receive lubricants whether in operation or shut down and shall not leak or waste lubricants under either condition. The manufacturer's recommendations of grade and quality and a supply of the lubricants so recommended in quantities sufficient to conduct start-up and testing operations shall be furnished with the equipment. The Contractor shall provide a 1-year supply of each required lubricant.

1.07 TESTS AND TEST REPORTS

A. When used in the Contract Documents, "Factory/Fabricating Shop Performance, Evaluation, Certification, and/or Acceptance Tests and Test Reports" shall be considered to mean the corresponding manufacturer’s, fabricator's, and/or other builder's official test and tests reports. Included in these test reports shall be appropriate substantiating documentation/data ascertaining the correct and complete manufacture, fabrication, and "shop performance" (to the greatest extent normally practicable) of the particular material, equipment, system, and/or facilities proposed for eventual delivery. These are subdivided into three significant tests and test report types: 1) Certification Tests and Test Reports,

2) Factory Tests and Test Reports, and 3) Shop Performance/Evaluation Tests and Test Reports. Minimal requirements are described below.

B. Certification Tests and Test Reports

1. Standard specifications, code references, etc. for minimum quality and workmanship levels are indicated in the Contract Documents and Construction Documents. Statements, certificates, and other substantiating reporting data, called "Certification Test Reports" in this Section, of tests conducted on previously manufactured materials or equipment identical to that proposed for use shall be compiled by the Contractor.
2. At a minimum, all Certification Test Reports shall contain an official analysis of sufficient material composition or show evidence of meeting or exceeding the specified material standard(s) referenced, e.g., ASTM, ASME, or other designations. All reports shall also indicate from whom the material was/will be purchased.
3. The Contractor shall pay all costs of certification tests and test reports.

C. Factory Tests and Test Reports

1. Additional tests and reports performed on material or equipment by the manufacturer or fabricator to ascertain quality or workmanship are referred to here as "Factory Tests and Test Reports."
2. Before the delivery of any Factory Test Report, the Contractor shall first submit for review and approval a detailed description of the proposed testing, including reporting procedure and criteria. Such descriptions shall also be delivered to the Engineer for review as part of the first submission of the technical submittal.
3. Materials and equipment used in the performance of the Work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. If Work to be accomplished away from the construction site is to be inspected on behalf of the Owner during its fabrication or manufacture, the Contractor shall give prior notice to the Engineer of the place and time where such fabrication or manufacture is to be done. Such notice shall be in writing and delivered to the Engineer not less than 30 days before the Work is to be done so that the necessary arrangements for the particular factory inspection tests can be made.
4. Upon completion of the factory inspection tests and immediately following manufacture or fabrication, the Contractor shall compile a complete Factory Test Report following the approved format above. All such reports shall be delivered to the Engineer for review as part of the technical submittal corresponding to such tested material or equipment.

D. Shop Performance/Evaluation Tests and Test Reports

1. Material and equipment used in the performance of the Work of this Contract are also subject to evaluation and testing after the complete full-scale assembly into major equipment and/or systems. Shop Performance/ Evaluation Tests, i.e., tests of simulated startup, steady-state, variable loading, and other normal operating conditions, for such assembled equipment/systems shall be accomplished in strict accordance with the standard testing practices specified or otherwise accepted by the Engineer.
2. Before the delivery of any Shop Performance/Evaluation Test Report, the Contractor shall submit for review a detailed description of the proposed performance/evaluation tests, including anticipated reporting procedures, data reduction, and criteria used. Where appropriate, such descriptions shall also be delivered to the Engineer for review as part of a first or subsequent submission of the technical submittal.
3. Should such performance/evaluation tests be accomplished away from the construction site, the Contractor shall give prior notice to the Engineer of the places and times where such tests will be accomplished. Such prior notice shall be in writing and delivered not less than 30 days before such events so that necessary arrangements for the particular tests can be made.
4. The requirements above pertaining to Factory Tests and Test Reports shall be incorporated for shop Performance/Evaluation Tests and Test Reports. Unless factory tests are coincident with shop performance tests and vice versa for the same material or equipment, a minimum of 15 days shall be scheduled between such multiple equipment tests where extended travel is required.

E. Cost of Performance Shop Tests

1. The Contractor shall conduct shop performance full-scale tests at its expense on all equipment as specified. Each piece of equipment shall be tested completely assembled and the shop tests performed by the equipment manufacturer until successful tests are achieved.
2. If the performance tests are conducted outside the continental United States, the Contractor shall pay all transportation expenses incurred by the Owner's representatives in witnessing the tests at no additional cost to the Owner.

1.08 FIELD TESTING

A. Field testing shall be conducted when called for in the Technical Specification Sections and on all completed systems in general. The Contractor shall provide services of a factory-authorized service representative to perform, approve, and certify the field testing specified in this Section. Field testing shall generally

consist of performing the pre-startup and startup tests as specified in the Division 11 Specifications and the final mechanical performance test specified in Section 11000, General Equipment Requirements. The Contract Documents may require the Contractor to perform factory testing on equipment items before the Engineer approves their use for this project. The Contractor shall refer to the Division 11 Specifications regarding equipment shop testing requirements.

B. After completing the installation, the Contractor shall test the system in the presence of the Engineer and under actual operating conditions. Tests shall be performed according to the manufacturer's recommendations.

C. The Contractor shall include with its bid the services of the equipment manufacturer's field service technician for a period necessary to complete the Work to the satisfaction of the Engineer.

D. This service shall be for the purposes of checkout, initial start-up, certification, and instruction of facilities personnel.

E. A written report covering the technician's findings and installation approval shall be submitted to the Engineer covering all inspections and outlining in detail any deficiencies noted.

1.09 ACCEPTANCE OF INSTALLATION

A. The Engineer may accept an equipment system installation as ready for Substantial Completion when:

1. The Engineer has accepted all factory tests and all other component testing.
2. The Engineer has accepted all performance shop tests.
3. All components of the system are installed and tested, including without limitation hydrostatic tests, leak tests, continuity tests, insulation resistance tests, phase rotation tests, bump tests, stroke testing, calibration, adjustment for proper operation, and all other component tests as appropriate.
4. Field start-up activities have been completed and approved by the Engineer.
5. The appropriate certificates have been submitted.
6. All equipment has met the performance requirements.
7. The Engineer has accepted integrated system tests and adjustments performed by the Contractor to demonstrate that the system as a whole functions reliably and meets the performance requirements, in manual and automatic modes, without failure, fault, or defect of any component or of the system as a whole.

8. The Engineer has accepted integrated facilities tests performed by the Contractor to demonstrate that the entire Construction functions together reliably as an integrated facility and meets the performance requirements, in manual and automatic modes, without failure, fault, or defect of any component.
9. The Engineer has accepted facility performance tests that demonstrate that the design criteria and performance criteria are met.
10. The Engineer has accepted the O&M Manuals.
11. All required Owner personnel have been trained.
12. All other Contract requirements for Substantial Completion have been satisfied.

1.10 ELECTRICAL EQUIPMENT ENCLOSURES

A. All items of electrical equipment that are furnished with process, or other equipment shall conform to the requirements specified under Section 16401, Low-Voltage Electrical Work—General Requirements. Enclosures for electrical equipment, such as switches and starters, shall conform to the requirements specified under Section 16401, Low-Voltage Electrical Work—General Requirements.

1.11 EQUIPMENT DRIVE GUARDS

A. Screens, guards, or cages shall be provided for all exposed rotating or moving parts in accordance with accepted practices of applicable governmental agencies. Unless specified otherwise in the technical sections, guards shall be constructed of galvanized sheet steel or galvanized woven wires or expanded metal set in a frame of galvanized steel members. Guards shall be secured in position by steel braces or straps that will permit easy removal for servicing the equipment.

1.12 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous-impregnated felt, heavy -bituminous coatings, nonmetallic separators or washers, or other acceptable materials.

1.13 SLEEVES

A. Unless otherwise indicated on the Drawings or specified, openings for the passage of pipes through floors and walls shall be formed of sleeves of standard-weight, galvanized-steel pipe. Each sleeve shall be of ample diameter to pass the pipe and its insulation, if any, and to permit such expansion as may occur. Sleeves shall be

of sufficient length to be flush at the walls and the bottom of the slabs and to project 2 inches above the finished floor surface. Threaded nipples shall not be used as sleeves.

1.14 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The Contractor shall arrange for a qualified service representative from each company manufacturing or supplying certain equipment as listed in this Section (or in the respective Technical Specification sections) to perform the duties described in this Section.

B. After the listed equipment has been installed and the equipment is presumably ready for operation but before it is operated by others, the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include but not be limited to the following points as applicable:

1. Soundness (without cracked, abraded, or otherwise damaged parts).
2. Completeness in all details, as specified.
3. Correctness of setting, alignment, and relative arrangement of various parts.
4. Adequacy and correctness of packing, sealing, and lubricants.

C. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

D. On completion of his or her work, the manufacturer's or supplier's representative shall submit in triplicate to the Engineer a complete, signed report of the result of the inspection, operation, adjustments, and tests. The report shall include detailed descriptions of the points inspected, tests and adjustment made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

E. After the Engineer has reviewed the reports from the manufacturer's representatives, the Contractor shall make arrangements to have the manufacturer's representatives present when the field acceptance tests are made in addition to training of the Owner's operation personnel.

F. The Contractor, at a minimum, shall arrange for the service of qualified service representatives from the companies manufacturing or supplying the following equipment and as required in the Technical Specifications:

1. Pumping Equipment.
2. Instrumentation and Control Systems.
3. Flow Meters.
4. Fiber Optic Communication System.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01650
DELIVERY, STORAGE, AND HANDLING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the general requirements for the delivery, handling, storage, and protection of all items required in the construction of the Work. Specific requirements, if any, are specified with the related item.

1.02 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in this Section for storing and protecting the items.

B. The Contractor shall do the following:

1. Provide instructions to all vendors regarding procedures for delivering materials to the construction site. The instructions shall require all delivery vehicles to be in possession of the instructions and to contact the Contractor's on-site representative before attempting to enter the landfill site. The Contractor's representative shall notify the scale house before the arrival of deliveries, instruct drivers regarding the route to the construction site and the speed limit, and when necessary escort the delivery vehicle to the unloading area.

2. Shall not rely on the Owner's employees to direct deliveries to the construction site or to unload deliveries.

3. Materials and equipment shall be loaded and unloaded by methods affording adequate protection against damage. Every precaution shall be taken to prevent injury to the material or equipment during transportation and handling. Suitable power equipment shall be used, and the material or equipment shall be under control at all times. Under no condition shall the material or equipment be dropped, bumped, or dragged. When a crane is used, a suitable hook or lift sling shall be used. The crane shall be so placed that all lifting is done in a vertical plane. Materials or equipment skid loaded, palletized, or handled on skidways shall not be skidded or rolled against material or equipment already unloaded.

4. Material and equipment shall be delivered to the job site by means that will adequately support it and not subject it to undue stresses. Material and

equipment damaged or injured in the process of transportation unloading or handling shall be rejected and immediately removed from the site.

5. The Contractor shall coordinate the delivery of all materials, including those furnished by the Owner. The Contractor shall be responsible for the proper transport, handling, and storing of all materials, and materials shall be protected to ensure their expected performance. Delivery schedules shall be coordinated by the Contractor, in advance, so that the Work will be done in a timely manner.

6. The Contractor shall coordinate deliveries of products with construction schedules to avoid conflict with work and conditions at the site. The Contractor shall also do the following:

    a. Deliver products in undamaged condition, in the manufacturer's original containers or packaging, with identifying labels intact and legible.
    b. Immediately on delivery, inspect shipments to ensure compliance with requirements of the Contract Documents and approved submittals and to ensure that the products are properly protected and undamaged.

7. The Contractor shall provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

8. All materials and equipment shall be stored on-site in complete compliance with the manufacturer’s recommendations.

9. Store products subject to damage by the elements in weathertight enclosures.

10. Maintain temperature and humidity within the ranges required by the manufacturer's instructions.

11. Store fabricated products above the ground, on blocking or skids to prevent soiling or staining. Cover products that are subject to deterioration with impervious sheet coverings, and provide adequate ventilation to avoid condensation.

12. All materials and equipment to be incorporated in the Work shall be handled and stored by the Contractor before, during, and after shipment in a manner that will prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft, or damage of any kind to the material or equipment.

13. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the Work, and the Contractor shall receive no compensation for the damaged material or its removal.

14. The Contractor shall arrange storage in a manner to provide easy access for inspection and make periodic inspections of stored products to ensure that products are maintained under specified conditions, free from damage or deterioration.

15. The Contractor shall provide substantial coverings as necessary to protect installed products from traffic damage and subsequent construction operations and shall remove these coverings when they are no longer needed.

16. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract, within 7 days after written notice to do so has been given, the Engineer retains the right to correct all deficiencies noted in the previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may include expenditures for labor, equipment use, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

17. Schedule delivery to reduce long-term onsite storage before installation and/or operation. Under no circumstances shall equipment be delivered to the site more than 1 month before installation without written authorization from the Engineer.

18. Coordinate delivery with installation to ensure minimum holding time for items that are easily damaged, or sensitive to deterioration.

19. Deliver products to the site in the manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting, and installing.

20. Unload and place all items delivered to the site in a manner which will not hamper normal construction operation nor that of subcontractors and other contractors and will not interfere with the flow of necessary traffic.

21. Provide necessary equipment and personnel to unload all items delivered to the site.

22. The Contractor shall store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Follow storage instructions, review them with the Engineer, and keep a written record of this. Arrange storage to permit access for inspection.

23. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

24. Store cement under a roof and off the ground and keep it completely dry at all times. All structural, miscellaneous, and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping, or cracking. Handle and store brick, block, and similar masonry products in a manner to keep breaking, cracking, and spilling to a minimum.

25. Store all mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) in a weathertight building to prevent damage. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. The building shall be provided with adequate ventilation to prevent condensation. The Contractor shall ensure that temperature and humidity are maintained within the range required by the manufacturer.

    a. All equipment shall be stored fully lubricated unless otherwise instructed by the manufacturer.
    b. Lubricants shall be changed when installation is complete and as frequently as required thereafter during the period between installation and acceptance. The Contractor shall put new lubricants into the equipment at the time of acceptance.
    c. Before accepting equipment that has been stored for some time, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01720
FIELD ENGINEERING

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall do the following:

A. Provide and pay for the following field engineering services required for the Project:

1. Survey work required in the execution of the Project.
2. Civil, structural, or other professional engineering services specified or required to execute the Contractor's construction methods.

B. Retain the services of a Florida-registered land surveyor to do the following:

1. Identify existing control points and property line corner stakes as required.
2. Verify all existing structure locations and all proposed structure corner locations, and equipment locations within the Project site.
3. Maintain an accurate location of all buried piping 4 inches in diameter and larger.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

B. The Contractor shall submit to the Engineer the name and address of the registered land surveyor or professional engineer.

C. On request of the Engineer, the Contractor shall submit documentation to verify the accuracy of field engineering work.

D. The Contractor shall submit a certificate signed by a registered land surveyor certifying that elevations and locations of improvements are in conformance or non-conformance with Contract Documents.

E. At the end of the Project and before final payment, submit the certified drawings listed below with the Surveyor's title block (signed and sealed by the registered

land surveyor) of the items listed below. These drawings shall be included with and made a part of the project record documents.

1. Certified site survey at 1-inch = 50-foot scale on sheets 24 inches by 36 inches, indicating the paved areas, and location of all aboveground structures for the project site.
2. Certified drawing showing the location, lines, and grades of all lines and other buried facilities (i.e., valves, tanks, vaults, etc.) installed as a result of the work. This shall be at the same scale as the Engineer's yard piping drawing and submitted on reproducible tracing paper.
3. Certified drawings showing elevations of all flow control points such as weirs, and elevations of all existing and new structures.
4. Certified drawings showing elevations of the subgrade layer and the top of protective cover soil layer.
5. Certified drawings showing the invert elevations at-50 foot intervals along the length for all leachate collection piping.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. All work shall be performed in accordance with the Minimum Technical Standards set forth by the Board of Professional Surveyors and Mappers.

1.04 QUALITY ASSURANCE

A. Existing basic horizontal and vertical control points for the project are those designated on Drawings.

B. Locate and protect control points before starting site work and preserve all permanent reference points during construction:

1. Make no changes or relocations without prior written notice to the Engineer.
2. Report to the Engineer when any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.
3. Require the surveyor to correctly replace project control points that may be lost or destroyed.
4. Establish replacements based on original survey control.

1.05 QUALIFICATIONS

A. Registered land surveyor of the discipline required for the specific service on the project, currently licensed in Florida.

1.06 SYSTEM DESCRIPTION

A. The Contractor shall establish a minimum of two permanent benchmarks on the site, referenced to data established by survey control points:

1. Record locations, with horizontal and vertical data, on Record Documents.

B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:

1. Site improvements:

a. Stakes for grading, fill, and topsoil placement.
b. Utility slopes and invert elevations.

2. Building (pump station) foundations, and floor levels.

3. Controlling lines and levels required for mechanical and electrical trades.

C. From time to time, verify layouts by the same methods.

D. Maintain a complete and accurate log of all control and survey work as the work progresses.

E. As a condition for approval of monthly progress payment requests, update the project record drawings monthly based on the work performed during the month ending at the pay request. The Contractor shall coordinate this monthly with the Engineer on the site as part of the pay request.

F. Maintain an accurate record of piping changes, revisions, and modifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01740
FINAL CLEANING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall execute cleaning during progress of the Work and at the completion of the Work as required by General Conditions.

1.02 ENVIRONMENTAL CONCERNS

A. Cleaning and disposal operations shall comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

The Contractor shall do the following:

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 EXECUTION

3.01 PERIODIC CLEANING

The Contractor shall do the following:

A. Execute periodic cleaning to keep the work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris.

B. Provide on-site containers for the collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal areas away from the site.

3.02 DUST CONTROL

The Contractor shall do the following:

A. Clean before the start of painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.03 FINAL CLEANING

The Contractor shall do the following:

A. Employ skilled workers for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from surfaces exposed to view.

C. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

D. Before final completion or Owner occupancy, inspect surfaces exposed to view and all work areas to verify that the entire Work is clean.

END OF SECTION

SECTION 01755
EQUIPMENT TESTING AND STARTUP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall provide a competent field services technician of the manufacturers of all equipment furnished under Divisions 11, Equipment, 15, Mechanical, and 16, Electrical, to supervise installation, adjustment, initial operation and testing, performance testing, final acceptance testing, and startup of the equipment.

B. The Contractor shall perform specified equipment field performance tests, final acceptance tests, and startup services.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Submit name, address, and résumé of proposed field services technicians at least 30 days in advance of the need for such services.

B. Submit for review detailed testing procedures for shop tests, field performance tests, and final acceptance tests as specified in the various equipment Specification Sections. Test procedures shall be submitted at least 30 days in advance of the proposed test dates and shall include at least the following information:

1. Name of equipment to be tested, including reference to Specification Section number and title.
2. Testing schedule of proposed dates and times for testing.
3. Summary of power, water, etc., needs and identification of who will provide them.
4. An outline of specific assignments of the responsibilities of the Contractor and manufacturers' factory representatives or field service personnel.
5. Detailed description of step-by-step testing requirements, with reference to appropriate standardized testing procedures and laboratory analyses by established technical organizations (e.g., ASTM, WPCF Standard Methods).
6. Samples of forms to be used to collect and record test data and to present tabulated test results.

C. Submit copies of test reports upon completion of specified shop, performance, and acceptance tests. Test reports shall incorporate the information provided in the test procedures submittals, modified to reflect the actual conducting of the tests and the following additional information:

1. Copies of all test data sheets and results of lab analyses.
2. Summary comparison of specified test and performance requirements vs. actual test results.
3. Should actual test results fail to meet specified test and performance requirements, a description of actions to be taken before re-testing the equipment.

D. Submit copies of the manufacturer's field service technician's report summarizing the results of the initial inspection, operation, adjustment, and pre-tests. The report shall include detailed descriptions and tabulations of the points inspected, tests and adjustments made, quantitative results obtained, suggestions for precautions to be taken to ensure proper maintenance, and the equipment supplier's Certificate of Installation in the format specified in this Section.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)
B. Water Pollution Control Federation (WPCF)

1.04 QUALITY ASSURANCE

A. Field service technicians shall be competent and experienced in the proper installation, adjustment, operation, testing, and startup of the equipment and systems being installed.

B. Manufacturers' sales and marketing personnel will not be accepted as field service technicians.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PRELIMINARY REQUIREMENTS

A. After the equipment has been installed and the equipment is presumably ready for operation but before it is operated by others, the manufacturer's field service technician shall inspect, operate, test, and adjust the equipment. The inspection shall include at least the following points where applicable:

1. Soundness (without cracks or otherwise damaged parts).
2. Completeness in all details, as specified and required.
3. Correctness of setting, alignment, and relative arrangement of various parts.
4. Adequacy and correctness of packing, sealing, and lubricants.

B. The operation, testing, and adjustment shall be as required to prove that the equipment has been left in proper condition for satisfactory operation under the conditions specified.

C. Upon completion of this work, the manufacturer's field service technician shall submit a signed report of the results of his/her inspection, operation, adjustments, and tests.

3.02 WITNESS REQUIREMENTS

A. Shop tests or factory tests may be witnessed by the Engineer, as required by the various equipment specifications.

B. Field performance and acceptance tests shall be performed in the presence of the Engineer.

END OF SECTION

SECTION 01770
PROJECT CLOSEOUT

PART 1 GENERAL

1.01 SUBSTANTIAL COMPLETION

A. When the Contractor considers that the Work or designated portion of the Work is Substantially Complete, the Contractor shall submit written notice to the Engineer with a list of items to be completed or corrected.

B. If the Engineer's review finds that the Work is not substantially complete, the Engineer will promptly notify the Contractor in writing, listing observed deficiencies.

C. The Contractor shall remedy deficiencies and send a second written notice of Substantial Completion.

D. When the Engineer finds the Work is Substantially Complete, the Engineer will prepare a Certificate of Substantial Completion.

1.02 FINAL COMPLETION

A. When the Contractor considers that the Work or designated period of the Work is complete, the Contractor shall submit written certification to the Engineer indicating the following:

1. The Contract Documents have been reviewed.
2. The Work has been reviewed for compliance with the Contract Documents.
3. The Work has been completed in accordance with the Contract Documents and deficiencies listed with Certificates of Substantial Completion have been corrected.
4. The Work is complete and ready for final inspection.
5. All required shop drawings, catalog cuts, operations and maintenance manuals, instruction manuals, test reports, samples, and all other submittals have been submitted and reviewed by the Engineer.
6. All deliverables have been delivered or placed as accepted by the Engineer.

B. If the Engineer's review reveals that the Work is incomplete, the Engineer will promptly notify the Contractor in writing listing observed deficiencies.

C. The Contractor shall remedy deficiencies and send a second certification of Final Completion.

D. When the Engineer finds that the Work is complete, the Engineer will consider closeout submittals.

1.03 ADDITIONAL REVIEW FEES

A. If the status of Completion of Work requires more than two reviews (one substantial completion review and one final completion review) of the Work by the Engineer due to failure of the Work to comply with the Contractor's claims on the first and second reviews, the Owner will deduct from the final payment to the Contractor the amount of the Engineer’s compensation for additional review services.

1.04 CLOSEOUT SUBMITTALS

A. Evidence of Compliance with Requirements of Governing Authorities:

1. All required Certificates of Government Inspections verifying conformance with project permitting documents including but not limited to local and FDEP.

B. Operation and Maintenance Manuals: Under the provisions of Section 01830, Operations and Maintenance Manuals.

C. Record Documents: Under the provisions of Section 01785, Record Documents.

D. Evidence of Payment and Release of Liens: In accordance with the Conditions of the Contract.

E. Consent of Surety to Final Payment.

1.05 STATEMENT OF ADJUSTMENT OF ACCOUNTS

A. Submit final statement reflecting adjustments to total Contract Price, indicating the following:

1. Original total Contract Price.
2. Previous change orders.
3. Changes under allowances.
4. Changes under unit prices.
5. Deductions for uncorrected Work.
6. Penalties and bonuses.

7. Deductions for liquidated damages.
8. Deductions for Engineer's additional review fees.
9. Other adjustments to total Contract Price.
10. Total Contract Price as adjusted.
11. Previous payments.
12. Sum remaining due.

B. Upon the Owner's review and approval, the Engineer will issue a final Change Order reflecting approved adjustments to the total Contract Price not previously made by change orders.

1.06 APPLICATION FOR FINAL PAYMENT

A. Submit application for final payment in accordance with provisions of the Conditions of the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01780
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall do the following:

A. Compile specified warranties.
B. Compile specified bonds (if required by the Contract Documents).
C. Co-execute submittals when so specified.
D. Review submittals to verify compliance with Contract Documents.
E. Submit submittals to the Engineer for review.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Assemble warranties and bonds executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: two each.

C. Table of Contents: Neatly typed, in sequence of the Specifications. Provide completion information for each item as follows:

1. Product or work item.

2. Firm, address, telephone and fax numbers, and name and email of principal.

3. Scope.

4. Date of beginning of warranty, bond, or service and maintenance contract.

5. Duration of warranty, bond, or service and maintenance contract.

6. Provide information for Owner's personnel:

a. Proper procedure in case of failure.
b. Instances that might affect the validity of warranty or bond.

7. Contractor, with address, telephone and fax numbers, and the name and email of responsible principal.

D. Submittal of warranties and bonds shall be included in submittals for review and before Final Completion with actual dates included.

E. The Contractor's obligation to correct defective or nonconforming Work shall run for a minimum of 1 year (or such longer period may otherwise be specified in the Contract Documents) from the date Final Completion in accordance with Section 00700, General Conditions, Paragraph 6.17.E.

1.03 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and this Section.

B. All mechanical and electrical equipment together with devices of whatever nature and all components that are furnished and/or installed by the Contractor shall be guaranteed.

C. The guarantee shall be against the manufacturing and/or design inadequacies, materials, and workmanship not in conformity, improper assembly, hidden damage, failure of devices and/or components, excessive leakage, or other circumstances that would cause the equipment to fail under normal design and/or specific operating conditions for a minimum of 1 year (or such longer period may otherwise be specified in the Contract Documents) from the date of Final Acceptance in accordance with Section 00700, General Conditions, Paragraph 6.17.E.

D. The Contractor shall replace and install each piece of equipment, device, or component that shall fail within the term specified above of the guarantee with reasonable promptness without increase in the Contract Price. If the Contractor fails to provide timely repairs as specified in this Section, the Owner shall issue a claim against the Contractor's Bond. In some instances, if approved by the Owner, the Contractor may be allowed to repair the equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01785
RECORD DOCUMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section details the minimum requirements for the Contractor for maintenance and recording of Record Documents.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. The Contractor shall store documents and samples in the Contractor's field office apart from documents used for construction and shall do the following:

1. Provide files and racks for storage of documents.
2. Provide cabinet or secure storage space for storage of samples.

B. The Contractor shall institute a computerized record control program.

C. The Contractor shall make documents and samples available at all times for inspection by the Engineer.

D. At Contract closeout, the Contractor shall transmit Record Documents and samples with cover letter to the Engineer, listing the following:

1. Date.
2. Project title and number.
3. Contractor's name and addresses.
4. Number and title of each Record Document.
5. Signature of Contractor or its authorized representative.
6. Contract Section and Subsection numbers.
7. Location.

E. Before assembling and submitting records, the Contractor shall review for completeness the records maintained by its subcontractors.

F. Tracings of all Construction Documents and Shop Drawings made by the Contractor, subcontractors, and suppliers of materials or equipment shall be corrected to show the Work as actually completed or installed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROJECT RECORD

A. The Contractor shall label and file Record Documents and samples in accordance with the corresponding Specification Section number. Each document shall be labeled “PROJECT RECORD” in neat, large, printed letters. Record Documents shall be maintained in a clean, dry, and legible condition. Record documents shall not be used for construction purposes.

3.02 RECORDING

The Contractor shall record construction information as follows:

A. Record and update daily Record information from field notes on a set of opaque drawings and to the satisfaction of the Engineer.

B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

C. Record information concurrently (daily) with construction progress. Work shall not be concealed until required information is recorded.

D. Mark Record Drawings to reflect the following:

1. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
3. Field changes of dimension and detail.
4. Changes made by modifications.
5. Details not on original Construction Drawings.

E. CAD Requirements for Record Drawings: The Contractor shall provide the Engineer with a complete set of Record Drawings in the latest version of AutoCAD format upon completion of the Work. No additional compensation will be allowed for the Contractor to provide the Record Drawings. The Contractor shall use the AutoCAD drawings furnished by the Engineer for this purpose. Record Drawings must be submitted in the AutoCAD format of the contract drawings. No other CAD software or format will be accepted. It is Contractor's

sole responsibility to ensure that the Record Drawings conform to the following CAD requirements:

1. Drawings shall be submitted to the Engineer on CD-ROM. Each CD shall be clearly labeled with the appropriate project number, client name, date, and file names included on each CD. If files are compressed, a description of the compression software must be included along with a copy of the appropriate uncompressing software.
2. Layer filters shall be included for views or drawings on layout tabs.
3. All changes to drawings must be done in accordance with the appropriate scale of the drawing revised and shall be delineated by placing a "cloud" around the areas revised and adding a revision triangle indicating the appropriate revision number.
4. Each drawing must have the revision block completed to indicate the revision number, date, and initials of the person revising the drawing. The description of the revision must say "Record Drawing." This procedure must be followed for every drawing even when no changes are made to the drawing.
5. All revisions to drawings must be put on separate layers with the layer names prefixed Record followed by the appropriate existing layer name. The colors and line types of the appropriate existing layers shall be adhered to when creating new layers.
6. All entities shall be drawn with properties (i.e., line types and colors) BYLAYER. This also applies to all Civil 3D styles and objects. Civil 3D styles set to color by entity are not to be used.
7. Text shall be placed on a text only layer and will be 0.1 inch in height with a width factor of 0.9. The font for all text styles shall be ROMANS. Wipeouts are not to be used.
8. The LTSCALE variable shall be set to the viewport scale and all line types shall remain at an entity scale of 1.
9. When mixed scales are to be used (i.e., different horizontal and vertical scales), please contact the Jones Edmunds representative for input.
10. Contours shall be placed on a separate layer of their own. Contour labels shall be smaller than the rest of the text on the drawing (0.1 minimum). The contour interval shall be 1 foot. “Tick marks” designating depression contours, if used, shall be placed on a separate layer.
11. There shall be no disjointed lines or polylines. To the extent possible, lines and polylines shall be continuous. Splines are not to be used.
12. A short description of the survey shall be provided in writing. The description shall include coordinate base (horizontal and vertical datum), benchmark information, North rotation, etc.
13. Civil 3D spot elevations shall use only the Civil 3D Points command in their own layer. Spot elevations as Surface Labels are not to be used.

14. Drawings shall be provided in AutoCAD 2018 DWG (if base or plain and ONLY if exported to AutoCAD) format or Autodesk Civil 3D 2018 on compact disc, FTP, or via email.
15. The Contractor shall supply one full set of Record Drawings on reproducible black line prints and five full sets of opaque copies.

F. The Contractor shall have the Florida-licensed Professional Surveyor and Mapper submit signed-and-sealed record surveys of completed work or various required stages thereof and certify the Record Drawings as being correct and complete. Record surveys shall include but are not limited to:

1. Preconstruction Survey – Survey of site project site conditions prior to beginning work.
2. As-Built Liner Subgrade Survey – Survey of site subgrade following earthwork prior to geomembrane installation.
3. Groundwater monitoring wells (including top of casing).
4. Top of landfill leak-detection gravel including trench and sump gravel.
5. Top of landfill leachate-collection gravel including trench and sump gravel.
6. Leachate collection pipe including leak detection and leachate collection sump piping.
7. Pump stations and access drives.
8. Stormwater improvements.
9. Anchor trench.
10. Installed Drainage Soil.
11. Edge-of-liner markers.
12. Concrete structures.
13. Leachate force main.
14. Transducers, pumps, and suction lines.

END OF SECTION

SECTION 01800

HEALTH AND SAFETY PLAN

PART 1 GENERAL

1.01 GENERAL

A. No smoking will be allowed on the active disposal areas, in the work area, or in the construction field offices or confined spaces. Areas for smoking will be designated as immediately outside the construction field offices or as otherwise allowed by the Owner.

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

C. The Contractor is hereby made aware by the Owner and Engineer that the Construction Site is adjacent to and above active landfill cells, and that landfill gas may migrate onto the Construction Site. The Contractor shall take proven means to protect personnel and facilities from related hazards, including explosion, asphyxiation, and poisoning due to the presence of landfill gases.

D. Animals and plants may be present that could affect the health and safety of the Contractor.

1.02 SITE-SPECIFIC HEALTH AND SAFETY PLAN

A. The Contractor shall prepare a written site-specific Health and Safety Plan (Plan) for use by the Contractor and Subcontractor's site workers. This plan must be prepared to meet the 29 CFR 1910.120 OSHA regulations and shall include as a minimum, the following:

1. Organizational Structure: To include general supervision, Health and Safety officer, lines of authority, and responsibility and communication.

The Health and Safety Officer shall be a worker who will be present at all times during site construction, in addition to his/her other site duties.

2. Comprehensive Work Plan: To include the work tasks and objectives, resources needed, and training requirements for workers (health and safety, machine operations license, etc.). This shall also include a section on safety procedures to be followed for excavation.

3. Health and Safety: To include identification of possible site hazards, training levels for each category of site workers, personal protective equipment and medical surveillance needed, site control measures, and confined space entry procedures.

4. Emergency Response Plans: To include all emergency telephone numbers, a highlighted map showing the quickest route to the nearest emergency care facility and directions to the facility.

5. Air Monitoring Procedures: To include frequency and type of air monitoring of exposed refuse and site worker areas, calibration of air monitoring equipment and action levels of air contaminants for site worker protection. All equipment calibration and field gas measurements shall be recorded with the date and time of sample and the sampler's name. Sampling shall be done by a Contractor worker trained in the use of gas sampling equipment. These trained workers shall be designated in the Contractor's Plan.

6. A signature page for all site workers covered by the Plan (Contractor and Subcontractor site workers).

1.03 SUBMITTAL

A. The Contractor shall submit copies of the site-specific Plan to the Engineer at the pre-construction meeting. The Engineer will review the plan for information purposes only. It is the Contractor's responsibility to prepare and implement a Plan appropriate for the work to be conducted at the landfill.

1.04 SITE OPERATIONS

A. The Plan will be kept on site in a known and easily accessible spot during all site operating hours. All site workers will be notified of the location of the Plan.

B. The Contractor shall have a Health and Safety Officer, with requisite qualifications and experience, on site during all activities.

C. A Safety Meeting will be held by the Contractor and attended by all Contractor site workers before starting construction. The Contractor shall notify the Engineer before the meeting to provide the Engineer the opportunity to attend the meeting. At this safety meeting, the Plan will be reviewed with the site workers, and all site workers will sign the Plan indicating that they have been apprised of the Plan's contents. New site workers must review the Plan with the Contractor's Health and Safety Officer before beginning work on site and must sign that they have been apprised of the Plan's contents.

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

E. All heat or torch welding or joining with solvents should take place in areas away from exposed refuse when possible. When work must take place in an excavation, appropriate ventilation measures shall be taken, as addressed in the Contractor's plan.

F. Start-up and shutdown of engines will not be done in areas of excavated refuse.

G. *A Compilation of Landfill Gas Field Practices and Procedures*, Solid Waste Association of North America (SWANA), March 1992, shall be reviewed by the Contractor for further safety information and requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01820
TRAINING

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall do the following:

A. Instruct and train the Owner's personnel in the operation and maintenance of the equipment and systems supplied and/or installed under this Contract.

B. Incorporate operation and maintenance data and training services furnished by the suppliers into the training program such as shop drawings, equipment manuals, and start-up engineering and training assistance.

C. Ensure that system suppliers provide a qualified training instructor to help the Contractor train the Owner's employees in the proper operation and maintenance of all equipment and systems.

D. Prepare instructors and training materials required for complete factory, field, classroom, and hands-on training.

E. Furnish training videos and manuals during the training program.

F. Include in the total Contract Price the cost for training equipment; preparing training manuals; performing field, factory, and hands-on training; and coordinating and incorporating training service provided by suppliers and all other activities required to provide a comprehensive training program of sufficient length, as determined by the Owner and Engineer.

1.02 WORK SEQUENCE

A. The field training programs shall be conducted in accordance with the approved schedule.

B. Individuals requiring training shall be trained in small groups during Mondays through Fridays. The Contractor will normally provide training during the 8-hour dayshift.

C. The hands-on training shall be conducted with a maximum of 10 students per instructor.

D. The Contractor shall coordinate and submit a training schedule to the Engineer 30 days before the first training event.

1.03 QUALITY ASSURANCE

A. Preparation of training materials and instructions to be provided shall be performed by personnel:

1. Trained and experienced in operation and maintenance of equipment and systems installed under this Contract.
2. Familiar with the training requirements of the Owner.

B. The Contractor shall furnish résumés, including three outside references, for each instructor to be used in the training program.

C. The Engineer may review the résumés. Based on the review of the résumés and contacts with references, the Engineer shall approve, request additional information, or reject proposed instructors for the training program. If a proposed instructor is rejected, the Contractor shall submit the résumé and references of another candidate within a reasonable time.

1.04 TRAINING PLAN

A. At the completion of the Work, the Contractor shall provide a competent and experienced person thoroughly familiar with the Work for not less than 1 day to instruct permanent operating personnel in the operation of equipment and control systems.

B. At least 30 days before training, the Contractor shall submit to the Engineer a detailed training plan including the following:

1. Title and objectives.
2. Training schedule.
3. Prerequisite training and experience of attendees.
4. Recommended types of attendees (e.g., managers, engineers, operators, maintenance staff).
5. Course description and outline of course content.
6. Duration.
7. Location (e.g., training center or site).
8. Format (e.g., lecture, self-study, demonstration, hands-on).
9. Instruction materials and equipment requirements.

1.05 FORM OF TRAINING MANUALS

A. The Contractor shall prepare training packages in the form of an instruction manual for use by the Owner's personnel. At least 30 days before the training, the Contractor shall submit the training packages to the Engineer for acceptance.

B. Format

1. Size: 8-1/2 x 11 inches.

2. Paper: 20-pound minimum, white, for typed pages.

3. Text: Manufacturer's printed data or neatly word processed including the following:

   a. Table of contents.
   b. Learning objectives.
   c. General operations, theory, and specific equipment information.

4. Drawings:

   a. Provide reinforced punched binder tab, bind in with text.
   b. Reduce larger drawings and fold to size of text pages, not larger than 11 x 17 inches.

5. Cover: Identify each volume with the following:

   a. Title of Project.
   b. Identity of separate structure or system as applicable.
   c. Identity of general subject matter covered in the manual.
   d. Locations.

C. Binders

1. Commercial quality three-post binders with durable and cleanable plastic covers.
2. Maximum post width shall be 3 inches.
3. When multiple binders are used, correlate the information into related consistent groupings.

1.06 VIDEOTAPED TRAINING MATERIAL

The Contractor shall do the following:

A. Produce or provide video training material subject to approval of the Engineer.

B. Furnish four copies of each videotape in DVD format in plastic case with title, the Owner's name, and time on a label in a clear plastic sleeve.

C. Bear all costs associated with production and provision of the DVDs.

1.07 INSTRUCTIONS

A. At the completion of Work, the Contractor shall provide a competent and experienced person thoroughly familiar with the Work for a period of time as directed by the Owner and Engineer to instruct permanent operating personnel in the operation of equipment and control systems.

B. The Contractor shall furnish four complete sets of operating instructions applying to each piece of equipment installed in conjunction with this Contract.

C. An "As-Installed" diagram of all control wiring and operating instructions shall be mounted in a watertight pocket on the inside door of the control panel of each unit.

D. Unless otherwise specified, the Contractor shall provide engraved metal, plastic tags, or instructions on any valve, switch, control, pipe, or other piece of equipment which is not self-evident as to its function or mode of operation. This includes, but is not limited to, all exposed piping and all switches. This shall particularly apply to operations that must be manually sequenced.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01830
OPERATIONS AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall do the following:

A. Compile product data and related information appropriate for the Owner's maintenance and operation of products furnished under the Contract.

1. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent Sections of the Specifications. The data presented in the Operations and Maintenance (O&M) Manuals shall be specifically related to this Contract and application.
2. Incorporate maintenance and operation data furnished by the Engineer, if any.

B. Furnish all labor, equipment, materials, and all other items to supply and deliver to the Engineer O&M Manuals for the Work in accordance with the requirements of this Section.

C. Provide O&M Manuals for all equipment, including instrumentation, electrical, and process control system equipment and software for the entire proposed construction project.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Manuals, in general, shall have two levels: a facilities-wide-systems level for the entire project and an individual-component level.

1. The facilities-wide systems level shall do the following:

a. Describe the facilities-wide systems, including diagrams.
b. Explain start-up, shutdown, normal operations, and malfunctions of the facilities-wide systems.
c. Tabulate a lubrication schedule for the facilities-wide systems.

d. Describe preventive maintenance checking procedures for the facilities-wide systems.
e. Include a cross-reference to all individual component manuals.

2. The individual-component level shall contain the following:

a. Storage requirements.
b. Installation instructions.
c. Alignment instructions and tolerances.
d. Operating instructions.
e. Troubleshooting instructions.
f. Lubrication requirements.
g. Maintenance instructions.
h. Parts list.
i. Recommended spare parts list and how to obtain same.

B. Format:

1. Size: 8-1/2-x-11-inch.

2. White paper: 20-pound.

3. Text: Manufacturer's printed data or neatly word-processed.

4. Drawings:

a. Provide reinforced, punched binder tab, bind in with text.
b. Reduce larger drawings and fold to size of text pages but not larger than 11 x 17 inches.
c. Place all drawings at the end of each section and drawing shall be printed on one side only.

5. Provide a blank page for each separate product or each piece of operation equipment.

a. Provide a word-processed description of the product and major component parts of equipment.
b. Provide indexed tabs.

6. Cover: Identify each volume with typed or printed title, "OPERATIONS AND MAINTENANCE INSTRUCTIONS," listing the following:

a. Title of Project.

b. Identity of separate structure as applicable.
c. Identity of general subject matter covered in the manual.

C. Media

1. Original word-processed CD shall be delivered to the Engineer.
2. All word processing must be done using the latest version of Microsoft Word or as directed by the Engineer.
3. All drawings except control system configuration drawings must be submitted on CD using AutoCAD.

D. Binders

1. Filled to not more than 75% capacity.
2. When multiple binders are used, arrange the data into related consistent groupings.

E. The Contractor shall submit the following:

1. Equipment Manuals—Five copies of the O&M Instruction Manual for each piece of equipment shall be submitted to the Engineer with delivery of the equipment. O&M manuals will not include the manufacturer's test results and Record specifications.
2. Systems O&M Manuals—Five copies of the systems O&M Manuals, bound and indexed and submitted to the Engineer no later than 60 days before start-up. Systems O&M Manuals will be complete except for field results and refinements added as result of demonstrations.
3. Final O&M Manuals—Five copies of the Final Equipment and Systems O&M Manuals, bound and indexed and submitted to the Engineer before the Substantial Completion under this Contract. Submittal must be reviewed and approved by the Engineer before Substantial Completion will be awarded.
4. The cost of these Manuals submitted shall be included in the total Contract Price. Copies supplied under Item 2 will not be included under Item 3.

F. Any modifications required after final O&M submission shall be made to the manuals by issuance of addenda in the form of change pages to the manual. The addenda will identify where the new data are to be inserted, what data are to be removed, and new index sheets as necessary and list of shop drawings and submittals.

1.03 QUALITY ASSURANCE

A. Data shall be prepared by personnel:

1. Trained and experienced in maintaining and operating the described products.
2. Familiar with requirements of this Section.
3. Skilled as a technical writer to the extent required to communicate essential data.
4. Skilled as a draftsman competent to prepare required drawings.

1.04 CONTENTS, EACH VOLUME

A. Neatly word-processed table of contents for each volume, arranged in systematic order, to include the following:

1. Contractor, name of responsible principal, mailing address, email address, fax number, and telephone number.

2. A list of each product required to be included, indexed to content of the volume.

3. A list with each product, name, mailing address, email address, fax number, and telephone number of the following:

a. Subcontractor or installer.
b. A list of each product to be included, indexed to content of the volume.
c. Identify area of responsibility of each subcontractor or installer, if more than one.
d. Local source of supply for parts and replacement.
e. Manufacturer.

4. Identify each product by product name and other identifying symbols as set forth in the Contract Documents.

B. Product Data

1. Include only those sheets that are pertinent to the specific product.

2. Annotate each sheet to achieve the following:

a. Clearly identify the specific product or part installed.

b. Clearly identify data applicable information.
c. Delete references to inapplicable information.

C. Drawings

1. Supplement product data with drawings as necessary to illustrate the following clearly:

a. Relations of component parts of equipment and systems.
b. Control and flow diagrams.
c. Owner Tag Numbers.

2. Coordinate drawings with information in Record Documents to ensure correct illustration of completed installation.

3. Do not use Record Documents as maintenance drawings.

D. Written text as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.
2. Provide a logical sequence of instructions for each procedure.
3. Describe how the complete system is to operate.

E. Copy of pertinent information related to warranty and bond issued.

1. Provide information sheet for Owner's personnel with the following information:

a. Proper procedures in event of failure.
b. Instances that might affect the validity of warranties or bonds.

F. Training manuals used in training courses will become part of this Manual.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Content, for applied materials, and finishes:

1. Manufacturer’s data, giving full information on products:

a. Catalog number, size, composition.
b. Color and texture designations.
c. Information required for re-ordering special-manufactured products.

2. Instructions for care and maintenance:

    a. Manufacturer's recommendation for types of cleaning agents and methods.
    b. Cautions against cleaning agents and methods that are detrimental to product.
    c. Recommended schedule for cleaning and maintenance.

B. Content, for moisture-protected and weather-exposed products:

1. Manufacturer's data, giving full information on products:

    a. Applicable standards.
    b. Chemical composition.
    c. Details of installation.

2. Instructions for inspection, maintenance, and repair.

C. Additional requirements for maintenance data as required by other Sections of the Specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content, for each electrical, mechanical, instrumentation, and communication system, as appropriate:

1. A table identifying each piece of equipment, each associated control or instrument, the location of the control or instrument, and the function of the control or instrument.

2. A description of the system and its component parts:

    a. Function, normal operating characteristics, and limiting conditions for the system, the sub-system, and the component parts.
    b. Performance curves, engineering data, and tests.
    c. Complete nomenclature and commercial numbers of replaceable parts.

3. Circuit directories of panel board:

    a. Electrical service.
    b. Controls.
    c. Communications.

4. As-installed color-coded wiring diagrams.

5. Instrument loop diagrams showing the path that a control or instrumentation signal takes from its origin to the action it takes.

    a. An electrical schematic for each item.
    b. A chart listing the controls/instruments in a loop identifying the equipment's abbreviated symbol, a description of the symbol, design criteria, process flow, quantity supplied, and manufacturer's model and serial number.

6. Operating procedures:

    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.

7. Maintenance procedures:

    a. Routine operations.
    b. Guide to "trouble-shooting."
    c. Disassembly, repair, and re-assembly.
    d. Alignment, adjustment, and checking.

8. The manufacturer's printed operating and maintenance instructions.

9. A list of the original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

10. Other data as required under other Sections of the Specifications.

11. Abnormal and emergency operations:

    a. Potential overloads.
    b. Procedures for equipment breakdown.
    c. Action to be taken in a power outage.
    d. Identity of alarms by equipment location and action to correct.
    e. Equipment safety features, requirements, and potential hazards.

12. Programming manuals for programmable devices including list of standard programming.

13. Operating procedures:

    a. Start-up, break-in, routine, and normal operating instructions.
    b. Regulation, control, stopping, shut-down, and emergency instructions.
    c. Summer and winter operating instructions.
    d. Special operating instructions.
    e. Control settings and ranges.

14. Maintenance procedures:

    a. Type and frequency of preventive maintenance activities required for each piece of equipment.
    b. Guide to "trouble-shooting."
    c. Disassembly, repair, and re-assembly.
    d. Alignment, adjusting, and checking.

15. Servicing and lubrication schedule:

    a. List of lubricants required.
    b. Period between lubrications.

16. Manufacturer's printed operating and maintenance instructions. (This is not to be a generalized catalog of the entire product line.)

17. Description of sequence of operation.

18. The original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance:

    a. Predicted life of parts subject to wear.
    b. Items recommended to be stocked as spare parts.

19. As-installed control diagrams.

20. Each Contractor's coordination drawings.

21. List of the original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

22. Other data as required under pertinent Sections of the Specifications.

23. Charts of equipment, instrument, and valve tag numbers with location and function:

    a. Reference drawing that shows equipment, instrument, or valve location.
    b. Manufacturer's model and serial number.
    c. Valve actuator type (manual, hydraulic, electric, or pneumatic).

B. The Contractor shall prepare and include additional data when the need for such data becomes apparent during instruction of the Owner's personnel.

C. Additional requirements for O&M data required by other Sections of the Specifications.

PART 2 PRODUCTS

2.01 O&M MANUALS

A. Binders: The manuals shall be supplied in binders that are the same as those provided in Paragraph 1.02D. above.

B. Electronic Version: Word-processed portions of the manuals shall also be provided on CDs. The electronic-version manuals must be capable of being read, edited, and printed with Microsoft Word or Engineer-approved file format at the time of the transmittal of documents. The format will be provided to the Contractor upon request. All drawings shall be generated using personal computer and plotter with the software package program from AutoCAD.

PART 3 EXECUTION (NOT USED)

END OF SECTION

DIVISION 2

SITE CONSTRUCTION

SECTION 02070
GEOCOMPOSITE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install a primary and secondary geocomposite as part of the leachate-collection and leak-detection layers for the Landfill.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Manufacturer Information

1. Manufacturer's Information: Submit the following within 10 days of the Notice to Proceed.

2. The Manufacturer's name, address, and primary contact.

3. The Manufacturing plant name and address where the geocomposite for this project will be produced.

4. The Manufacturer's qualifications including:

   a. A minimum of 5 years of successful development and production of geonets and geocomposites.
   b. Evidence of production of at least 10 million square feet of geocomposite that meets the specifications of Article 2.01.
   c. Certification that the Manufacturer has sufficient capacity to provide required material in the given timeframe.
   d. A list of at least 10 projects for which the Manufacturer has supplied geocomposite, three of which shall have been for projects of similar size.

5. Certificate provided by the manufacturer stating the product name, style number, chemical composition of the geonet and geotextiles involved, and other pertinent information to fully describe the product along with five representative samples of the product (small samples approximately 5 inches long by 4 inches wide enclosed in plastic labeled with the product name) proposed for use on this project.

6. The Manufacturer's material properties sheet (cut sheet) of proposed geocomposite including transmissivity test results in accordance with ASTM D4716/D4716M.

7. Available data on the long-term (10,000-hour) creep test on the geonet core in accordance with GRI-GS4 or ASTM D7406 for loads of 25,000 psf or greater at a reference temperature of 20ºC. Provide Manufacturer's Quality Control (MQC) data for the geonet component of the geocomposite tested with long-term creep results.

8. Written instructions for storing, handling, installing, seaming, and repairing the proposed geocomposite, including recommendations for loading, unloading, and handling equipment (model number or load capacity) must be included.

9. Sample product warranty that meets the requirements of Article 1.05 and Section 01780, Warranties and Bonds.

10. The MQC plan, including examples of MQC certification documents, name and address of the quality control testing laboratory, quality control laboratory certification, examples of retesting notification, and documentation.

B. Installer Information

1. The Contractor shall submit the Installer's Information at least 30 days before geocomposite is scheduled to be installed.

2. Installer's name, address and primary contact.

3. Installer's qualifications including but not limited to a list of at least three previous projects of similar size to this project, including project name, location, size, date of installation, and evidence of the installation of at least 1 million square feet of geocomposite.

4. Construction quality control (CQC) plan including but not limited to the following:

   a. Description of seaming equipment and techniques.
   b. Description of methods for repairing geotextiles and geonet.
   c. Description of method for removing rejected materials.
   d. Proposed staffing.
   e. Proposed equipment.

f. Complete set of forms to be used for recording installation QC data, including but not limited to daily record documents.

5. Installer's written procedures manual.

6. Panel layout drawings identifying panels and seams.

C. Project-Specific Product Acceptance Testing

1. After the CQA Consultant's review and approval of the Manufacturer's Information, representative samples of the geocomposite product intended for this project and manufactured at the same plant that will produce the product for this project shall be sent to the Product Acceptance Laboratory for Project-Specific Product Acceptance Testing as listed in Article 2.01, Table 2.

2. Acceptance by the CQA Consultant of the geocomposite product proposed for use on this project will depend on the results of the Project-Specific Product Acceptance testing. Project-Specific Product Acceptance test results shall be submitted to the CQA Consultant 21 days before shipping the geocomposite. The geocomposite shall not be shipped before review and acceptance of the Project-Specific Product Acceptance Test results.

3. Product samples shall be sent to the Product Acceptance Laboratory unless otherwise noted or specified by the CQA Consultant. The sample package should include a cover letter referencing the project location, project number, Manufacturer, date of sampling, lot and roll number, and MQC test data documented for the particular production run from which the sample was taken. This submittal shall conform to the requirements of Section 01330, Submittals and Acceptance. A copy of the cover letter shall be sent to the CQA Consultant.

4. The Contractor shall bear the cost of all Project-Specific Product Acceptance Testing, including shipping samples to Product Acceptance Laboratory.

5. Geocomposite Samples: The Manufacturer shall package and ship two 3-foot-long by the width-of-roll wide samples to the Product Acceptance Laboratory. The Manufacturer shall package the samples securely for shipping to prevent damage. The sampler shall mark the Manufacturer's roll identification number as well as the machine direction on the sample. The Contractor shall submit MQC data for the roll sampled with the test results.

6. Transmissivity Testing: The Product Acceptance Laboratory shall perform 100-hour transmissivity testing and report results in accordance with ASTM D4716. Laboratory procedures shall use digital gradient level indicators. The geocomposite must be tested with geomembrane on one side and Drainage Soil (meeting the gradation requirements of Section 02301, Earthwork for Landfill Construction) on the other. Test as follows:

   a. Normal Load of 1,500 psf, gradient of 0.02 and test duration of 100 hours. Report results at 15 minutes, 1 hour, and then every 24 hours.
   b. Normal load of 10,000 psf, gradient of 0.02 and test duration of 100 hours. Report results at 15 minutes, 1 hour, and then every 24 hours.
   c. Normal load of 15,000 psf, gradient of 0.02 and test duration of 100 hours. Report results at 15 minutes, 1 hour, and then every 24 hours.

7. Interface Direct Shear Strength Testing: The Product Acceptance Laboratory shall perform one interface direct shear strength test for four normal load conditions in accordance with ASTM D5321 on representative samples of geocomposite in the configuration listed below. This requirement is in addition to the requirement for interface direct shear strength tests included in the Section 02072, Geosynthetic Clay Liner, and Section 02071, Geomembrane.

   a. Test Configuration—Geocomposite versus Drainage Sand: Lower geotextile of geocomposite clamped to the bottom of the box and drainage sand compacted into the upper box. Upper components of geocomposite shall be allowed to slide along soil.

      (1) Submit Drainage Soil sample in accordance with Section 02301, Earthwork for Landfill Construction.
      (2) Drainage Soil shall be compacted to 80% relative compaction as determined by Modified Proctor Test ASTM D1557. Report Modified Proctor Test.

   b. Saturate for 1 hour under full load before shearing and shear under fully saturated (tap water) conditions.

   c. Normal loads: See Table 2 in Article 2.01.

   d. Shear rate: 0.04 inch/minute.

e. Provide complete shear versus displacement length to at least 3 inches of displacement.

f. Report peak (maximum) shear strength and post-peak shear strength measured at 3 inches of displacement for all three normal loads. Report location of the failure (i.e., slip plane).

g. Results shall meet the requirements of Table 2 in Article 2.01.

8. If the results of any test do not conform to the requirements of this Specification, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the CQA Consultant that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Specification, the product shall be rejected and the Contractor must submit Pre-Construction Submittals pertaining to the new product and perform Project-Specific Acceptance Tests for the new product.

D. Manufacturer's Quality Control (MQC)

1. The manufacturer is responsible for establishing and maintaining a quality control program to ensure compliance with the requirements of the specifications. Documentation describing the quality control program shall be made available upon request.

2. The MQC data shall be submitted at least 21 days before geocomposite shipment.

3. The Contractor shall submit the MQC test results to demonstrate that the geocomposite is in accordance with this Section.

4. MQC sampling shall be in accordance with the test methods and minimum test frequencies provided in Article 2.01, Table 1. If no sampling protocol is specified in the test method, then the samples shall be taken evenly spaced across the entire roll width in accordance with ASTM D4354.

5. The manufacturer shall provide a manufacturer's certificate stating that the finished geocomposite meets the minimum average values and that the geotextile meets minimum average roll value (MARV) requirements of the Specifications as evaluated under the manufacturer's quality control program. A person having legal authority to bind the manufacturer shall attest to the certificate.

6. MQC data shall be submitted electronically in PDF and data format (.xls, .xlsx, .csv, .txt, .doc, .docx, .accdb, etc.) that the data can be readily copied.

7. Provide the following information with MQC test data:

   a. Project Name, Project Location, Manufacturer, Product Name.
   b. Roll and lot numbers and any additional production identification.
   c. Results of MQC tests, including a description of test methods used.

8. The Engineer will reject rolls for which quality control requirements are not met.

9. If the results of any test do not conform to the requirements of this Specification, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the CQA Consultant that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Section, the product shall be rejected and removed from the site.

10. Either mislabeling or misrepresentation of material shall be reason to reject the products involved in this Specification.

E. Construction Quality Control (CQC)

1. The Contractor's CQC representative will be responsible for quality control in accordance with the submitted CQC Plan. During construction, the Contractor shall submit CQC documentation weekly:

   a. Material delivery report.
   b. Rejected material removal report.
   c. Records of daily installation including roll numbers placed.
   d. Records of daily personnel activity.
   e. Meeting reports.
   f. Updated Record Drawings.

1.03 REFERENCES

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at bid time. The following documents are a part of this

Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM D751—Standard Test Methods for Coated Fabrics.
2. ASTM D792—Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
3. ASTM D1238—Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
4. ASTM D1505—Standard Test Method for Density of Plastics by the Density-Gradient Technique.
5. ASTM D1558—Standard Test Method for Moisture Content Penetration Resistance Relationships of Fine-Grained Soils.
6. ASTM D1603—Standard Test Method for Carbon Black Content in Olefin Plastics.
7. ASTM D3786—Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method.
8. ASTM D4218—Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
9. ASTM D4354—Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing.
10. ASTM D4491/D4491M—Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
11. ASTM D4533/D4533M—Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
12. ASTM D4632/D4632M—Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
13. ASTM D4716/D4716M—Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
14. ASTM D4751—Standard Test Method for Determining Apparent Opening Size of a Geotextile.
15. ASTM D4833/D4833M—Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
16. ASTM D5199—Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
17. ASTM D5261—Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
18. ASTM D5321/D5321M—Standard Test Method for Determining the Sheer Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.

19. ASTM D6141—Standard Guide for Screening Clay Portion and Index Flux of Geosynthetic Clay Liner (GCL) for Chemical Compatibility to Liquids.
20. ASTM D7005/D7005M—Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.
21. ASTM D7361—Standard Test Method for Accelerated Compressive Creep of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method.
22. ASTM D7406—Standard Test Method for Time-Dependent (Creep) Deformation Under Constant Pressure for Geosynthetic Drainage Products.

B. Geosynthetics Research Institute (GRI)

1. GRI-GC8—Determination of the Allowable Flow Rate of a Drainage Geocomposite.
2. GRI-GS4—Test Method for Time Dependent (Creep) Deformation Under Normal Pressure (superseded by ASTM D7406).

1.04 QUALITY ASSURANCE

A. MQC and CQC are the responsibility of the Manufacturer and Installer to document that the material and installation are in accordance with this Specification. The Installer's CQC representative will be responsible for CQC in accordance with the submitted CQC Plan, which is independent of Construction Quality Assurance.

B. The Owner will engage and pay for the services of an Engineer and/or CQA Consultant. The Owner will engage and pay for the services of an independent CQA Laboratory for monitoring the quality and installation of the geocomposite. The Manufacturer, Installer, and Contractor shall help the Engineer with product sampling for Construction Quality Assurance (CQA) testing by providing samples, personnel, and equipment as necessary.

1. CQA tests will be the measure of the acceptance of material. The Contractor will be responsible for the cost of retesting should the CQA tests fail. The retests will be paid by the Owner and reimbursed by the Contractor.
2. Samples of geocomposite: After review of the project-specific Product Acceptance Test results the Engineer or representative may visit the manufacturing plant and/or select product rolls to be sampled by the Manufacturer. The Manufacturer will ship one 3-foot-long by the width-of-roll-wide sample for every 100,000 square feet of material to the Engineer's CQA Laboratory for CQA testing. The sample package should

include a cover letter referencing the project location, project number, Manufacturer, date of sampling, lot and roll number, and MQC test data documented for the particular production run from which the sample was taken. A copy of the cover letter shall be submitted to the Engineer.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

B. The Geocomposite Manufacturer shall warrant, in writing, the geocomposite material for 5 years on a pro rata basis from the date of Substantial Completion. The warranty shall apply to normal use and service in a sanitary landfill environment under exposure to sanitary landfill gas and leachate as well as other exposures which can be anticipated from the intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. The Contractor shall conform to the Manufacturer's delivery, storage, and handling requirements submitted in accordance with documents as required in Article 1.02, Paragraphs A and B of this Section (Manufacturer Information and Installer Information, respectively).

C. Labeling, shipment, and storage shall follow ASTM D4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document should include a notation certifying that the material is in accordance with this Specification.

D. The Contractor shall deliver materials to the site only after the CQA Consultant approves the required submittals.

E. The Contractor shall identify and separate damaged rolls from undamaged rolls and store damaged rolls at locations designated by the Engineer. Rolls without proper labeling that identify roll number and dimensions will be considered damaged. Damaged material will be repaired or rejected at the discretion of the CQA Consultant. The cost of repair or replacement will be borne by the Contractor.

F. The Contractor shall store geocomposite rolls in a location designated by the Engineer. In the absence of a specific location, material must not be stored in areas that will impair the operations of the facility or harm the materials.

G. The Contractor shall store geocomposite rolls to protect them from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, or other damage.

H. The Contractor shall store geomembrane rolls on a prepared surface and prevent water from accumulating beneath the rolls.

I. The Contractor shall not store geocomposite outdoors for more than 12 months. If the geocomposite will be stored outdoors for more than 6 months, rolls shall be covered with a waterproof, plastic covering that is resistant to ultraviolet degradation in addition to the plastic wrap that covers each geocomposite roll.

J. The Contractor shall not stack geocomposite higher than three rolls.

K. The Contractor shall use appropriate handling equipment to unload and store geomembrane rolls. Appropriate equipment includes cloth chokers and spreader bars. The equipment must be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage to the materials or injury to personnel.

L. The Contractor shall not drag panels or rolls on the ground.

M. The Contractor shall not crease geocomposite material; creased material will be rejected.

N. Shipping materials including straps are the property of the Owner and shall be set aside by the Contractor for the Owner's use.

1.07 QUALIFICATIONS

A. Provide the Manufacturer's and Installer's qualifications in accordance with Article 1.02.

1.08 TESTING REQUIREMENTS

A. Provide samples and testing for CQC testing in accordance with the requirements of this Section. Provide samples for CQA testing in accordance with the requirements of this Section. Please refer to the material requirement and testing frequencies provided in this Section.

B. CQA testing shall be performed for the material properties list in Part 2 of this Section. The cost of CQA testing shall be paid by the Owner.

C. If CQA tests fail the requirements of this Section, the retesting of material provided by the Contractor will be paid for by the Owner and the cost reimbursed by the Contractor as part of the Project's final change order.

1.09 RECORD DRAWINGS

A. Record Drawings: The Contractor shall prepare, maintain, and submit Record Drawings showing geocomposite installation indicating panel locations, seam locations, and roll numbers for each panel in accordance with the requirements of the Contract Documents. The Record Drawings shall be updated throughout the project and are subject to field review by the Engineer any time upon request.

1.10 DEFINITIONS

A. *Formulation*: The mixture of a unique combination of ingredients identified by type, properties, and quantity. For geocomposites, a *formulation* is defined as the percentages and types of resins, additives, and carbon black.

B. *Installer*: The party responsible for field handling, transporting, storing, deploying, seaming, and temporarily restraining (against wind and thermal/solar expansion) the Geotextile.

C. *Lot*: Group of consecutively numbered rolls from the same manufacturing line.

D. *Geocomposite Manufacturer (Manufacturer)*: The party responsible for the production and quality of geocomposite.

E. *Minimum Average Roll Value (MARV):* Minimum value of a limited series of tests that represents a value two standard deviations lower than the overall average value. Ninety-five percent of any individual samples will have values greater than the MARV for any given property.

PART 2 PRODUCTS

2.01 GEOCOMPOSITE

The geocomposite must meet the following requirements:

A. Description: A drainage geocomposite manufactured by heat-bonding non-woven needle punched geotextile to both sides of a polyethylene geonet.

B. Manufactured with a thickness adequate to meet specified flow capacity.

C. Manufactured with core material made of polyethylene that maintains the required flow under specified loads.

D. Manufactured to meet or exceed the following product requirements in Articles 2.02 and 2.03, based on minimum average roll values.

E. Conforming to the following minimum property values:

Table 1 Geocomposite Manufacturing Quality Control Test Requirements

Test	ASTM Test Method	Minimum Test Frequency	Required Test Values
Geocomposite			
Transmissivity – Project Specific	D4716	1/540,000 sf	See Table 2
Flow Rate/Width (min. ave.) (1)	D4716	1/540,000 sf	9.0 gal/min-ft
Ply Adhesion (min. avg.)	D7005	1/50,000 sf	> 1.0 lb/inch
Geonet Component of Geocomposite			
Thickness (2)	D5199	1/50,000 sf	See Table 2
Melt Flow Index	D1238, E	1 per resin batch	< 1.0 g/10 mins
Density	D792 or D1505	1/100,000 sf	0.94 to 0.97 g/cc
Carbon Black Content (range)	D1603 or D4218	1/100,000 sf	2 – 3%
Tensile Strength (min. ave.)	D7179	1/100,000	300 lb
Compressive Strength (min. ave.)	D6364	1/200,000	120 lb/in^2
Flow Rate/Width (min. ave.) (1)	D4716	1/540,000	9.0 gal/min-ft
Geotextile Component of Geocomposite (before lamination)			
Mass/unit area	D5261	1/100,000 sf	≥ 8.0 ounce per square yard
Apparent Opening Size	D4751	1/540,000 sf	< 0.25 mm 80 US Sieve
Grab Strength	D4632	1/100,000 sf	> 220 lbs.
Grab Elongation	D4632	1/100,000 sf	> 50%
Tear Strength	D4533	1/100,000 sf	> 90 lbs
Puncture Strength	D6241	1/540,000 sf	> 575 lbs.
Flow rate	D4491	1/540,000 sf	> 95 gpm/ft^2
Permittivity	D4491	1/540,000 sf	> 1.3 s^{-1}
UV Stability, % Retained (500 hours)	D4355	1/formulation	50%

(1) Geonets shall be tested between rigid end plates at a hydraulic gradient of 1.0, a pressure of 480 kPa, and a seating dwell time of 15 minutes. If the specimen is a geocomposite, the geotextile side(s) should be tested using flexible boundaries. Test values are for machine direction only.

(2) The diameter of the presser foot shall be 2.22 inches and the pressure shall be 2.9 $lb./in^2$.

Table 2 Project-Specific Product Acceptance Test Requirements				
Test	ASTM Test Designation	Minimum Test Frequency	Required Test Values	
Interface Shear Strength (see Article 1.02 for test configurations) (1)	D5321	1/project	Minimum Peak Shear Strength (psf)	Normal Load (psf)
			70	250
			1,340	5,000
			4,020	15,000
			5,630	21,000
Transmissivity (100 hour Result)(2)				
2,000 psf; 0.02	D4716	1/project	$> 2.94\times10^{-3}$ m²/s	
15,000 psf; 0.02	D4716	1/project	$> 2.00\times10^{-3}$ m²/s	
21,000 psf; 0.02	D4716	1/project	$> 1.4\times10^{-3}$ m²/s	
Geonet Component of Geocomposite				
Thickness	D5199	1/project	>300 mil(1)	
Creep Reduction Factor(2)	D7361	1/formulation	$RF_{CR} < 1.10$(1)	

(1) Testing shall be performed in accordance with Article 1.02.D.5.
(2) Creep-Reduction Factor at 20ºC under 15,000 psf for a design life of 10,000 hours determined using ASTM D7361 if historical creep data per ASTM D7406 is not available..

2.02 GEONET COMPONENT OF GEOCOMPOSITE

The Geonet component of the geocomposite must meet the following requirements:

A. Manufactured with a thickness adequate to meet specified flow capacity.

B. Manufactured with material made of polyethylene that maintains the required flow under specified loads.

C. Resistant to soil, chemicals, landfill gas, and leachate.

D. The resin shall be virgin material with no more than 25% rework. If rework is used, it must be a similar formulation as the parent material.

E. No post-consumer resin (PCR) of any type shall be added to the formulation.

F. Conform to the minimum property values specified in Article 2.01.

2.03 NON-WOVEN GEOTEXTILE COMPONENT OF GEOCOMPOSITE

The Geotextile component of the geocomposite must meet the following requirements:

A. Products comprised of nonwoven needle-punched polypropylene yarn oriented into a stable network that maintains its structure during handling, placement, and long-term service.

B. May not be heat-bonded as a primary process.

C. Resistant to soil and leachate chemicals.

D. New product made from virgin materials.

E. Geotextile shall be certified by the Manufacturer as substantially needle-free. A certification on the Manufacturer's letterhead and signed by an authorized representative of the Manufacturer shall be provided to the CQA Consultant.

F. Conforming to the minimum property values specified in Article 2.01.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before installing the geocomposite, the Contractor shall examine the underlying construction for conformance with Specifications. Verify the following:

1. Underlying installations are complete, installed as designed, and Record Documentation has been obtained.
2. There is no debris, excessive dust, or rocks on the geomembrane in the area where the geocomposite will be deployed.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Protect geocomposite from ultraviolet light exposure, precipitation, inundation, mud, dirt, dust, puncture, cutting, and other damaging or deleterious conditions.

B. Ship geocomposite in a closed trailer or flat bed trail if the geocomposite is wrapped in opaque plastic.

C. Immediately restore damaged protective covering.

3.03 PROTECTION

A. When placing other geosynthetics over the geocomposite ensure the following:

1. No damage occurs to the geocomposite.
2. The geocomposite does not slip on the underlying geosynthetics.
3. There are no excessive tensile stresses in the geocomposite.

3.04 DEPLOYMENT

A. Follow the Manufacturer's recommendations, standards, and guidelines.

B. Examine underlying geomembrane for conformance with Specifications.

C. Deploy geocomposite as indicated in the Drawings.

D. Do not entrap excessive dust, stones, or moisture in geocomposite that could damage or clog drains or filters or hamper subsequent seaming.

E. Deploy rolls down slope, not across slope, with primary flow direction of rolls going down slope, perpendicular to the contour lines.

F. Lay smooth with no wrinkles and free of stresses.

G. Examine the geocomposite over the entire installed surface to ensure that no potentially harmful foreign objects, such as needles, are present. Remove any foreign objects.

H. Do not drag the geocomposite across rough or textured surfaces to avoid damage to the geocomposite. Use a smooth geosynthetic slip sheet or rub sheet as necessary to reduce friction damage during deployment.

3.05 PANEL SEAMS

A. Panel seams shall be in accordance with the requirements of this Section, the Manufacturer’s recommendations, or GRI-GN2/GRI-GC13, whichever is more stringent.

B. Adjacent edges along the length of the geocomposite roll shall be overlapped a minimum of 6 inches or as recommended by the Manufacturer and approved by the CQA Consultant.

C. Adjacent Edge Seams—The overlapped edges shall be joined by tying the geonet structure with cable ties. These ties shall be spaced every 5 feet along the roll

length or as recommended by the Manufacturer and approved by the CQA Consultant.

D. Butt Seams—Adjoining geocomposite rolls (end to end) along the roll width should be shingled down in the direction of the slope with a minimum overlap of 24 inches across the roll width or as recommended by the Manufacturer and approved by the CQA Consultant. The geonet should be joined with cable ties spaced every 9 inches along the roll width or as recommended by the Manufacturer and approved by the CQA Consultant.

E. The Contractor shall provide additional cable ties along points of high stress or as instructed by the CQA Consultant.

F. The top layers of geotextiles shall be sewn together. The Contractor, upon approval by the CQA Consultant, may propose to wedge weld the top layers of geotextile in lieu of sewing. The method for performing this work must be submitted to the CQA Consultant for approval a minimum of 14 days before installation.

G. Geotextiles shall have a minimum 1-inch overlap before seaming or wedge welding. If wedge welding is proposed and approved, the Contractor must ensure that the geotextile is not burned, damaged, or punctured by the wedge welding process. The geotextiles shall be joined continuously to the adjacent and adjoining rolls to prevent material from migrating into the geonet core of the geocomposite.

3.06 REPAIRS

A. Before covering the deployed geocomposite, the Contractor shall inspect the geocomposite for damage resulting from construction.

B. The Contractor shall remove and patch any rips, tears, or damaged areas on the deployed geocomposite. The patch shall be secured to the original geocomposite by tying every 6 inches with the approved cable ties. If the area to be repaired is more than 50% of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be joined in accordance with Article 3.05.

C. The Contractor shall remove damaged material and replace it with new geocomposite. The geonet component of the new material will be secured to the remaining geocomposite with cable ties. The overlying geotextile will be sewn or heat-bonded to the in-place geotextile.

3.07 ACCEPTANCE

A. The Contractor retains ownership and responsibility for geocomposite until acceptance by Engineer.

B. The Engineer accepts geocomposite when:

1. The installation is complete.
2. All required documentation from the Manufacturer, Installer, and Contractor has been received and accepted.
3. Conformance test reports verifying material properties have been received and accepted.
4. The CQA Consultant has completed Final Inspection and any noted defects have been repaired.

END OF SECTION

SECTION 02071
GEOMEMBRANE (HDPE)

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install a primary and secondary, 60-mil, textured, high-density polyethylene (HDPE) geomembrane as a component of the geomembrane liner system as shown on the Drawings and specified in this Section. This includes all labor and resources to collect samples, perform testing, and collect data necessary to furnish all required documentation.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Manufacturer's Information

1. Manufacturer's Information shall be submitted within 10 days of the Notice to Proceed.

2. The Manufacturer's name, address, and primary contact.

3. The Manufacturing plant name and address where the geomembrane for this project will be produced.

4. The Manufacturer's qualifications including:

   a. A minimum of 5 years of successful development and production of geomembrane.
   b. Evidence of production of at least 10 million square feet of geomembrane that meets the specifications of Article 2.02.
   c. Certification that the Manufacturer has sufficient capacity to provide the required material in the given timeframe.
   d. A list of at least 10 projects for which geomembrane has been supplied by the Manufacturer, three of which shall have been for projects of similar size.

5. Product name and the Manufacturer's description of the proposed geomembrane and five representative samples of the product (small

samples approximately 5 inches long by 4 inches wide enclosed in plastic labeled with product name) proposed for use on this project.

6. The Manufacturer's material properties sheet (cut sheet) of the proposed geomembrane documenting it will meet or exceed specified requirements.

7. The Manufacturer's quality control certificates for raw resin material. Testing must be done in accordance with the Manufacturer's Quality Control (MQC) plan with a minimum of one test per lot and include tests listed in the table in Paragraph 2.01C.

8. The Manufacturer's quality control certificates for finished geomembrane. Testing must be done in accordance with the Manufacturer's QA/QC plan on the actual material to be shipped and include tests and frequencies performed as listed in the table in Paragraph 2.02I.

9. Written instructions for storing, handling, installing, seaming, and repairing proposed geomembrane, including recommendations for loading, unloading, and handling equipment (model number or load capacity) must be included.

10. Sample product warranty that meets the requirements of Article 1.06 and Section 01780, Warranties and Bonds.

11. The Manufacturer's Quality Control (MQC) plan, including examples of MQC certification documents, name and address of the quality control testing laboratory, quality control laboratory certification, examples of retesting notification, and documentation.

B. Installer's Information

1. The Contractor shall submit the Installer's Information as part of the Pre-Qualification of Construction Bidders prior to Award described in Section 2 and at least 30 days before the geomembrane is scheduled to begin to be installed.

2. Installer's name, address, and primary contact.

3. The Geomembrane Installer shall have current Approved Installation Contractor (AIC) status issued by the International Association of Geosynthetic Installers.

4. Installer's qualifications including a list of at least three previous projects of similar size to this project, including project name, location, size and

date of installation, and evidence of installing at least 1 million square feet of geomembrane.

5. The geomembrane installer shall be an approved installer by the geomembrane manufacturer.

6. The Installer must submit the following written information verifying qualifications:

    a. A list of projects for which similar geomembrane has been installed for at least five projects totaling a minimum of 2 million square feet over the past 5 years.
    b. The résumé of a Field Installation Supervisor who has directly supervised over 1 million square feet of installation.
    c. The résumé of a Master Seamer who has seamed a minimum of 500,000 linear feet of seam.
    d. The résumé of a CQC Representative who has conducted quality control on at least two projects with a total of at least 1 million square feet of geomembrane.
    e. If any of the Installer's personnel changes during the project, the Contractor shall submit to the Engineer résumés of the replacement personnel from the Installer before the new personnel may work on the project.

7. Construction Quality Control (CQC) Plan including but not limited to the following:

    a. Description of seaming equipment and techniques.
    b. Description of methods for repairing.
    c. Description of method for removing rejected materials.
    d. Proposed staffing.
    e. Proposed equipment.
    f. Complete set of forms to be used for recording installation CQC data, including but not limited to daily record documents.

8. A preliminary panel layout plan, including at a minimum:

    a. Panel layout.
    b. Panel identification numbers.
    c. Field seams.
    d. Installed square footage of the geomembrane.
    e. Details that do not conform to the construction drawings.

9. A complete set of forms to be used for record installation CQC data.

10. The geomembrane Installer's sample product warranty that the geomembrane installation is guaranteed in accordance with Section 01780, Warranties and Bonds, and Article 1.06.

C. Project-Specific Product Acceptance Testing

1. After the Engineer's review and approval of the Manufacturer's Information, representative samples of the geomembrane product intended for this project and manufactured at the same plant that will produce the product for this project shall be sent to the CQA Laboratory for Project-Specific Product Acceptance Testing as listed in Article 2.02.A.

2. The Engineer's acceptance of the geomembrane product proposed for use on this project will depend on the results of the Project-Specific Product Acceptance testing. Project-Specific Product Acceptance test results shall be submitted to the Engineer 21 days before the geomembrane material is shipped to the project site. The geomembrane shall not be shipped before review and acceptance of the project-specific Product Acceptance Test results.

3. Product samples shall be sent to the Product Acceptance Laboratory unless otherwise noted. The sample package should include a cover letter referencing the project location, engineer project number, Manufacturer, date of sampling, lot and roll number, and MQC test data documented for the particular production run from which the sample was taken. This submittal shall conform to the requirements of Section 01330, Submittals and Acceptance. A copy of the cover letter shall be sent to the Engineer.

TRI Environmental, Inc.
9063 Bee Caves Road
Austin, Texas 78733
(800) 880-8378

4. The Contractor shall bear the cost of all Project-Specific Product Acceptance Testing, including shipping samples to Product Acceptance Laboratory.

5. Geomembrane Samples: The Manufacturer shall package and ship two 3-foot-long by the width-of-roll-wide samples to the Product Acceptance Laboratory. The Manufacturer shall package the samples securely for shipping to prevent damage. The sampler shall mark the Manufacturer's roll identification number as well as the machine direction on the sample.

The Contractor shall submit MQC data for the roll sampled with the test results.

6. Interface Direct Shear Strength Testing: The CQA Laboratory shall perform one interface direct shear strength test – four normal load conditions for the one test configuration – in accordance with ASTM D5321 on representative samples of geomembrane and geocomposite in the configuration provided below. This requirement is in addition to the requirement for interface direct shear strength tests included in Section 02070, Geocomposite, and Section 02072, Geosynthetic Clay Liner.

    a. Test Configuration 1—Textured Geomembrane versus Geocomposite: Geomembrane is clamped to the top of the box and lower geotextile of geocomposite clamped to the bottom of the box and upper components of geocomposite shall be allowed to slide along the geomembrane.
    b. Submit the geocomposite sample in accordance with Section 02070, Geocomposite.
    c. Saturate for 1 hour under full load before shearing and shear under fully saturated (tap water) conditions.
    d. Normal loads: See Paragraph 2.02A.
    e. Shear rate: 0.04 inch/minute.
    f. Provide complete shear versus displacement length to at least 3 inches of displacement.
    g. Report peak (maximum) shear strength and post-peak shear strength measured at 3 inches of displacement for all four normal loads. Report the location of the failure (i.e., slip plane).
    h. Results shall meet the requirements of Table 2 in Article 2.02.A.

7. If the results of any test do not conform to the requirements of this Specification, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the Engineer that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Section, the product shall be rejected and the Contractor must submit Pre-Construction Submittals pertaining to the new product and perform Project-Specific Acceptance Tests for the new product.

D. Manufacturer’s Quality Control (MQC)

1. The Manufacturer’s Quality Control data shall be submitted at least 21 days before geomembrane shipment.

2. The Contractor shall submit the MQC test results to demonstrate that the geomembrane is in accordance with this Specification.

3. MQC sampling shall be in accordance with the test methods and minimum test frequencies provided in Article 2.02. If no sampling protocol is specified in the test method, then the samples shall be taken evenly spaced across the entire roll width in accordance with ASTM D4354.

4. Certification reports shall be submitted by the Manufacturer on the Manufacturer's letterhead and signed by an authorized representative of the Manufacturer.

5. MQC data shall be submitted electronically in PDF and data format (.xls, .xlsx, .csv, .txt, .doc, .docx, .accdb, etc.) that the data can be readily copied.

6. Provide the following information with MQC test data:

   a. Project Name, Project Location, Manufacturer, Product Name.
   b. Roll and lot numbers and any additional production identification.
   c. Results of MQC tests, including a description of test methods used.

7. The Engineer will reject rolls for which quality control requirements are not met.

8. If the results of any test do not conform to the requirements of this Specification, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the Engineer that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Specification, the product shall be rejected and removed from the site.

E. Construction Quality Control (CQC)

1. The Contractor's CQC representative will be responsible for quality control in accordance with the submitted CQC Plan. During construction the Installer shall submit the following weekly:

   a. Material delivery report.

   b. Rejected material removal report.

   c. Soil subgrade acceptance.

d. Records of daily installation logs, including but not limited to:

(1) Deployment, including roll numbers placed.
(2) Destructive sample testing.
(3) Seaming.
(4) Non-destructive tests.
(5) Trial welds.
(6) Repairs.

e. Weekly installation log data shall be submitted electronically in PDF and data format (.xls, .xlsx, .csv, .txt, .doc, .docx, .accdb, etc.) that the data can be readily copied.

f. Records of daily personnel activity.

g. Meeting reports.

h. Updated Record Drawings.

F. Record Drawings: The Contractor shall prepare, maintain, and submit Record Drawings showing geomembrane installation indicating panel locations, seam locations, and roll numbers for each panel in accordance with the requirements of the Contract Documents. The Record Drawings shall be updated throughout the project and are subject to field review by the Engineer any time upon request. Record Drawings shall be in accordance with Article 1.09.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM D792—Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
2. ASTM D1004—Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
3. ASTM D1238—Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
4. ASTM D1505—Standard Test Method for Density of Plastics by the Density-Gradient Technique.

5. ASTM D1603—Standard Test Method for Carbon Black Content in Olefin Plastics.
6. ASTM D3895—Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
7. ASTM D4218—Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
8. ASTM D4437/D4437M—Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
9. ASTM D4833/D4833M—Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
10. ASTM D5199—Standard Test Method for Measuring Nominal Thickness of Geosynthetics.
11. ASTM D5321/D5321M—Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.
12. ASTM D5397—Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.
13. ASTM D5596—Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.
14. ASTM D5641/D5641M—Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
15. ASTM D5721—Standard Practice for Air-Oven Aging of Polyolefin Geomembranes.
16. ASTM D5820—Standard Practice for Pressurized Air Channel Evaluation of Dual-Seamed Geomembranes.
17. ASTM D5885/D5885M—Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry.
18. ASTM D5994/D5994M—Standard Test Method for Measuring Core Thickness of Textured Geomembranes.
19. ASTM D6392—Standard Test Method for Determining the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
20. ASTM D6497/D6497M—Standard Guide for Mechanical Attachment of Geomembrane to Penetrations or Structures.
21. ASTM D6693/D6693M—Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.
22. ASTM D7466/D7466M—Standard Test Method for Measuring Asperity Height of Textured Geomembranes.
23. ASTM E96/E96M—Standard Test Methods for Water Vapor Transmission of Materials.

B. Environmental Protection Agency (EPA)

1. EPA/600/R-93-182—Quality Assurance and Quality Control for Waste Containment Facilities.

C. Geosynthetics Research Institute (GRI) Standards

1. GM-10—The Stress Crack Resistance of HDPE Sheet.
2. GRI Test Method GM-13—Test Methods, Test Properties, and Testing Frequency for High-Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
3. GRI Test Method GM-19—Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.

1.04 QUALITY ASSURANCE

A. MQC and CQC are the responsibility of the Contractor and are performed by the Manufacturer and Installer to document that the material and installation are in accordance with this Specification. The Installer's CQC representative will be responsible for CQC in accordance with the submitted CQC Plan, which is independent of Construction Quality Assurance (CQA).

B. The Owner will engage and pay for the services of an Engineer and/or CQA Consultant. The Owner will engage and pay for the services of an independent CQA Laboratory for monitoring the quality and installation of the geomembrane. The Manufacturer, Installer, and Contractor must help the Engineer with product sampling for CQA testing by providing samples, personnel, and equipment as necessary.

1. CQA tests will be the measure of the acceptance of material. The Contractor will be responsible for the cost of retesting if the CQA tests fail. The retests will be paid by the Owner and reimbursed by the Contractor.
2. Samples of geomembrane: After review of the project-specific Product Acceptance Test results, the Engineer or representative may visit the manufacturing plant and/or select product rolls to be sampled by the Manufacturer. The Manufacturer will ship one 3-foot-long by the width-of-roll-wide sample for every 100,000 square feet of material to the Engineer's CQA Laboratory for CQA testing. The sample package shall include a cover letter referencing the project location, project number, Manufacturer, date of sampling, lot and roll number, and MQC test data documented for the particular production run from which the sample was taken. A copy of the cover letter shall be submitted to the Engineer.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds, and as specified in this Section.

B. The geomembrane Manufacturer's warranty, in writing, that the geomembrane material is guaranteed for 5 years on a pro rata basis from the date of Substantial Completion. This warranty shall apply to normal use and service in a landfill bottom liner (primary and secondary containment and GCL protection) application under exposure to landfill leachate and landfill gas as well as other exposures that can be anticipated from the intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. Material delivery, storage, and handling shall be in accordance with documents as required in Article 1.02, Manufacturer's Information and Installer's Information.

C. The Contractor shall deliver materials to the site only after the CQA Consultant approves the required submittals.

D. The Contractor shall identify and separate damaged rolls from undamaged rolls and store damaged rolls at locations designated by the Engineer. Rolls without proper labeling that identify roll number and dimensions will be considered damaged. Damaged material will be repaired or rejected at the discretion of the CQA Consultant. The cost of repair or replacement will be borne by the Contractor.

E. The Contractor shall store geomembrane rolls in a location designated by the Engineer. In the absence of a specific location, material must not be stored in areas that will impair the operations of the facility or harm the materials.

F. The Contractor shall store geomembrane rolls to protect them from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, or other damage.

G. The Contractor shall store geomembrane rolls on a prepared surface. Prevent water from accumulating beneath the rolls.

H. The Contractor shall not store geomembrane outdoors for more than 6 months. The geomembrane shall be moved inside an enclosed facility for storage exceeding 6 months. If an enclosed facility does not exist, a temporary enclosure shall be constructed.

I. The Contractor shall not stack geomembrane more than three rolls high.

J. The Contractor shall use appropriate handling equipment to unload and store geomembrane rolls. Appropriate equipment includes cloth chokers and spreader bars. The equipment must be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage to the materials or injury to personnel.

K. The Contractor shall not drag panels or rolls on the ground.

L. The Contractor shall not crease geomembrane material; creased material will be rejected.

M. Shipping materials including straps are the property of the Owner and will be set aside by the Contractor for the Owner's use.

1.07 QUALIFICATIONS

A. Provide the Manufacturer's and Installer's qualifications in accordance with Article 1.02.

1.08 TESTING REQUIREMENTS

A. Provide samples and testing for CQC testing in accordance with the requirements of this Section. Provide samples for CQA testing in accordance with the requirements of this Section. Please refer to the material requirement and testing frequencies provided in this Section.

B. CQA testing shall be performed for the material properties list in Part 2 of this Section. The cost of CQA testing shall be paid by the Owner.

C. If CQA tests fail the requirements of this Section, the retesting of material provided by the Contractor will be paid for by the Owner and the cost reimbursed by the Contractor as part of the project's final change order.

1.09 RECORD DRAWINGS

A. Geomembrane installation Record Drawings shall include complete CQC reports for the installation of primary and secondary geomembranes. Reports shall be typed and provided in PDF format. The CQC reports shall include the following:

1. Completed soil subgrade acceptance forms.

2. Records of daily installation logs, including:

    a. Deployment, including roll numbers placed.
    b. Destructive sample testing.
    c. Seaming.
    d. Non-destructive tests.
    e. Trial welds.
    f. Repairs.

B. The Record Drawings shall include an as-built panel layout drawing for the installation of primary and secondary geomembranes. The as-built panel layout drawings shall be submitted on a full-size drawing (22 × 34 inches or 24 × 36 inches) and shall be submitted in AutoCAD and PDF formats. The as-built panel layout drawing shall indicate the following at a minimum:

1. Panel number.
2. Geomembrane roll number.
3. Anchor trench.
4. Tie-in to existing liner.
5. Repairs locations with unique identification number.
6. Destructive sample locations with unique identification number.

1.10 DEFINITIONS

A. *Batch*: A quantity of resin, usually the capacity of one rail car, used in the fabrication of HDPE geomembrane sheet. A roll number corresponding to the particular quantity of resin used will identify the finished sheet.

B. *Bridging*: The condition when geomembrane becomes suspended over its subgrade due to contraction of the material or poor installation.

C. *Extrudate*: The molten polymer emitted from an extruder during seaming using either extrusion fillet or extrusion flat methods. The polymer is initially in the form of a ribbon rod, bead, or pellets.

D. *Geomembrane*: An essentially impermeable membrane used as a solid or liquid barrier. Synonymous term for flexible membrane liner (FML).

E. *Geomembrane Manufacturer (Manufacturer)*: The party responsible for producing the geomembrane rolls from resin and for the quality of the resin.

F. *Geomembrane Subgrade*: The soil or geosynthetic surface on which the geomembrane lies.

G. *Installer*: The party responsible for field handling, transporting, storing, deploying, seaming, temporarily restraining (against wind), and installing the geomembrane.

H. *Lot*: A group of consecutively numbered rolls manufactured from the same resin batch or production line. For this Section, a lot may not exceed 180,000 pounds of raw resin material.

I. *Manufacturing Quality Assurance* (MQA): A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits, and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. *MQA* refers to measures taken by the MQA organization to determine if the Manufacturer complies with the product certification and contract specifications for the project.

J. *Manufacturing Quality Control* (MQC): A planned system of inspections that is used to directly monitor and control the manufacture of a material, which is factory originated. MQC is normally performed by the Manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the Manufacturer to determine compliance with the requirements of materials and workmanship as stated in certification documents and contract specifications.

K. *Panel*: The unit area of geomembrane that will be seamed in the field. If the geomembrane is not fabricated into panels in a factory, a panel is identified as a roll or portion of a roll without any seams.

PART 2 PRODUCTS

The Manufacturer shall supply the following products:

2.01 GEOMEMBRANE RESIN

A. The geomembrane resin shall be virgin materials with no more than 10% reworked material from the same formulation as the parent material.

B. Do not add any post-consumer resin (PCR) of any type to the formulation.

C. Use materials meeting the following requirements unless otherwise approved:

Table 1 Geomembrane Resin Test Requirements		
Test	Test Designation	Requirements
1. Melt Index	ASTM D1238	< 1.0g /10 min
2. Specific Gravity	ASTM D1505 or D792 Method B	> 0.932 g/mL

2.02 PROPERTIES FOR TEXTURED HIGH-DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE

The Manufacturer shall ensure that the textured HDPE Geomembrane has the following properties:

A. Project-Specific Product Acceptance Test Requirements

Table 2 Project-Specific Product Acceptance Test Requirements				
Test	ASTM Test Designation	Minimum Test Frequency	Required Test Values	
Interface Shear Strength (see Paragraph 1.02C.6 for test configurations)	D5321	1 per project	Required Peak Shear Strength (psf)	Normal Load (psf)
			70	250
			1,340	5,000
			4,020	15,000
			5,630	21,000

B. Textured geomembrane shall generally have uniform texturing appearance. It shall be free from agglomerated texturing material and defects that would affect the specified properties of the geomembrane (GRI GM-13).

C. The geomembrane may not exceed a combined maximum total of 1% by weight of additives other than carbon black or pigment.

D. The geomembrane may not exceed 3.5% by weight of finished geomembrane for total combined processing aids, antioxidants, carbon black, and other additives.

E. All additives for UV protection, thermal stability, color, or processing agents must not "bloom" to the surface over time or inhibit welding.

F. The finished product must be free from blemishes, holes, pin holes, bubbles, blisters, excessive gels, undispersed resins and/or carbon black, contamination by foreign matter, as well as nicks or cuts on edges. The Manufacturer shall continuously perform spark tests during manufacturing to locate holes in the geomembrane. Repair holes before shipping in accordance with Article 3.22.

G. White co-extruded geomembrane may be used in place of black HDPE geomembrane.

H. Roll manufactured sheets for shipment.

I. The geomembrane must conform to the following requirements in general accordance with GRI GM-13 (some requirements are stricter than GM-13):

Table 3 Geomembrane Test Requirements

Test	Test Designation	MQC Test Frequency	Requirements
1. Sheet Thickness	ASTM D5994	Per roll	60 mils minus 15% for any measurement, minus 10% for 8 out of 10 individual values, and the average of all measurements for any roll, not less than 57 mils
2. Asperity Height *(1)*	ASTM D7466	Every second roll *(1)*	16 mils and as needed to meet shear-strength requirements
3. Sheet density	ASTM D1505 (preferred) or D792 Method B	1/50,000 sf	> 0.940 g/cc
4. Tensile Properties *(2)*			
a. Yield Strength	ASTM D6693 Type IV	1/50,000 sf	> 126 lb/in
b. Break Strength	ASTM D6693 Type IV	1/50,000 sf	> 90 lb/in
c. Yield Elongation	ASTM D6693, Type IV	1/50,000 sf	> 12% each sample
d. Break Elongation	ASTM D6693, Type IV	1/50,000 sf	> 100%
5. Tear Resistance	ASTM D1004, Die C	1/100,000 sf	> 42 lb
6. Puncture Resistance	ASTM D4833	1/100,000 sf	> 90 lb

Table 3 Geomembrane Test Requirements			
Test	Test Designation	MQC Test Frequency	Requirements
7. Stress Crack Resistance *(3)*	ASTM D5397 (App.)	Per GRI GM10	> 500 hr
8. Carbon Black Content	ASTM D4218 *(4)*	1/50,000 sf	2.0 to 3.0%
9. Carbon Black Dispersion	ASTM D5596	1/100,000 sf	*(5)*
10. Standard Oxidation Induction Time of Polyolefins *(6)*	ASTM D3895 or ASTM D5885	One per formulation	Minimum average 100 minutes or Minimum average 400 minutes
11. Oven Aging at 85°C *(6), (7)*	D 5721		
a. Standard OIT (min. ave.) – % retained after 90 days	D 3895	Per each formulation	55
— or —			
b. High Pressure OIT (min. ave.) – % retained after 90 days	D 5885		80
12. UV Resistance *(8)*	D 7238		
a. High Pressure OIT (min. ave.) – % retained after 1,600 hrs *(9)*	D 5885	Per each formulation	50

Notes:
(1) Alternate the measurement side for double-sided textured sheet.
(2) Machine direction (MD) and cross-machine direction (XMD) average values should be on the basis of five test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches. Break elongation is calculated using a gauge length of 2.0 inches.
(3) SP-NCTL in accordance with ASTM D5397 Appendix, is not appropriate for testing geomembranes with textured or irregular rough surfaces. The test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials. The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(4) Other methods such as ASTM D1603 (tube furnace) or D6370 (TGA) are acceptable if an appropriate correlation to D4218 (muffle furnace) can be established.
(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views: Nine in Categories 1 or 2 and one in Category 3.
(6) The manufacturer has the option to select one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(7) Evaluating samples at 30 and 60 days to compare with the 90-day response is also recommended.
(8) The condition of the test should be 20 hours. Ultraviolent (UV) cycle at 75°C followed by 4-hour condensation at 60°C.
(9) UV resistance is based on percent-retained value regardless of the original HP-OIT value.

2.03 MANUFACTURER SOURCE QUALITY CONTROL (MQC) TESTING

A. The Manufacturer shall perform the Manufacturer's quality control tests listed above.

B. Submit as indicated in Part 1 of this Section.

2.04 EXTRUDATE ROD OR BEAD

A. Made from same resin type as the geomembrane.
B. Containing 2% to 3% carbon black.

PART 3 EXECUTION (INSTALLER)

3.01 CERTIFICATION OF GEOMEMBRANE SUBGRADE

A. The Installer shall verify in writing by submitting a subgrade acceptance form to the CQA Consultant that the surface on which the geomembrane will be installed is acceptable.

B. The Installer shall verify that no particles project from the underlying surface that could puncture or damage the geomembrane.

3.02 PREPARATION

A. The Contractor shall repair any damage to the subgrade (soil or GCL) before deploying the geomembrane. The subgrade soil shall meet the requirements of Section 02301, Earthwork for Landfill Construction, and the GCL shall meet the requirements of Section 02072, Geosynthetic Clay Liner.

B. Round edges of anchor trenches or cushion with geotextiles.

3.03 TRIAL SEAM WELDS

The Contractor shall perform trial seam welds as follows:

A. Perform trial welds on samples of geomembrane to verify the performance of welding equipment, welding personnel, seam welding methods, and weather conditions.

B. Do not begin production seam welding until equipment and welders have successfully completed trial welds.

C. Frequency of trial welds:

1. There shall be a minimum of two trial welds per day per equipment and per seamer with one before the start of work and one at mid shift.
2. After any equipment shutdown or loss of power.
3. When directed by the CQA Monitor.

D. Make trial welds in the same surroundings and environmental conditions as the production welds (i.e., in contact with subgrade or GCL).

E. Make trial weld sample at least 6 feet long for dual-hot-wedge welding machines and 6 feet long for extrusion welds.

F. Allow welds to cool for 5 minutes and then cut excess material from the ends of the welds.

G. Using a cutting die cut ten 1-inch specimens spaced evenly along the length of the weld.

H. Using a field tensiometer, test specimens for peel adhesion and bonded seam strength (ASTM D6392). Test both sides of the weld for peel strength (fusion welds only). Test at a separation rate of 2 inches per minute.

I. A weld is considered passing when the following results are achieved in accordance with GRI GM-19 Table 1(a):

1. The break is a film-tearing bond (FTB). The following are unacceptable break codes according to their description in ASTM 6392 (in this regard, SIP is an acceptable break code):

    a. Hot Wedge: AD and AD-Brk > 25%.
    b. Extrusion Fillet: AD1 and AD2.
    c. Exception: AD-WLD (unless strength is achieved).

2. The peel strength is a minimum of 91 pounds per inch for 60-mil thick at yield for wedge welds or flat welds and a minimum of 78 pounds per inch for 60-mil thick at yield for extrusion welds. The peel separation (or incursion) shall not exceed 25%.

3. There is no more than 25% separation of the weld. For wedge welds the width of the weld is considered the width of the nip roller.

4. The shear strength is a minimum of 120 pounds per inch for all weld types. Set grips back 2 inches from the edge of the weld when testing. Minimum elongation between the grips must be 2 inches. The shear elongation at break shall exceed 50% (shear elongation testing shall be omitted during field testing but included in laboratory tests.)

5. The test is acceptable when all test specimens pass the peel and shear tests.

J. Repeat the trial weld in its entirety when any of the trial weld specimens fail in either peel or shear.

K. When repeated trial weld fails, do not use the welding apparatus and welder until deficiencies or conditions are corrected and two consecutive successful trial welds are achieved.

3.04 DEPLOYMENT

A. Carefully consider the timing and temperature during deployment. Focus on verifying that there are no bridging or stresses in the geomembrane and there are no wrinkles in the geomembrane.

B. Deployment, welding, and covering would all occur at the same temperature. In a practical sense, strive to perform these activities within as narrow a temperature range as practical and avoid these activities during peak hot or cold conditions.

C. Deploy manually or by use of spreader bar attached to equipment as approved by the Manufacturer. The equipment shall not damage the subgrade, GCL, geomembrane, or other geosynthetic materials.

D. Provide minimum overlap of 4 inches (for extrusion welding) or 6 inches (for fusion welding) between panels.

E. Dual-hot-wedge welding is the preferred method of seaming. Extrusion welding shall be limited to areas that cannot be fusion welded (i.e., patches).

F. Panel Identification: Assign each panel an identifying code number or letter consistent with the approved panel layout drawing. The coding is subject to approval by the CQA Monitor.

G. Repair damage to subgrade or other underlying materials before completing deployment of geomembrane.

H. Do not deploy more panels in one shift than can be welded or secured during that same shift.

I. Do not deploy in the presence of excessive moisture, precipitation, ponded water, or high winds.

J. Do not damage the geomembrane when handling, with equipment traffic, due to leakage of hydrocarbons, or by any other means.

K. Do not wear shoes that can damage the geomembrane.

L. Unroll geomembrane panels using methods that will not damage, stretch, or crimp the geomembrane. Protect the underlying surface from damage.

M. Place ballast on the geomembrane that will prevent wind from uplifting and moving the geomembrane.

N. Use ballast that will not damage the geomembrane.

O. Protect the geomembrane in areas of heavy traffic by placing a protective cover over the geomembrane.

P. Do not allow any vehicular traffic directly on the geomembrane without approval from the Engineer.

Q. Remove wrinkled or creased material.

R. Install material to account for shrinkage and contraction while avoiding wrinkles. Install material stress-free with no bridging before it is covered. Add material as needed to avoid bridging.

S. Before wrinkles fold over, attempt to push them out. For wrinkles that cannot be pushed out, cut them out and repair.

T. Do not allow textured surfaces to be dragged over the installed geocomposite. Use a smooth geosynthetic slip sheet or rub sheet as necessary to reduce friction damage during deployment.

U. Visually inspect geomembrane for imperfections. Mark faulty or suspect areas for repair.

3.05 SEAM LAYOUT

A. Orient seams parallel to the line of a maximum slope, i.e., orient down, not across a slope.

B. Minimize the number of field seams in corners, odd-shaped geometric locations, and outside corners.

C. Keep horizontal seams (seams running approximately parallel to slope contours) at least 6 feet away from the toe or crest of slope.

D. When full-roll lengths do not extend past the toe of slope, panel ends may be seamed provided the panel is cut at an angle greater than 45º. The use of 45º

seams along the slope is limited to situations that are unavoidable due to slope geometry.

E. Use a seam-numbering system compatible with the panel number system.

F. Shingle panels on all slopes and grades to promote drainage over the seam, not into the seam.

3.06 WELDING EQUIPMENT

A. The Contractor shall maintain sufficient operating seaming apparatus to continue work without delay.

B. Use a power source capable of providing constant voltage under combined line load.

C. Provide protective lining and splash pad large enough to catch spilled fuel under the electric generator if the generator is positioned on the geomembrane.

D. Provide extrusion welders equipped with gauges showing temperatures in the extruder apparatus and at the nozzle.

E. Provide a hot-wedge welder meeting the following requirements:

1. Contained on wheeled chassis and self-propelled.
2. Automated variable-speed capability.
3. Equipped with devices for adjusting temperatures at the wedge.
4. Pressure controlled by springs, pneumatics, or other system that allows for variation in sheet thickness.

F. Rigid-frame fixed-position equipment is not acceptable.

3.07 TEST EQUIPMENT

A. The Contractor shall provide a tensiometer capable of measuring seam strength. The tensiometer must be calibrated and accurate within 2 pounds. The Contractor shall provide calibration certification within the last 12 months for inspection upon request by the Engineer.

B. The Contractor shall provide non-destructive testing equipment (i.e., vacuum box) (ASTM 4437).

C. The Contractor shall provide dies for cutting seam samples.

3.08 GENERAL WELDING PROCEDURES

A. Do not begin welding until the welder and equipment pass the trial weld tests.

B. Clean seam area surfaces of grease, moisture, dust, dirt, debris, or other foreign material.

C. Overlap panels a minimum of 4 inches for extrusion and 6 inches for hot-wedge welding.

D. Construct the weld with adequate material width on each side of the weld to allow peel and shear testing.

E. Extend welding to the outside edge of all panels.

F. If required for firm support, provide a firm subgrade under the seaming area.

G. Cut fish mouths or wrinkles along the ridge of the wrinkle to achieve a flap overlap. Extrusion-weld the cut fish mouths or wrinkles where the overlap is more than 3 inches. When there is less than a 3-inch overlap, patch with an oval or round patch extending a minimum of 6 inches in all directions beyond the cut.

3.09 EXTRUSION TYPE OF WELDING

A. The Contractor shall use procedures to tack bond adjacent panels together that do not damage geomembrane and allow CQA tests to be performed.

B. Purge welding apparatus of heat-degraded extrudate before welding.

C. Bevel top edges of geomembrane a minimum of 45° and the full thickness of the geomembrane before extrusion welding.

D. Clean seam-welding surfaces of oxidation by disc grinder or equivalent not more than 30 minutes before extrusion welding. Change grinding discs frequently. Do not use clogged discs.

E. Do not remove more than 4 mils of material when grinding.

F. Grind across, not parallel to, welds.

G. Cover entire width of grind area with extrudate.

H. When restarting welding, grind ends of all welds that are more than 5 minutes old.

3.10 HOT WEDGE WELDING

A. Place smooth insulating plate or fabric beneath hot welding apparatus after use.

B. Protect against moisture build-up between panels.

C. If welding cross seams, conduct field test welds at least every 2 hours; otherwise, conduct tests once before the start of work and once at mid-day.

D. Bevel edges of top and bottom panels on cross seams.

E. Extrusion-weld a repair patch over all tee and cross-seam intersections.

3.11 INSTALLATION QUALITY CONTROL

A. Log the following every 4 hours:

1. Temperature 6 inches above the geomembrane surface being welded.
2. Extrudate temperatures in barrel and at nozzle (extrusion welder).
3. Operating temperature of hot wedge (hot-wedge welder) and any pressure adjustments made.
4. Preheat temperature.
5. Speed of hot wedge welder in feet per minute.

B. Weld only when ambient temperature measured 6 inches above the geomembrane is between 40°F and 130°F.

C. If seaming at ambient temperatures below 40°F (5°C) or above 130°F (40°C), the Contractor shall demonstrate and certify that such methods produce seams which are entirely equivalent to seams produced at ambient temperatures above 40°F (5°C) and below 130°F (40°C). Certify that the overall quality of the geomembrane is not adversely affected. Perform work under a contract change order that states the seaming procedure will not cause any physical or chemical modification to the geomembrane which will generate short- or long-term damage to the geomembrane.

D. Seaming below temperatures of 32°F must be performed under cold weather welding procedures approved by the Engineer.

3.12 NON-DESTRUCTIVE TESTING

A. The Contractor shall non-destructively test all field seams over their full length using a vacuum test unit, air pressure (for dual-hot-wedge seams only), spark testing, or other approved methods (ASTM 4437).

B. Perform testing as the seaming progresses and not at the completion of all the field seaming.

C. Note all required repairs in CQC reports and then complete all required repairs in accordance with this Specification.

3.13 NON-DESTRUCTIVE VACUUM TESTING

A. Equipment

1. A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom porthole or valve assembly, and a vacuum gauge.
2. A vacuum pump assembly equipped with a pressure control.
3. A rubber pressure/vacuum hose with fittings and connections.
4. A soapy solution and an applicator.

B. Vacuum Box Test Procedures

1. Wet the seam area with a soapy solution.
2. Place the box over the wetted seam area. Ensure that a leak-tight seal is created.
3. Energize the vacuum pump.
4. Reduce the vacuum box pressure to approximately 10 inches of mercury (i.e., 5-psi gauge).
5. Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 10 seconds.
6. Mark areas where soap bubbles appear.
7. Repair in accordance with repair procedures described in this Specification.

3.14 NON-DESTRUCTIVE AIR PRESSURE TESTING FOR DUAL-HOT-WEDGE WELD

A. Equipment

1. An air pump (manual or motor driven) equipped with a pressure gauge capable of generating and sustaining a pressure over 70 psi and mounted on a cushion to protect the geomembrane.
2. A rubber hose with fittings and connections.
3. A sharp hollow needle or other approved pressure-feed device.
4. A pressure gauge with an accuracy of plus or minus 1 psi.

B. Test Procedures

1. Seal both ends of the welded seam to be tested.
2. Insert needle or other approved pressure-feed device into the tunnel created by the weld.
3. Energize the air pump to a minimum pressure of 30 psi.
4. Maintain this pressure for 5 minutes.
5. Close the valve allowing 5 minutes relaxation time. During the relaxation time the air pressure cannot drop more than 2 psi.
6. If loss of pressure exceeds 2 psi or does not stabilize, the Contractor shall locate the faulty area and repair it in accordance with repair procedures described in this Specification.
7. Puncture the opposite end of the seam to release air. If blockage is present, locate and test the seam on both sides of the blockage.
8. Remove the needle or other approved pressure-feed device.
9. Repair the penetration holes.

3.15 SPARK TEST PENETRATIONS OR OTHER DIFFICULT AREAS AS AN ALTERNATIVE TO VACUUM TESTING

A. Equipment and Materials

1. 24-gauge copper wire.
2. Low-amperage electric detector, 20,000 to 30,000 volt, with brush-type electrode capable of causing visible arc up to 3/4 inch from copper wire.

B. Spark Testing Procedures

1. During extrusion welding, place a copper wire within 1/4 inch of the edge of the extrusion weld.
2. Pass an electrode over the seam area and observe for spark. If a spark is detected, perform a repair.

3.16 LABORATORY DESTRUCTIVE TESTING

A. Location and Frequency of Testing

1. Collect destructive test samples at a minimum frequency of one test location per 500 feet of seam length.
2. Determine test locations during welding. Locations may be prompted by suspicion or excess crystallinity, contamination, offset welds, or suspected defect. The CQA Monitor will be responsible for choosing the locations. The CQA Monitor will not notify the Installer in advance of selecting locations where weld samples will be taken.

3. The CQA Monitor may increase the test frequency based on marginal results.

B. Sampling Procedures

1. The Installer shall cut samples at locations designated by the CQA Monitor as the welding progresses. The Installer is to verify that passing laboratory test results have been obtained before the geomembrane is covered by another material.
2. The CQA Monitor will number each sample and mark the sample number and location in compliance with the CQA program.

C. The Contractor shall immediately repair all holes in the geomembrane resulting from destructive test sampling in accordance with repair procedures described in this Section. Test the continuity of the repair in accordance with this Section.

D. Size of Samples: Samples shall be a minimum of 12 inches wide by 52 inches long with the seam centered lengthwise. Cut ten 1-inch-wide strips evenly across the sample and test these for (shear and peel) in the field. Cut the remaining sample into three parts for distribution as follows:

1. One portion for the Installer: 12 inches by 12 inches.
2. One portion for the CQA Laboratory: 12 inches by 18 inches.
3. One portion to the Engineer for archive storage: minimum 12 inches by 12 inches.

3.17 FIELD TESTING (PERFORMED BY INSTALLER)

A. Test the ten 1-inch-wide strips specified in Paragraph 3.03G by tensiometer for peel and shear.

B. The test strips must meet peel and shear requirements for welded seams specified in Paragraph 3.03I.

C. If any field test sample fails, follow failed test procedures outlined in this Section.

3.18 LABORATORY TESTING PERFORMED INDEPENDENTLY BY CONSTRUCTION QUALITY ASSURANCE (CQA) LABORATORY

A. The Engineer will retain an independent CQA Laboratory to perform CQA testing.

B. Test "seam strength" and "peel adhesion" (ASTM D6392).

C. Test at least five specimens for each test method. Minimum acceptable values to be obtained for these tests are specified in Paragraph 3.02I.

D. Select specimens alternately by test from the samples (i.e., peel, shear, peel, shear).

E. Provide test results no more than 48 hours after receiving samples.

F. For dual-hot-wedge welded samples, test both sides in peel.

G. Seams failing testing and/or inspection shall be repaired, reinspected, and retested by the Owner until compliance is attained. However, the Contractor shall reimburse the Owner for all failed tests.

3.19 FAILED WELD PROCEDURES

A. The Installer shall follow one of the following options when there is a destructive test failure:

1. First Option:

a. Reconstruct the seam between any two passing test locations. Do not extrusion weld the flap.

2. Second Option:

a. Trace the weld at least 10 feet minimum in both directions along the seam from the failed specimen.
b. Obtain specimens at these locations for additional field tests. Obtain specimens as described above.
c. If the additional test specimens meet seam quality requirements, repair the seam between the passing seam specimen locations or the passing specimen location and the end of the seam.
d. If any specimen fails to meet seam quality requirements, repeat the process to establish the zone in which the seam must be repaired.

B. Shear or peel test: If a shear or peel test taken from a butt seam fails, cap the entire butt seam. Obtain a specimen from the cap and perform a shear and peel test. If the test from the cap specimen fails, repeat the capping until a passing test is obtained from a specimen of the cap weld.

C. Whenever a sample fails, perform additional trial seams for the specific welder and welding apparatus.

3.20 ACCEPTABLE WELDED SEAMS

Welded seams are considered acceptable under the following conditions:

A. The weld passes all non-destructive tests and the weld is bracketed by two locations from which all specimens have passed destructive tests.

B. For reconstructed seams exceeding 50 feet, a specimen taken from within the reconstructed weld passes destructive testing and all non-destructive tests pass.

3.21 SEAMS THAT CANNOT BE DESTRUCTIVELY TESTED

A. If the weld cannot be tested, cap strip the weld. The welding and cap-stripping operations must be observed by the CQA Monitor and Installer for uniformity and completeness. The cap strip must pass nondestructive testing.

3.22 DEFECT AND REPAIR PROCEDURES

A. The repair procedures, materials, and techniques must be accepted in advance of the specific repair by the Owner, the Engineer, and the Installer.

B. The Contractor shall examine all welds and non-weld areas of the geomembrane for defects, holes, blister, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane must be clean at the time of the examination.

C. Repair and non-destructively test each suspect location regardless if it is in a weld area or discovered in the panel. Do not cover geomembrane at locations that have been repaired until test results with passing values are available.

D. Extrusion weld a patch over all “cross” or “tee” welds and specimen locations.

E. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.

F. Repair, removal, and replacement are at the Contractor's expense if the damage results from the Contractor's, Installer's, or the Contractor's subcontractor’s activities.

G. Repair any portion of the geomembrane exhibiting a flaw or failing a destructive or non-destructive test. The Owner, the Engineer, the Installer must agree on the appropriate repair method. Acceptable repair procedures may include:

1. Patching: Used to repair large holes (over 3/8-inch diameter), tears (over 2 inches long), undispersed raw materials, and contamination by foreign matter and to cover cross and tee connections.
2. Abrading and re-welding: Used to repair small sections of seams.
3. Spot welding or seaming: Used to repair small tears (less than 2 inches long), pinholes, or other minor localized flaws.
4. Capping: Used to repair large lengths (greater than 2 inches long) of failed seams.
5. Complete replacement of the seam.

H. In addition, the Contractor must do the following:

1. Abrade geomembrane surfaces to be repaired (extrusion welds only) no more than 1 hour before the repair.
2. Clean and dry all surfaces at the time of repair.
3. Extend patches or caps at least 6 inches beyond the edge of the defect and round all corners of material to be patched and the patches to a radius of at least 3 inches.
4. Unless otherwise instructed by the Engineer, cut geomembrane below large caps to avoid water or gas collection between the sheets.

I. Verification of Repair

1. Number and log each repair.
2. Non-destructively test each repair using methods specified in this Section.
3. Destructive tests may be required at the discretion of the Engineer.
4. Reconstruct repairs until tests indicate passing results.

3.23 GEOMEMBRANE ACCEPTANCE

A. The Contractor retains all Ownership and responsibility for the geomembrane until acceptance by the Engineer.

B. The Engineer will accept geomembrane installation when:

1. All required MQC and Installer records have been received and accepted.
2. The installation is finished.

3. Test reports verifying completion of all field seams and repairs, including associated testing, have been received.
4. Written certification documents and drawings have been received by the Engineer.

END OF SECTION

SECTION 02072
GEOSYNTHETIC CLAY LINER

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install geosynthetic clay liner (GCL) as a component of the liner system.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Manufacturer's Information

1. Manufacturer's information shall be submitted within 10 days of the Notice to Proceed.

2. The Manufacturer's name and address and primary contact.

3. The manufacturing plant name and address where the GCL for this project will be produced.

4. The Manufacturer's qualifications including:

   a. A minimum of 5 years of successful development and production of GCL.
   b. Evidence of production of at least 10 million square feet of GCL that meets the specifications of Article 2.01.
   c. Certification that the Manufacturer has sufficient capacity to provide the required material in the given timeframe.
   d. A list of at least 10 projects for which GCL has been supplied by the Manufacturer, three of which shall have been for projects of similar size.

5. Product name and the Manufacturer's description of the proposed GCL and five representative samples of the product (small samples approximately 5 inches long by 4 inches wide enclosed in a plastic bag with the product name) proposed for use on this project.

6. The Manufacturer's material properties sheets (cut sheets) of proposed GCL product meeting the requirements listed in the Article 2.01.

7. The Manufacturer's written instructions for storing, handling, installing, seaming, protecting from hydration, and repairing the proposed GCL, including recommendations for handling equipment (model number and load capacity).

8. Sample product warranty that meets the requirements of Article 1.06 and Section 01780, Warranties and Bonds.

9. The Manufacturer's quality control (MQC) plan, including examples of GCL certification documents, name and address of the quality control testing laboratory, quality control laboratory certification, examples of retesting notification, and documentation.

B. Installer's Information

1. The Contractor shall submit the Installer's Information at least 30 days before GCL is scheduled to be installed.
2. Installer's name and address and primary contact.
3. Installer's qualifications including a list of at least three previous projects of similar size to this project, including project name, location, size and date of installation, and evidence of installing at least 1 million square feet of GCL.
4. The construction quality control (CQC) plan, including examples of subgrade certification documents, daily record documents, methods for repairing GCL and Subbase and example documents to certify repairs, method for removing rejected materials, proposed staffing, and proposed equipment.
5. The Installer's written procedures manual.
6. Panel layout drawings identifying panels and overlaps.

C. Project-Specific Product Acceptance Testing

1. After the CQA Consultant review and approval of the Manufacturer's Information and, representative samples of the GCL product intended for this project and manufactured at the same plant that will produce the product for this project shall be sampled in accordance with ASTM D6072 and sent to the Product Acceptance Laboratory for Project-Specific Product Acceptance Testing as listed in Table 2 in Article 2.01.

2. The CQA Consultant's acceptance of the GCL product will depend on the results of the Project-Specific Product Acceptance testing. Project-Specific

Product Acceptance test results shall be submitted to the CQA Consultant 21 days before shipping the GCL. The GCL shall not be shipped before review and acceptance of the Project-Specific Product Acceptance Test results.

3. Samples shall be sent to the Product Acceptance Laboratory specified by the CQA Consultant unless otherwise noted. The sample package should include a cover letter referencing the project location, project number, Manufacturer, date of sampling, lot and roll number, and MQC test data documented for the particular production run from which the sample was taken. This submittal shall conform to the requirements of Section 01330, Submittals and Acceptance. A copy of the cover letter shall be sent to the CQA Consultant.

4. The Contractor shall bear the cost of all Project-Specific Product Acceptance testing, including shipping samples to the Product Acceptance Laboratory.

5. The GCL samples shall include two 3-foot-long-by-the-width-of-roll samples for laboratory testing. The Contractor may elect to have the Product Acceptance Laboratory collect the samples from the Manufacturer or direct the Manufacturer to ship the samples to the Product Acceptance Laboratory. The samples shall be packaged securely for shipping to prevent damage, bentonite loss, and hydration. Each sample shall be clearly marked with lot and roll number and date of sampling as the machine direction on the sample. The Contractor shall submit MQC data for the roll sampled with the test results.

6. Interface Direct Shear Strength Testing: The CQA Laboratory shall perform two interface direct shear strength tests – four normal load conditions for each of the two test configurations – in accordance with ASTM D6243 on representative samples of GCL, Textured Geomembrane, and subgrade soils in the configuration provided below. These tests are in addition to the requirements for interface direct shear tests included in Section 02070, Geocomposite, and Section 02071, Geomembrane (HDPE).

    a. Test Configuration 1—GCL versus Subgrade Soil: Lower geotextile of GCL clamped to bottom of box and compacted subgrade soil on top. Subgrade soil shall be compacted within 3% of optimum moisture content to 90% of Modified Proctor in accordance with ASTM D1557. Report Modified Proctor Test.
    b. Test Configuration 2— GCL versus Textured Geomembrane: Upper geotextile of GCL clamped to top of the box and textured

geomembrane clamped to bottom of box. Textured geomembrane sample shall be provided by the Contractor using representative geomembrane product intended for use in this project.

c. See Section 02071, Geomembrane (HDPE), for geomembrane sampling and shipping requirements.

d. Saturate GCL sample for 48 hours under full normal load before shearing and shear under fully saturated (tap water) conditions.

e. Normal loads: See Table 2 in Article 2.01.

f. Shear rate: 0.04-inch/minute.

g. Provide complete shear versus displacement graph to at least 3 inches of displacement.

h. Report peak (maximum) shear strength and post-peak shear strength measured at 3 inches of displacement for all four normal loads.

i. Report location of failure surface (i.e. slip plane).

j. Results shall meet the requirements of Table 2 in Article 2.01.

7. The Product Acceptance Laboratory shall perform GCL compatibility testing to verify that the site-specific leachate will not adversely affect the hydraulic properties of the proposed GCL.

a. The Contractor shall arrange with the Owner to obtain a leachate sample for use in compatibility testing. The Contractor shall bear the cost of shipping samples to the Product Acceptance Laboratory and all Project-Specific Product Acceptance testing and disposal costs.

b. GCL Compatibility: The Product Acceptance Laboratory shall perform leachate compatibility testing on the GCL in accordance with ASTM D6766 for hydraulic properties using actual leachate obtained from the site as permanent. Confirm test configurations with the CQA Consultant before testing. Report the flux (m^3/m^2sec) and hydraulic conductivity (cm/sec). Results shall meet the requirements of Table 2 in Article 2.01.

(1) Leachate Compatibility: The GCL test specimen shall be hydrated with leachate for a minimum of 48 hours using sufficient backpressure to achieve a minimum B coefficient of 0.9 and using a confined effective consolidation stress not exceeding 5 pounds per square inch (psi). The hydraulic conductivity test on the GCL specimen shall be conducted using leachate at a confined effective consolidation stress not exceeding 5 psi. The hydraulic conductivity test shall continue until steady state conditions are reached or a

minimum of two pore volumes of permeant fluid have passed through the test specimen.

c. Bentonite Screening Tests: The Product Acceptance Laboratory shall perform compatibility testing on the bentonite portion of the GCL in accordance with ASTM D6141 guidance, which includes swell index in accordance with ASTM D5890 and fluid loss in accordance with ASTM D5891. Results shall meet the requirements of Table 2 in Article 2.01. Bentonite screening tests shall include the following:

(1) Swell Index (ASTM D5890) – Deionized water.
(2) Fluid Loss (ASTM D5891) – Deionized water.

8. If the results of any test do not conform to the requirements of this Specification, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the CQA Consultant that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Specification, the product shall be rejected and the Contractor must submit pre-construction submittals pertaining to the new product and perform Project-Specific Acceptance Tests for the new product.

D. Manufacturer's Quality Control (MQC)

1. The MQC data shall be submitted at least 21 days before GCL shipment.

2. The Contractor shall submit the MQC test results to demonstrate that the GCL is in accordance with this Specification.

3. MQC Sampling shall be in accordance with the specific test method listed in Table 1 of Article 2.01. If no sampling protocol is stipulated in the test method, then samples shall be taken evenly spaced across the entire roll width in accordance with ASTM D4354.

4. Certification reports shall be submitted by the Manufacturer on the Manufacturer's letterhead and signed by an authorized representative of the Manufacturer.

5. MQC data shall be submitted electronically in PDF and data format (.xls, .xlsx, .csv, .txt, .doc, .docx, .accdb, etc.) that the data can be readily copied.

6. The Contractor shall submit MQC testing reports and certifications meeting requirements of Article 2.01. Before shipping the product, the Manufacturer shall submit the certification that GCL is essentially free of broken needle fragments on the Manufacturer's letterhead and signed by an authorized representative of the Manufacturer.

7. Provide the following information with MQC test data:

   a. Project Name, Project Location, Manufacturer, Product Name.
   b. Roll and lot numbers and any additional production identification.
   c. Results of MQC tests, including a description of test methods used.

8. The Engineer will reject rolls for which quality control requirements are not met.

9. If the results of any test do not conform to the requirements of this specification, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the CQA Consultant that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this specification, the product shall be rejected and removed from the site.

E. Construction Quality Control (CQC): During construction, the Contractor shall submit CQC documentation weekly:

1. Material delivery report.
2. Rejected material removal report.
3. Soil subgrade certification signed by the Contractor.
4. Records of daily installation, including roll numbers placed.
5. Records of daily personnel activity.
6. Meeting reports.
7. Updated Record Drawings.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM D1557—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
2. ASTM D2216—Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
3. ASTM D4354—Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing.
4. ASTM D4439—Standard Terminology for Geosynthetics.
5. ASTM D4533/D4533M—Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
6. ASTM D4632/D4632M—Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
7. ASTM D4833/D4833M—Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
8. ASTM D5887/D5887M—Standard Test Method for Measurement of Index Flux through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
9. ASTM D5888—Standard Guide for Storage and Handling of Geosynthetic Clay Liners.
10. ASTM D5889/D5889M—Standard Practice for Quality Control of Geosynthetic Clay Liners.
11. ASTM D5890—Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
12. ASTM D5891/D5891M—Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.
13. ASTM D5993—Standard Test Method for Measuring Mass Per Unit Area of Geosynthetic Clay Liners.
14. ASTM D6072/D6072M—Standard Practice for Obtaining Samples of Geosynthetic Clay Liners.
15. ASTM D6141—Standard Guide for Screening Clay Portion and Index Flux of Geosynthetic Clay Liner (GCL) for Chemical Compatibility to Liquids.
16. ASTM D6243/D6243M—Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
17. ASTM D6496/D6496M—Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners.
18. ASTM D6766—Standard Test Method for Evaluation of Hydraulic Properties of Geosynthetic Clay Liners Permeated with Potentially Incompatible Aqueous Solutions.

19. ASTM D6768/D6768M—Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

1.04 QUALITY ASSURANCE

A. MQC and CQC are the responsibility of the Manufacturer and Installer to document that the material and installation are in accordance with this Specification.

B. The Installer's CQC representative will be responsible for CQC in accordance with the submitted CQC Plan, which is independent of Construction Quality Assurance (CQA).

C. The Owner will engage and pay for the services of an Engineer and/or CQA Consultant. The Owner will engage and pay for the services of an independent CQA Laboratory for monitoring the quality and installation of the GCL. The Manufacturer, Installer, and Contractor must help the Engineer with product sampling for CQA testing by providing samples, personnel, and equipment as necessary.

1. CQA tests will be the measure of the acceptance of material. The Contractor will be responsible for the cost of retesting should the CQA tests fail. The retests will be paid by the Owner and reimbursed by the Contractor.
2. Samples of GCL: After review of the project-specific Product Acceptance Test results, the CQA Consultant or representative may visit the manufacturing plant and/or select product rolls to be sampled by the Manufacturer. The Manufacturer will ship one 3-foot-long by the width-of-roll-wide sample for every 100,000 square feet of material to the CQA Consultant's CQA Laboratory for CQA testing. The sample package shall include a cover letter referencing the project location, project number, Manufacturer, date of sampling, lot and roll number, and MQC test data documented for the particular production run from which the sample was taken. A copy of the cover letter shall be submitted to the CQA Consultant.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

B. The GCL Manufacturer shall warrant in writing the GCL material for 5 years on a pro rata basis from the date of Substantial Completion. The warranty shall apply to normal use and service in a sanitary landfill environment under exposure to

sanitary landfill gas and leachate as well as other exposures which can be expected from the intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. Material delivery, storage, and handling shall be in accordance with documents as required in Article 1.02, Manufacturer's Information and Installer's Information.

C. The Contractor shall deliver materials to the site only after the CQA Consultant approves the required submittals.

D. The Contractor shall do the following to ensure proper delivery, storage, and handling:

1. Comply with the Manufacturer's instructions provided as part of the pre-construction submittals described in Paragraph 1.02A.

2. Deliver materials to the site only after the Engineer accepts pre-construction submittals and project-specific product acceptance submittals.

3. Deliver GCL covered with a waterproof, tightly fitting, plastic covering resistant to ultraviolet degradation.

4. Deliver GCL on a rigid core sufficient to prevent collapse during shipping, shattering or breaking during deployment, and to facilitate handling.

5. Ship less than 1 month before scheduled installation.

6. Deliver each roll with the following information marked on each label:

   a. Manufacturer's name.
   b. Project name.
   c. Product identification.
   d. Lot and roll numbers.
   e. Roll dimensions and weight.

7. Each roll shall have a label clearly visible and attached to the outside of the roll and at the end of the roll.

8. Preserve integrity and readability of roll labels.

9. Store rolls in space allocated by the Engineer. Space shall be at high-ground level or elevated above ground surface.

10. Stack no more than three rolls high.

11. Protect rolls from precipitation, mud, dirt, dust, puncture, cutting, standing water, or any other damaging or deleterious conditions.

12. Use appropriate handling equipment meeting the Manufacturer's recommendations to load, move, or deploy GCL rolls.

13. Handle rolls to prevent damage to the product or to its protective wrapping and labels. Follow handling procedures outlined in ASTM D5888.

14. Immediately repair damage to protective covering due to mishandling or sampling. Repair to protect rolls from moisture or other deleterious conditions.

15. The Installer is responsible for off-loading, storing, and transporting material from the storage area to the installation site, installing the GCL, and performing or coordinating CQC activities.

16. The Contractor shall reject any roll that does not have an identifying roll number and lot number.

17. The Contractor shall not store GCL outdoors for more than 12 months. GCL rolls shall be covered with a waterproof, plastic covering that is resistant to ultraviolet degradation in addition to the plastic wrap that covers each GCL roll.

1.07 QUALIFICATIONS

A. The Contractor shall provide the Manufacturer's and the Installer's qualifications as specified in Article 1.02.

1.08 TESTING REQUIREMENTS

A. Provide samples and testing for CQC testing in accordance with the requirements of this Section. Provide samples for CQA testing in accordance with the requirements of this Section. Please refer to the material requirement and testing frequencies provided in this Section.

B. CQA testing shall be performed for the material properties list in Part 2 of this Section. The cost of CQA testing will be paid by the Owner.

C. If CQA tests fail the requirements of this Section, the retesting of material provided by the Contractor will be paid for by the Owner and the cost reimbursed by the Contractor as part of the project's final change order.

1.09 RECORD DRAWINGS

A. Record Drawings shall be prepared, maintained, and submitted showing GCL installation in accordance with the requirements of the Contract Documents. Record Drawings shall be updated throughout the project and are subject to field review by the CQA Consultant any time upon request.

1.10 DEFINITIONS

A. *Bentonite:* Clay soil, comprised primarily of sodium montmorillonite, characterized by high-swelling potential and low hydraulic conductivity.

B. *Geosynthetic Clay Liner (GCL):* Manufactured liner material consisting of a layer of granular bentonite encapsulated by geotextiles.

C. *GCL Manufacturer (Manufacturer):* The party responsible for the production and quality of GCL.

D. *Geotextile:* Permeable geosynthetic comprised solely of textiles (ASTM D4439).

E. *Installer:* The party responsible for field handling, transporting, storing, deploying, seaming, and protection against hydration of the GCL.

F. *Lot:* A group of consecutively numbered rolls from the same manufacturing line.

G. *Minimum Average Roll Value (MARV):* Minimum value of a limited series of tests that represents a value two standard deviations lower than the overall average value. Ninety-five percent of any individual samples will have values greater than the MARV for any given property.

H. *Overlap:* The width of a GCL panel in contact with an adjacent GCL panel. The distance is measured perpendicular from the overlying edge of one panel to the underlying edge of the other.

PART 2 PRODUCTS

2.01 GEOSYNTHETIC CLAY LINER (GCL)

The GCL must meet the following requirements:

A. Manufactured with a layer of bentonite granules between two layers of geotextile, with the geotextiles needle punched together to provide internal shear strength. All GCL to be supplied and installed on this project will be reinforced GCL products.

B. Manufactured rolls marked with continuous waterproof laplines and matchlines offset 6 inches from the edge of the rolls.

C. Certified by the Manufacturer as needle-free.

D. Polymer-enhanced GCL product may be used.

E. Manufactured to meet the requirements listed in Table 1 and Table 2.

Table 1 Manufacturing Quality Control Test Requirements

Test	ASTM Test Designation	Minimum Test Frequency	Required Test Values
Bentonite Component of GCL Requirements			
Bentonite Swell Index (Tap water)	D5890	Every 50 tons	≥ 24 mL/2g
Bentonite Fluid Loss (Tap water)	D5891	Every 50 tons	<18 mL
Nonwoven Geotextile Component of GCL			
Mass/Unit Area (cover and base)	D5261	1/200,000 sf	≥ 5.9 oz/sy MARV
Grab Tensile Strength	D4632	1/200,000 sf	Cover > 15 lb Base > 150 lb
GCL Requirements			
Bentonite Mass/Unit Area	D5993	1/40,000 sf	>0.75 lb/sf(1)
Tensile Strength	D6768	1/200,000 sf	>50 lb/in
Peel Strength	D6496	1/40,000 sf	>3.5 lb/in
Hydraulic Conductivity (Deionized Water)	D5887	1/250,000 sf	$<5 \times 10^{-9}$ cm/sec(2)
Index Flux (Deionized Water)	D5887	1/250,000 sf	$<1.0 \times 10^{-8}$ $m^3/m^2/sec$(2)

Notes:
(1) Report bentonite mass per unit area at 0% moisture content.
(2) These values are maximum permitted.

Table 2 Project-Specific Product Acceptance Test Requirements				
Test	ASTM Test Designation	Minimum Test Frequency	Required Test Values	
			Minimum Peak Shear Strength (psf)	Normal Load (psf)
Shear Strength (min.) (see Article 1.02.C.6 for test configurations)	D6243	1 per project	70	250
			1,340	5,000
			4,020	15,000
			5,630	21,000
Leachate Compatibility (see Article 1.02D)				
Bentonite Swell Index (Deionized Water)	D5890	1 per project	≥ 24 mL/2g	
Bentonite Fluid Loss (Deionized Water)	D5891	1 per project	< 18 mL	
Hydraulic Conductivity (Leachate) (2)	D6766	1 per project	$<1.0 \times 10^{-7}$ cm/sec	

(1) Hydraulic Conductivity and Index Flux testing in accordance with FDEP 62-701.400(3)(d)9, FAC.
(2) Hydraulic conductivity/leachate compatibility testing (ASTM D6766) has been performed for Solmax Bentoliner NWL. If this product is used, testing in accordance with ASTM D6766 is not required.

2.02 BENTONITE COMPONENT OF GCL

The Bentonite component of the GCL shall meet the following requirements:

A. Greater than 90% sodium montmorillonite clay.
B. Granular.
C. Meeting the product requirements listed in Table 1 and Table 2 of Article 2.01.

2.03 NON-WOVEN GEOTEXTILE COMPONENT OF GCL

The Geotextile component of the GCL shall meet the following requirements:

A. Products comprised of non-woven needle-punched polypropylene or polyester yarn oriented into a stable network that maintains its structure during handling, placement, and long-term service.

B. May not be heat-bonded as a primary process. Heat burnishing after needle-punching is permitted.

C. Resistant to soil and leachate chemicals.

D. New product made from virgin materials.

E. Geotextile used for GCL conforming to the requirements listed in Table 1.

PART 3 EXECUTION

3.01 EXAMINATION OF GCL SUBGRADE

A. The Contractor shall verify in writing to the Engineer with standard subgrade acceptance forms (Article 1.02) that the surface on which the GCL will be installed is acceptable.

B. Subgrade acceptance forms shall also verify that the subgrade meets the requirements of Section 02301, Earthwork for Landfill Construction.

3.02 DEPLOYMENT

A. Installation shall not begin until submittals have been received and approved (see Article 1.02).

B. Do not deploy GCL in the presence of excessive moisture, precipitation, ponded water, or high winds.

C. Deploy only after submittal of subgrade acceptance forms signed by the Installer, received and reviewed by the Engineer, and accepted by the Engineer.

D. No equipment used shall damage the GCL by handling, deploying, leaking of hydrocarbons, or other means.

E. Deploy panels parallel to slope, running panels down slope. Correct or make adjustments to panels that become askew to line parallel to slope.

F. Seams should be located at least 5 feet from the toe and crest of slopes.

G. Deploy manually or by use of spreader bar attached to a loader or backhoe.

H. Use track- or rubber-tire-mounted equipment to deploy the GCL.

I. Equipment shall be as described in the CQC plan and must not cause rutting of the subgrade surface. Equipment is subject to approval by the CQA Consultant.

J. Do not make sharp turns during installation.

K. Do not drive over the GCL unless approved in writing by the GCL Manufacturer and proven to not void the material's warranty (Article 1.05).

L. Repair any damage to the subgrade or GCL that occurs during deployment. Any GCL surface showing damage due to scuffing, penetration by foreign objects or

distress from rough subsurface shall, at the expense of the Contractor, be replaced or repaired in accordance with the CQC plan (Article 1.02).

M. Do not trap objects or standing water beneath the GCL.

N. To avoid damage to the GCL, do not drag textured geomembrane over the installed GCL. Use a smooth geosynthetic slip sheet or rub sheet as necessary to reduce friction damage during deployment.

O. Avoid wrinkles during deployment. Areas that could potentially fold over or result in a crease in the GCL shall be removed and repaired in accordance with Article 3.06.

P. The GCL shall be repaired in accordance with the CQC plan (Article 1.02) and Article 3.06.

Q. Only deploy as much GCL as can be covered with geomembrane at the end of the working day. Do not leave the GCL uncovered overnight.

R. If water is on the GCL or if stepping on the GCL expels water, the GCL is prematurely hydrated and shall be removed. The CQA Consultant shall be consulted if premature hydration is suspected, even if the GCL does not expel water or is covered. GCL that has been prematurely hydrated shall not be used, even after drying.

S. Where dewatering is required, the Contractor shall maintain dewatering system as required in Section 02240, Dewatering, until installation of all overlying layers, including protective cover soil or gravel, is completed to prevent premature hydration of the GCL.

3.03 PANEL OVERLAPS

A. Use the lapline as a guide.

B. Overlap along roll length a minimum of 6 inches (or greater as recommended by the Manufacturer) on base slopes where slopes are less than 10%.

C. Overlap along roll length a minimum of 9 inches (or greater as recommended by the Manufacturer) on side slopes where slopes are greater than 10%.

D. Overlap a minimum of 24 inches at roll ends and apply supplemental bentonite as described in this Section and in accordance with the Manufacturer’s installation requirements.

E. Orient panels parallel to the line of a maximum slope (i.e., orient down, not across slope).

F. Minimize the number of field seams in inside corners, odd-shaped geometric locations, and outside corners.

G. Keep horizontal overlaps (overlaps running approximately perpendicular to slope contours) at least 5 feet away from the toe or crest of slope.

H. Shingle panel overlaps on all slopes and grades so that surface water flows across the seam flap, not under it.

I. Contact surfaces between two GCL panels shall be thoroughly cleaned of foreign material. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.

J. If the GCL material used for this work does not include self-seaming capabilities along the longitudinal overlaps, supplemental granular bentonite shall be used in the seams as provided in this Section as described in the Manufacturer's installation requirements.

K. Where applicable, the granular bentonite sealing clay used for overlap seaming, penetration sealing, and repairs shall be made from the same natural sodium bentonite as used in the GCL and shall be as recommended by the GCL Manufacturer.

3.04 PROTECTION

A. The Contractor shall deploy no more panels in 1 day than can be secured under geomembrane during that same day.

B. Secure or anchor the GCL and overlying geomembrane at the end of each day to prevent damage from rain or wind.

C. Protect the GCL from hydration caused by rain, run off, run on, groundwater infiltration, etc.

3.05 REPAIR PROCEDURES

A. Remove punctured, torn, or hydrated material.
B. Cover removed area with the same type of GCL material with the same side up.
C. Overlap new GCL 18 inches in all directions over repair area.

3.06 QUALITY ASSURANCE

A. Adhere to the Manufacturer's instructions and CQC plan. Project-Specific Product Acceptance results shall be received at least 21 days before material is shipped to project site.

B. Project-Specific Product Acceptance tests and CQA tests will determine the product's compliance with specified values.

C. The CQA Consultant will observe and document, among other things:

1. Delivery and storing material.
2. Subsurface preparation.
3. Placement and seaming.
4. Repairs.
5. Quantities used.

3.07 ACCEPTANCE

A. The Contractor retains ownership and responsibility of the GCL until Substantial Completion.

B. The Owner will accept GCL installation when:

1. The soil subgrade certification has been received.
2. All pre-construction submittals and Project-Specific Product Acceptance documentation has been received and accepted.
3. MQC and CQC test reports verifying material properties have been received and accepted.
4. Defects have been repaired and rejected material has been removed from the site.

GCL INSTALLER'S CERTIFICATE
OF
ACCEPTABLE INSTALLATION

The GCL Installer, _____(Installer), for the _____(Project) hereby certifies that the installation of the subgrade for the liner system is in accordance with our recommendations, approved CQC Plan, and the quality of the work has been to our satisfaction.

Area Accepted:

_____

_____

_____

GCL Installer

_____

Signature Name Title Date

Earthwork Contractor

_____

Signature Name Title Date

CQA Representative

_____

Signature Name Title Date

END OF SECTION

SECTION 02074

GEOTEXTILE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install non-woven geotextile around the gravel in the leachate collection and leachate detection systems.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Pre-construction Submittals: Submit the following within 10 days of Notice to Proceed:

1. Manufacturer's Information:

a. A minimum of 5 years of successful development and production of geotextiles.

b. The Manufacturer's name, address, and primary contact.

c. The manufacturing plant name and the address where the geotextile for this project will be produced.

d. The Manufacturer's qualifications including:

(1) Evidence of production of at least 10 million square feet of geotextile that meets the specifications of Articles 2.01 and 2.02.

(2) Certification that the Manufacturer has sufficient capacity to provide the required material in the given timeframe.

(3) A list of at least 10 projects for which the Manufacturer has supplied geotextile, three of which shall have been for projects of similar size.

e. The Manufacturer's quality control (MQC) certificates. Testing must be done in accordance with the quality control plan and in accordance with Articles 2.01 and 2.02.

f. Product name and the Manufacturer's description of the proposed geotextile and five representative samples of the product (small samples approximately 5 inches long by 4 inches wide enclosed in plastic labeled with product name) proposed for use on this project.

g. The Manufacturer's material properties sheet (cut sheet) of proposed geotextile documenting it will meet or exceed the requirements specified in Articles 2.01 and 2.02.

h. Written instructions for delivering, storing, handling installing, seaming, and repairing the proposed geotextile, including recommendations for loading, unloading, and handling equipment (model number or load capacity).

i. Sample product warranty that meets the requirements of Article 1.05 and Section 01780, Warranties and Bonds.

B. Installer's Information

1. The Contractor shall submit the Installer's information at least 30 days before geotextile is scheduled to be installed.

a. Installer's name, address, and primary contact.

b. Installer's qualifications, including but not limited to a list of at least three previous projects of similar size and scope to this project including project name, location, size, and date of installation.

c. CQC plan, including but not limited to the following:

(1) Description of seaming equipment and techniques.

(2) Description of methods for repairing geotextiles.

(3) Description of method for removing rejected materials.

(4) Proposed staffing.

(5) Proposed equipment.

(6) Complete set of forms to be used for recording installation quality control data, including but not limited to daily record documents.

d. Installer's written procedures manual.

C. Manufacturer's Quality Control (MQC)

1. The MQC data shall be submitted at least 21 days before geotextile shipment.

2. The Contractor shall provide the following information with the MQC test data: project name, project location, Manufacturer, product name, and lot and roll numbers.

3. MQC sampling shall be in accordance with the test methods and minimum test frequencies provided in Article 2.01, Table 1, and Article 2.02, Table 2. If no sampling protocol is specified in the test method, then the samples shall be taken evenly spaced across the entire roll width in accordance with ASTM D4354.

4. The Contractor will bear the cost of all Manufacturer's certification testing, including shipping samples to the Product Acceptance Laboratory.

5. The Manufacturer shall submit certification reports on the Manufacturer's letterhead and signed by an authorized representative of the Manufacturer.

6. MQC data shall be submitted electronically in PDF and data format (.xls, .xlsx, .csv, .txt, .doc, .docx, .accdb, etc.) that the data can be readily copied.

7. Provide the following information with MQC test data:

    a. Project Name, Project Location, Manufacturer, Product Name.

    b. Roll and lot numbers and any additional production identification.

    c. Results of MQC tests, including a description of test methods used.

8. The Engineer will reject rolls for which quality control requirements are not met.

9. If the results of any test do not conform to the requirements of this Section, the Contractor may elect to retest from the same roll of product and/or perform bracket sampling to bracket the problem. The Contractor shall notify the CQA Consultant that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Specification, the material shall be rejected and removed from the site.

10. If retesting of the roll is performed, two additional specimen sets shall be selected from the failed roll. Each of these specimens is required to pass unique sampling/testing events. If the additional testing events result in failure or if retesting of the roll in question is not undertaken, the extent of the failure shall be bracketed by selecting samples from rolls produced before and after the failed roll. Unique sampling/testing events shall be performed until passing results are obtained bracketing the failure. All rolls falling between the bracketing passing rolls shall be rejected.

D. Construction Quality Control (CQC)

1. During construction the Contractor shall submit the following CQC documentation weekly:

a. Material delivery report.

b. MQC testing reports and certifications.

c. Rejected material removal report.

d. Records of daily installation including roll numbers placed.

e. Records of daily personnel activity.

f. Meeting reports.

g. Updated Record Drawing.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at bid time. The following documents are a part of this Specification. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM D4439—Standard Terminology for Geosynthetics.

2. ASTM D4491/D4491M—Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

3. ASTM D4533/D4533M—Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

4. ASTM D4632/D4632M—Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

5. ASTM D4751—Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

6. ASTM D4833/D4833M—Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.

7. ASTM D5035—Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).

8. ASTM D5261—Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

9. ASTM D6241—Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

10. ASTM D7238—Standard Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus.

1.04 QUALITY ASSURANCE

A. MQC and CQC are the responsibility of the Contractor who must document that the material and installation are in accordance with this Section.

B. The Owner will engage and pay for the services of a CQA Consultant and an independent CQA Laboratory for monitoring the quality and installation of the geotextile.

C. The Installer's quality control representative will be responsible for construction quality control in accordance with the submitted CQC Plan, which is independent of the Plan.

D. The Installer must help the CQA Consultant with product sampling by providing personnel and equipment when necessary.

E. The Manufacturer and the Installer shall coordinate activities with the CQA Consultant.

F. Manufacturer

1. The Contractor shall perform the MQC tests for geotextile manufactured for this project. Perform tests necessary to verify that the geotextile meets the specified product requirements. Perform each MQC test at the minimum frequencies listed Articles 2.01 and 2.02.

2. The CQA Consultant will reject rolls for which quality control requirements are not met.

G. Owner

1. The CQA Laboratory will receive geotextile samples 21 days before material is shipped to the project site and will perform conformance tests as required in the CQA Plan to determine product compliance with specified values.

2. Among other tasks, the CQA Consultant will observe and document the following:

a. Delivery and storing material.

b. Subsurface preparation.

c. Placement and seaming.

d. Repairs.

e. Quantities used.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplemental Conditions, and Section 01780, Warranties and Bonds.

B. The geotextile Manufacturer shall warrant, in writing, the geotextile material for 5 years on a pro rata basis. The warranty shall apply to anticipated liquid and gas exposure from the intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. Material delivery, storage, and handling shall be in accordance with documents as required in Article 1.02 Manufacturer's Instructions and Installer's Procedures.

C. Geotextile labeling, shipment, and storage shall follow ASTM D4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

D. Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight, and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

E. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures exceeding 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.

1.07 RECORD DRAWINGS

A. Record Drawings shall be prepared, maintained, and submitted in accordance with Section 01785, Record Documents.

1.08 DEFINITIONS

A. *Construction Quality Assurance (CQA):* A planned system of activities that provides assurance that the materials to be installed on the project are in accordance with the Contract plans and specifications. CQA includes manufacturing facility inspections, testing verifications, and evaluation of the products to assess the quality of the material. CQA refers to the measures taken by the CQA Consultant to determine compliance of the materials with the product and contract specifications.

B. *Construction Quality Control (CQC):* A planned system that provides procedures for delivering a construction project that meets the requirements defined in the contract plans and specification. CQC is performed by the Contractor and

includes process control testing, inspection and control procedures, description of records to be maintained, and personnel qualifications.

C. *CQA Laboratory:* An independent laboratory contracted by the Owner to monitor the quality and installation of the product.

D. *CQA Consultant:* An independent consultant contracted by the Owner to manage the quality and installation of the product. Responsibilities include field observations, laboratory observation and testing, and construction certification.

E. *Geotextile:* Permeable geosynthetic composed solely of textiles (ASTM D4439).

F. *Geotextile Manufacturer (Manufacturer)*: The party responsible for the production and quality of geotextile.

G. *Installer:* The party responsible for field handling, transporting, storing, deploying, seaming, and protection of the material.

H. *Lot:* A group of consecutively numbered rolls from the same manufacturing line.

I. *Manufacturing Quality Assurance (MQA):* A planned system of activities that provides assurance that the materials were manufactured as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits, and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the Manufacturer is in compliance with the product certification and contract specifications for the project.

J. *Manufacturing Quality Control (MQC):* A planned system of inspections used to directly monitor and control the manufacture of a material that is factory originated. MQC is normally performed by the Manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the Manufacturer to determine compliance with the requirements of materials and workmanship as stated in certification documents and contract specifications.

PART 2 PRODUCTS

2.01 NON-WOVEN GEOTEXTILE FOR SEPARATION

A. Products composed of non-woven polypropylene or polyester filaments that maintain their structure during handling, placement, and long-term service.

B. Resistant to soil chemicals, landfill gas, and leachate.

C. New product made from virgin materials.

D. Geotextile used for separation conforming to the following minimum property values:

Table 1 Nonwoven Geotextile for Separation Test Requirements

Test	ASTM Test Designation	Minimum MQC Test Frequency	Required Test Values(1)
Mass per Unit Area	D5261	1/100,000 ft^2	8.0 oz/sy
Grab Tensile Strength	D4632	1/100,000 ft^2	180 lb
Grab Elongation	D4632	1/100,000 ft^2	> 50%
Trapezoid Tear	D4533	1/100,000 ft^2	68 lb
Puncture (CBR) Strength	D6241	1/540,000 ft^2	380 lb
Permittivity	D4491	1/540,000 ft^2	1.26 sec^{-1}
Mullen Burst	D3786	1/540,000 sf	290 psi
Water Flow Rate	D4491	1/540,000 ft^2	95 gpm/ft^2
Apparent Opening Size	D4751	1/540,000 ft^2	< 0.60 mm > 30 US Sieve No.
UV Resistance(2)	D7238	1/formulation	70%

(1) All required test values are minimum average roll values (MARV) except ultraviolet (UV) stability, which is a minimum average value.

(2) Evaluation to be on 2.0-inch strip tensile specimens in accordance with ASTM D5035 after 500 light hours' exposure.

E. The Contractor shall be responsible for the cost of retesting if the conformance CQA tests fail. The tests will be paid for by the Owner and reimbursed by the Contractor.

2.02 NON-WOVEN GEOTEXTILE FOR PROTECTION (CUSHION)

A. Products composed of nonwoven polypropylene or polyester filaments that maintain their structure during handling, placement, and long-term service.

B. Resistant to soil chemicals, landfill gas, and leachate.

C. New product made from virgin materials.

D. Geotextile used for protection (cushion) conforming to the following minimum property values:

Table 2 Nonwoven Geotextile for Geomembrane Protection (Cushion) Test Requirements

Test	ASTM Test Designation	Minimum MQC Test Frequency	Required Test Values(1)	
Mass per Unit Area	D5261	1/100,000 ft^2	16 oz/sy	32 oz/sy
Grab Tensile Strength	D4632	1/100,000 ft^2	370 lb	500 lb
Grab Elongation	D4632	1/100,000 ft^2	50%	50%
Trapezoid Tear	D4533	1/100,000 ft^2	145 lb	215 lb
Puncture (CBR) Strength	D6241	1/540,000 ft^2	900 lb	1,700 lb
UV Resistance(2)	D7238	1/formulation	70%	70%

(1) All required test values are MARV except UV stability, which is a minimum average value.

(2) Evaluation to be on 2.0-inch strip tensile specimens in accordance with ASTM D5035 after 500 light hours' exposure.

E. The Contractor will be responsible for the cost of retesting if the conformance CQA tests fail. The tests will be paid for by the Owner and reimbursed by the Contractor.

PART 3 EXECUTION

3.01 PROTECTION

A. Before installing the geotextile, the Contractor shall confirm that the underlying geomembrane, geocomposite, and gravel layer have been approved by the CQA Consultant.

B. When placing soil materials over geotextile ensure the following:

1. No damage to geotextile.
2. No slippage of geotextile on underlying layers.
3. No excessive tensile stresses are applied to geotextile.

3.02 PREPARATION

A. Underlying components must be completed and accepted by the CQA Consultant.

B. The surface shall be smooth and free of debris of any kind.

C. Geotextile shall not be placed in standing water.

3.03 DEPLOYMENT

To ensure proper deployment, the Contractor shall do the following:

A. Follow the Manufacturer's recommendations, standards, and guidelines.

B. Weight geotextile with sandbags or equivalent as ballast during deployment. Leave ballast in place until the geotextile is about to be covered. Remove ballast before placing overlying soil.

C. Cut geotextile using approved cutter only. Take care to protect other in-place geosynthetic materials when cutting geotextile.

D. Do not entrap excessive dust, stones, or moisture in the geotextile that could damage or clog drains or filters or hamper subsequent seaming.

E. Examine the geotextile over the entire completed surface to ensure that no potentially harmful foreign objects are present. Remove any foreign objects.

F. Do not drag the geotextile across rough or textured surfaces to avoid damage to the geotextile. Use a smooth geosynthetic slip sheet or rub sheet as necessary to reduce friction damage during deployment.

3.04 SEAMING AND OVERLAPPING

A. Sew all seams for non-woven geotextiles used in separation and cushion applications. Overlap the geotextile 3 inches minimum before seaming. Do not seam horizontal on slopes steeper than 10% (i.e., seam along, not across slopes). Stagger horizontal butt seams.

B. Ensure that no soil is inadvertently inserted into the seams of geotextiles.

C. Sew with polymeric thread having chemical resistance and strength properties equal to or exceeding those of the geotextile.

D. For sewing, use a 401 two-thread chain stitch, or equivalent.

3.05 REPAIRING

A. Patching: Repair holes or tears in geotextiles with a patch from the same geotextile material continually sewn or heat bonded in place with a minimum

seam overlap of 12 inches in all directions. Sew or heat bond the geotextile within 1 inch of the outside edge of the patch materials.

B. Remove any soil or other material that may have penetrated the torn geotextile.

3.06 ACCEPTANCE

A. The Contractor retains all Ownership and responsibility for geotextile until acceptance by the Owner.

B. The Owner accepts geotextile when:

1. The installation is complete.
2. Conformance tests verify product requirements.
3. Documentation of installation, including the CQA Consultant's final inspection, is complete.
4. Verification of the adequacy of all seams and repairs, including associated testing, is complete.

END OF SECTION

SECTION 02079
GEOSYNTHETIC RAIN TARP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work specified in this Section includes the manufacture, testing, and installation of a geosynthetic rain tarp (geomembrane) as shown on the Drawings and as specified in this Section.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Pre-Construction Submittals: Submit the following within 10 days of the Notice to Proceed.

1. Manufacturer's Information:

a. The Manufacturer's name and address and primary contact.

b. The Manufacturing plant name and address where the geomembrane for this project will be produced.

c. Manufacturer's qualifications including:

(1) Certification that the Manufacturer has sufficient capacity to provide the required material in the given timeframe.
(2) A list of at least 10 projects for which geomembrane has been supplied by the Manufacturer, three of which shall have been for projects of similar size.

d. The product name and the Manufacturer's description of the proposed geomembrane and five representative samples of the product (small samples approximately 5 inches long by 4 inches wide enclosed in plastic labeled with product name) proposed for use on this project.

e. The Manufacturer's material properties sheets (cut sheets) of proposed geomembrane product meeting requirements of tests listed in Article 2.01.

f. The MQC plan, including but not limited to examples of geomembrane certification documents, name and address of the quality control testing laboratory, quality control laboratory certification, examples retesting notification and documentation.

g. The Manufacturer's written instructions for storing, handling, installing, seaming, and repairing the proposed geomembrane, including recommendations for handling equipment (model number and load capacity).

h. Sample product warranty.

2. Installer's Information:

a. Installer's name and address and primary contact.
b. The Installer's qualifications, including but not limited to a list of at least three previous projects of similar size to this project, including project name, location, size, and date of installation.
c. Résumés of key installation personnel. Clearly identify the Installation Supervisor, Master Seamers, and QC representative.
d. The Construction Quality Control (CQC) plan, including but not limited to examples of daily record documents, methods for deploying geomembrane, methods for protecting drainage sand, methods for repairing geomembrane and drainage sand and example documents to certify repairs, method for removing rejected materials, proposed staffing, and proposed equipment, including descriptions of welding equipment, techniques, and material, including the proposed equipment list. A complete set of forms to be used for recording installation CQC data.
e. The Installer's written procedures manual to be used by field personnel. Should procedures shown in the Installer's manual differ from those listed in this Section, this Section will govern.
f. Panel layout drawings identifying panels and seams.
g. Sample workmanship warranty.

B. Manufacturer's Quality Control (MQC): Submit MQC certifications and test reports at least 21 days before product shipment.

1. MQC testing reports and certifications in accordance with tests and frequencies listed in Article 2.01.

a. MQC certificates for raw resin material. Testing must be done as specified in the Manufacturer's MQC plan with a minimum of one test per lot.
b. MQC certificates for finished geomembrane. Testing must be done as specified in the Manufacturer's MQC plan on the actual material to be shipped and include tests and frequencies performed as listed in Article 2.01.

C. Construction Quality Control (CQC): During construction, the Contractor shall submit CQC documentation weekly:

1. Material delivery report.

2. Rejected material removal report.

3. Records of daily installation including but not limited to:

a. Deployment, including roll numbers placed.
b. Destructive sample testing.
c. Seaming.
d. Non-destructive tests.
e. Trial welds.
f. Repairs.

4. Records of daily personnel activity.

5. Meeting reports.

6. Updated record drawings.

D. Construction Quality Assurance (CQA): Submit five copies of the CQA sample package cover letter to the Engineer in accordance with Article 1.04.C.

1.03 REFERENCES

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of

this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society of Testing and Materials (ASTM)

1. ASTM D751—Standard Test Methods for Coated Fabrics.
2. ASTM D1765— Standard Classification System for Carbon Blacks Used in Rubber Products.
3. ASTM D3895—Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
4. ASTM D4873/D4873M—Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
5. ASTM D5721—Standard Practice for Air-Oven Aging of Polyolefin Geomembranes.
6. ASTM D5884/D5884M—Standard Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes.
7. ASTM D5885/D5885M—Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry.
8. ASTM D6241—Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Properties Using a 50-mm Probe.
9. ASTM D7003/D7003M—Standard Test Method for Strip Tensile Properties of Reinforced Geomembranes.
10. ASTM D7004/D7004M—Standard Test Method for Grab Tensile Properties of Reinforced Geomembranes.
11. ASTM E96/E96M—Standard Test Methods for Water Vapor Transmission of Materials.

B. Geosynthetics Research Institute (GRI)

1. GRI-GM11—Accelerated Weathering of Geomembranes Using a Fluorescent UVA Device.
2. GRI-GM16—Observation of Surface Cracking of Geomembranes.
3. GRI-GM22—Test Methods, Required Properties, and Testing Frequencies for Scrim Reinforced Polyethylene Geomembranes used in Exposed Temporary Applications.

1.04 QUALITY ASSURANCE

A. MQC and CQC are the responsibility of the Manufacturer, Contractor, Installer, and the Installer's QC representative who must document that the material and installation are in accordance with this Section.

1. MQC Sampling shall be in accordance with the specific test method listed in Article 2.01.
2. The number and frequency of the tests shall be in accordance with Article 2.01.
3. If the results of any test do not conform to the requirements of this Section, the Contractor may elect to retest from the same roll of product. The Contractor shall notify the CQA Consultant that a retest is planned. Retesting results shall be reported within 7 days. If the retest does not conform to the requirements of this Section, the product shall be rejected and removed from the site.
4. Manufacturer shall certify that the material meets GRI-GM22 Standard Specification.

B. The Manufacturer and the Installer shall coordinate activities with the CQA Consultant.

C. The Manufacturer, Installer, and Contractor must help the CQA Consultant with product sampling for Construction Quality Assurance (CQA) testing by providing samples, personnel, and equipment as necessary.

1. The Owner will engage and pay for the services of the Engineer and CQA testing of the geomembrane in accordance with the procedures listed in Article 2.01. The Engineer may use the services of an independent CQA Laboratory for monitoring the quality and installation of the geomembrane.
2. CQA tests will be the measure of the acceptance of material. The Contractor will be responsible for the cost of retesting should the CQA tests fail. The retests will be paid by the Owner and reimbursed by the Contractor.
3. CQA samples of geomembrane: The Engineer or representative may visit the Manufacturing plant to select product rolls to be sampled by the Manufacturer. The Manufacturer shall ship one 3-foot-long by-the-width-of-roll sample for every 100,000 square feet of material to the CQA Laboratory for testing. The sample package shall include a cover letter referencing the project location, project number, Manufacturer, date of sampling, lot, and roll number, and MQC test data documented for the particular production run from which the sample was taken. Five copies of the cover letter shall be submitted to the Engineer.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

B. The geomembrane Manufacturer shall warrant, in writing, the geomembrane material for 5 years on a pro rata basis from the date of Final Completion. The warranty shall apply to normal use and service in a sanitary landfill environment under exposure to sanitary landfill gas and leachate as well as other exposures which can be anticipated from the intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. Material delivery, storage, and handling shall be in accordance with documents as required in Article 1.02.

C. Each roll of material shall have a Manufacturer's identification label. Each roll shall be labeled to provide product identification adequate for inventory and quality-control purposes. At a minimum the label shall provide the Manufacturer's name, product identification, lot number, roll number, and roll dimensions. Rolls shall be labeled as specified in ASTM D4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

D. Materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geosynthetic to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.

E. Rolls of material should not be stacked upon one another to the extent that deformation of the core occurs. Outdoor storage shall not exceed 6 months.

1.07 QUALIFICATIONS

A. Provide Manufacturer's and Installer's qualifications as in Article 1.02.

1.08 RECORD DRAWINGS

A. Record Drawings shall be prepared, maintained, and submitted showing geomembrane installation in accordance with the requirements of the Contract

Documents. Record Drawings shall be updated throughout the project and are subject to field review by the Engineer any time upon request.

1.09 DEFINITIONS

A. *Batch:* A quantity of resin, usually the capacity of one rail car, used in the fabrication of HDPE geomembrane sheet. A roll number corresponding to the particular quantity of resin used will identify the finished sheet.

B. *Geomembrane:* An essentially impermeable membrane used as a solid or liquid barrier. Synonymous term for flexible membrane liner (FML).

C. *Geomembrane Manufacturer (Manufacturer):* The party responsible for the production of the geomembrane rolls from resin and for the quality of the resin.

D. *Geomembrane Subgrade:* The soil or geosynthetic surface on which the geomembrane lies.

E. *Installer:* The party responsible for field handling, transporting, storing, deploying, seaming, temporary restraining (against wind), and installing the geomembrane.

F. *Manufacturing Quality Assurance (MQA):* A planned system of activities that provides assurance that the materials were manufactured as specified in the certification documents and contract Specifications. MQA includes manufacturing facility inspections, verifications, audits, and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the Manufacturer is in compliance with the product certification and contract Specifications for the project.

G. *Manufacturing Quality Control (MQC):* A planned system of inspections that is used to directly monitor and control the manufacture of a material, which is factory originated. MQC is normally performed by the Manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the Manufacturer to determine compliance with the requirements of materials and workmanship as stated in certification documents and contract Specifications.

PART 2 PRODUCTS

2.01 GEOSYNTHETIC RAIN TARP

A. Material shall be a scrim- reinforced polyethylene geomembrane with a formulated density of the polyethylene being 0.930 g/cc, or greater.

B. The additive package for the polyethylene shall be adequate to pass the endurance testing (OIT and UV resistance) of the Specifications and meet the minimum performance requirements of GRI-GM22. The Manufacturer shall provide written certification that acceptable use of the formulation has been achieved in similar applications.

C. For black geomembranes, the carbon black must be N-110 or higher specific surface areas in accordance with ASTM D1765.

D. This Section focuses on scrim-reinforced geomembranes. As such, the polyethylene plys must be on both sides of the fabric scrim so as to completely encapsulate it and provide enough ply adhesion to resist delamination under field conditions.

E. The fabric scrim consists of polyester yarns in an open woven pattern sufficient to achieve the minimum specification strength and elongation values.

F. Post-consumer plastics which have seen previous use cannot be used for either the geomembrane plys or the fabric scrim.

G. The finished geomembranes shall have consistently good appearance. It shall be free from defects, including cracking and crazing, that would affect the specified properties of the geomembrane.

H. The scrim-reinforced geomembranes shall generally have a uniformly undulating surface appearance. It shall be free from defects, including delamination and blisters, that would affect the specified properties of the geomembrane.

I. General manufacturing procedures shall be performed in accordance with the Manufacturer's internal quality control guide and/or documents.

J. The finished geomembrane shall conform to the test property requirements in Table 1.

Table 1 Manufacturing Quality Control and Construction Quality Assurance Test Requirements for Exposed Scrim-Reinforced Polyethylene Geomembranes					
Property[1]	Units	Test Method	MQC Testing Frequency	CQA Frequency	Requirements
Thickness[2] (nominal 20 mils)	mils	ASTM D751	per roll	1/250,000 sf	17
Weight	lb/1,000 sf	ASTM D751	20,000 lb	1/250,000 sf	94
Grab Tensile Strength[3]	lb	ASTM D7004/ D7004M	20,000 lb	1/250,000 sf	114
Grab Tensile Elongation[3]	%	ASTM D7004/ D7004M	20,000 lb	1/250,000 sf	15
Strip Tensile Strength[3]	lb	ASTM D7003/ D7003M	20,000 lb	1/250,000 sf	77
Strip Tensile Elongation[3]	%	ASTM D7003/ D7003M	20,000 lb		15
Tongue Tear	lb	ASTM D5884/ D5884M	20,000 lb	1/250,000 sf	53
CBR Puncture	lb	ASTM D6241	45,000 lb		320
Hydrostatic Resistance[4]	lb/in^2	ASTM D751	45,000 lb	N/A	130
Water Vapor Transmission[5]	g/m^2-day	ASTM E96/ E96M	200,000 lb	N/A	0.4
High-Pressure Oxidation Induction Time	minutes	ASTM D5885/ D5885M	per each formulation	1/Project	1,000
UV Resistance (fluorescent light method) (a) Strength and Elongation Retained after 10,000 hours (b) Response to bending	%	ASTM D7238 ASTM D7004/ D7004M GRI GM16	per each formulation	N/A	50 No cracking.

Notes: g/m^2-day = grams per square meter per day; lb = pound; lb/in^2 = pounds per square inch; sf = square foot.

(1) All values are minimum, or minimum average, except Water Vapor Transmission (WVT) which is a maximum value.

(2) The thickness value is measured in the valleys created by the scrim reinforcement, i.e., ply to ply thickness between scrim should be measured.

(3) If the reinforcement is aligned in any direction other than the machine and transverse directions, specimen shall be cut such that reinforcing yarns are oriented parallel to the central axis of the tension testing machine.

(4) The center of the circular test specimen should be equidistant between sets of parallel yarns.

(5) Performed at 23° ± 0.5°C temperature and 50% ± 5% relative humidity.

2.02 BALLAST

A. Sandbags shall be Dura-Scrim reinforced polyethylene sandbags (5-year UV-resistance minimum) or Engineer-approved equivalent filled with a minimum weight of 30 pounds.

B. Rope for securing sandbags shall be 1/2-inch-diameter nylon rope.

C. Anchor blocks shall be 250 pounds minimum (1.5 feet x 1.5 feet x 9inches) with five #5 bars at mid depth each way with 1-1/2-inch edge clearance. Two lifting eyes shall be cast into the top using #4 stirrups with 6-inch 60-degree hooks embedded in the concrete and shall be centered and spaced 3 inches apart.

PART 3 EXECUTION

3.01 INSTALLATION

A. The geomembrane shall be installed in accordance with the Manufacturer's recommendations at locations as shown on the Drawings. Ballast materials shall be placed on the geomembrane to avoid uplift due to wind and spaced at intervals as indicated in the Contract Documents. No equipment shall be allowed to operate on the geomembrane, and any tears or damage to the geomembrane shall be repaired before placement. The surface of the geomembrane shall be kept relatively clean and free of debris during installation.

B. Sheets shall be joined in accordance with the Manufacturer's recommendations.

C. The Contractor shall place all cover materials so as to prevent damage to the materials, slippage of the underlying layers, and excessive tensile stresses in the materials.

D. Anchor blocks shall be installed at 50-foot spacing along the edge of liner on the north, east, and west sides of the perimeter and at the same spacing on the south side above the stormwater diversion berm located outside the edge of liner on the south side.

E. Nylon rope shall be fastened to the anchor blocks. Sandbags shall be installed at 10-foot spacing everywhere within the limits delineated by the anchor blocks. Nylon rope shall be fastened to the sandbags and tied in a grid-like manner forming a 10-foot by 10-foot grid.

3.02 REPAIRS

A. Geomembrane damaged during placement or before final acceptance shall be replaced or repaired at the Contractor's expense in accordance with the Manufacturer's recommendation. The Contractor shall be responsible for documenting repairs, including describing the location and type of repair. Repair documentation shall be submitted to the Engineer.

END OF SECTION

SECTION 02220
DEMOLITION AND MODIFICATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals required and demolish, modify, remove, and dispose of work shown on the Drawings and as specified in this Section.

B. The work includes but is not limited to demolishing, modifying, and removing existing materials, equipment, or work necessary to install the new work as shown on the Drawings and as specified in this Section and to connect with existing work in an approved manner.

C. Demolition, modifications, and removals which may be specified under other Sections shall conform to requirements of this Section.

D. Demolition and modifications include:

1. Removal and disposal onsite of existing concrete structures, pads, piping, and miscellaneous items as shown on the Drawings.
2. Removal and stockpiling of signs, roadway materials, guardrails, and appurtenances.
3. Removal and reuse of edge of liner markers, concrete ballast blocks, and wellheads.
4. Demolition, removal, and/or reuse of other miscellaneous items indicated in the Contract Documents.

E. Blasting and the use of explosives will not be permitted for any demolition work.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Submit to the Engineer proposed methods, schedule, and operations of demolition of the structures and modifications before beginning work. Include in the schedule for the coordination of shutoff, capping, and continuation of utility service.

B. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations. The sequence shall be

compatible with sequence of construction and shutdown coordination requirements.

C. Before beginning demolition work, the Contractor shall complete all modifications necessary to bypass the affected structure. Actual work shall not begin until the Engineer has observed and approved the modifications and authorized beginning the demolition work in writing.

1.03 JOB CONDITIONS

A. Protection

1. The Contractor shall conduct the demolition and removal work to prevent damage or injury to structures, equipment, piping, instrumentation, conduit, environmental monitoring devices, etc., and to adjacent features.

B. Notification

1. At least 48 hours before beginning demolition or removal, the Contractor shall notify the Engineer in writing of the proposed schedule of the demolition or removal. The Engineer shall inspect the existing equipment and identify and mark those items that are to remain on the property of the Owner. No removals shall be started without the permission of the Engineer.

C. Conditions of Structures

1. The Owner and the Engineer assume no responsibility for the actual condition of the items to be demolished or modified.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure may occur before the start of demolition work.

D. Repairs to Damage

1. The Contractor shall promptly repair damage caused to adjacent facilities by demolition operation when directed by the Engineer and at no cost to the Owner. Repairs shall be made to a condition at least equal to that which existed before construction.

E. Traffic Access

1. The Contractor shall conduct demolition and modification operations and remove equipment and debris to ensure minimum interference with roads onsite.

1.04 DISPOSAL OF MATERIAL

A. Salvageable material and equipment shall become the property of the Owner. The Contractor shall dismantle all such items to a size that can be readily handled and deliver them to a designated storage area at the North Central Landfill.

B. All other material and items of equipment shall become the Contractor's property and must be removed from the site or disposed of in the Active Class I Landfill if allowed by the site's permit. All materials disposed of at the landfill shall be weighed at the onsite scale house.

C. Storing (except as otherwise noted in this Section) or selling removed items will not be allowed on the project site.

D. Excavated soil is not considered a demolition material and shall be stockpiled or reused in the construction in accordance with the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. All materials and equipment removed from existing work shall become the property of the Contractor, except for those which the Owner has identified for reuse, salvage, or stockpiling. All materials and equipment identified by the Owner for reuse, salvage, or stockpiling shall be carefully removed so as not to be damaged and stockpiled where indicated by the Engineer or Owner.

B. The Contractor shall dispose of all demolition materials, debris, and all other items.

C. Pollution Controls

1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the

lowest practical level. Comply with governing regulations pertaining to environmental protection.

a. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.
b. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing before starting the work.

3.02 CLEAN-UP

A. The Contractor shall dispose of all debris resulting from the demolition operations as it accumulates.

END OF SECTION

SECTION 02230
SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, and equipment required and perform all site preparation, complete as shown on the Drawings and as specified in this Section.

B. The Contractor shall obtain all permits required for site preparation before proceeding with the Work.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

B. Submit to the Engineer copies of all permits required before clearing, grubbing, and stripping work.

1.03 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

1.04 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING

A. The Contractor shall cut and remove brush, shrubs, roots, grass, weeds, rubbish, and any other objectionable material resting on or protruding through the surface of the ground.

3.02 GRUBBING

A. The Contractor shall grub and remove all stumps, roots in excess of 1-1/2 inches in diameter, matted roots, brush, logs, concrete rubble, and other debris encountered to a depth of 18 inches below the bottom of foundations, or bottom liner, whichever is deeper.

B. The Contractor shall refill all grubbing holes and depressions excavated below the original ground surface with suitable materials and compact to a density conforming to the surrounding ground surface in accordance with Section 02301, Earthwork for Landfill Construction.

3.03 DISPOSAL

A. Dispose of material and debris from site preparation operations by hauling such materials and debris to an approved on-site disposal area. No rubbish or debris of any kind shall be buried by the Contractor on the project site.

B. Burning of cleared and grubbed materials or other fires for any reason will not be permitted.

END OF SECTION

SECTION 02240
DEWATERING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section covers the work necessary to perform dewatering activities before, during, and after the construction of the bottom-liner system. Tasks associated with dewatering activities include the following: installing an environmental cutoff wall, developing a Dewatering Plan, installing piezometers for groundwater elevation measurement, monitoring dewatering, managing produced groundwater, and operation and maintenance of dewatering activities during the construction period.

B. All work in this Section shall be done in accordance with the requirements of the South Florida Water Management District (SFWMD) and the Florida Department of Environmental Protection (FDEP) permits.

C. Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control groundwater flow into excavations and permit construction to proceed on dry, stable subgrade.

1. Maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrade and permanent structures is prevented.
2. Prevent surface water from entering excavations by grading, dikes, or other means of surface water control.
3. Operate the dewatering system until all Protective Soil has been installed above the leachate collection trenches or unless otherwise authorized by the Engineer. The Contractor shall provide an as-built survey of the Protective Soil that is signed and sealed by a Florida-licensed professional surveyor for Engineer approval before dewatering activities may cease.
4. Remove dewatering system if no longer needed.

D. The Contractor shall design the dewatering system. The Contractor shall be responsible for obtaining whatever investigations are necessary before bidding to design the dewatering system.

E. The Dewatering Contractor shall dewater so as to prevent damage to existing work. The Contractor shall repair or replace any damage resulting from the dewatering activities promptly, remedy environmental damage as approved by the

Engineer, and pay any and all fines levied to the Owner at no additional cost or time to the Owner.

F. All groundwater shall be recharged to the aquifer from where it was produced via an infiltration pond.

1.02 DEFINITIONS

A. *Contractor* – the General Contractor.

B. *Dewatering Contractor* – the Contractor responsible for developing the Dewatering Plan and performing dewatering activities.

C. *Steady State* – the condition after the initial water removal when dewatering continues to maintain the groundwater level at least 2 feet below the bottom of liner in order to ensure dry working conditions (for silty and clayey soils, groundwater level may need to be maintained about 3 to 5 feet below the slopes and the bottom of liner to prevent water from pumping to the surface through capillary action to prevent wet and spongy conditions).

1.03 SUBMITTALS

The Contractor shall submit the following in accordance with Section 01330, Submittals and Acceptance:

A. At least 30 days prior to the commencement of any dewatering activity, the Dewatering Contractor shall submit a Dewatering Plan to the Engineer. The Dewatering Plan shall be signed and sealed by a Florida-licensed Professional Engineer responsible for its preparation. The dewatering system shall be designed such that each of the three sub-cells may be dewatered independently. The Dewatering Plans shall provide a detailed description of the proposed dewatering system. This plan shall include, but is not limited to, the following information:

1. Description and understanding of the site's and regional hydrogeology.
2. Layout, type, and spacing of dewatering devices.
3. Estimated volume of produced water to be discharged into the infiltration pond.
4. Estimated time to reach steady state, as defined in Paragraph 1.02C, of this Section.
5. Type and location of environmental cutoff wall.
6. Number and size of pumps, the design shall only incorporate electrical pumps. No fuel-powered pumps will be permitted.
7. Specifications for pumps including pump curves.
8. Capacities of pumps and standby equipment.

9. Performance certification of flow-meters.
10. Filter material specifications, if used.
11. Other equipment with a description of the installation and operating procedures.
12. Recharge means, location(s) and path.
13. Means for prevention of erosion and sedimentation.
14. A specific discussion of the understanding and expected impacts from the intermediate confined aquifer on the confining unit, surficial aquifer, and the dewatering system.
15. Personnel responsible for monitoring the dewatering system, recharge system, and dewatered excavations.
16. Supporting design documentation demonstrating adequacy of systems and selected equipment.
17. Drawings indicating the location and size of any berms, dikes, ditches, sumps, vacuum and discharge lines, flow-meters, silt tanks, and additional monitoring wells.
18. A written report outlining control procedures to be followed if dewatering problems arise (backup plans for continued dewatering).
19. Shop drawings signed and sealed by the qualified professional engineer responsible for their preparation.
20. Method(s) of pumped water quality monitoring.
21. Quantity and type of standby equipment.
22. Plan for abandonment of dewatering wells or sock drains and contingencies.
23. Methods for stormwater management that will ensure 24-hour protection of the work during a storm event.
24. Methods to ensure geosynthetic clay liner (GCL) is not prematurely hydrated.

B. The Dewatering Contractor shall be responsible for determining if permits for dewatering activities will be required. If permits are required, it is the Contractor's responsibility to obtain the required information from the Engineer and Owner/Owner representative to complete the permit application(s) and supporting information and pay all permit fees.

C. The Dewatering Contractor shall provide a pre-construction site assessment / inspection report including photographs and/ or videotape with sufficient details of existing conditions of adjoining properties, facilities, and other construction and site improvements that might be later misconstrued as damage caused by dewatering operations.

D. The Dewatering Contractor shall maintain daily records of the dewatering system installation and performance data. The records shall include well locations, depths, elevations, dates of installation, approximate flow rate(s), water levels at

various times during construction, and sump and piping locations. The records shall be submitted to the Owner/Owner representative after completion of construction dewatering activities, or as required by the Engineer.

E. Throughout the duration of construction, the Dewatering Contractor shall submit weekly reports on dewatering and recharge operations on the form provided at the end of this Section. The reports shall present the following information:

1. Number of wells and/or collection trenches in operation for each system.
2. Average rate of water pumped from each pump and well.
3. Total volume of water pumped and total volume of water recharged from the date of the last report to the date of the current report.
4. Description of any problems with dewatering system equipment or operations.
5. Water level elevation in each monitoring well and piezometer, as outlined in Article 3.06.
6. Resubmit revised working drawings and calculations as necessary to reflect changes required by field conditions.

F. Provide photographs or videotape, sufficiently detailed, of existing conditions of adjoining properties, facilities, and other construction and site improvements that might be later misconstrued as damage caused by dewatering operations.

G. Submit Record Drawings at Project closeout identifying and locating utilities and other subsurface structural, electrical, or mechanical items encountered during dewatering.

1. Note locations and capping depth of wells and well points.
2. Note as-built location of environmental cutoff wall.

1.04 WORK SEQUENCE

A. Dewatering shall not begin in any subcell until the environmental cutoff wall for that subcell has been completely installed in accordance with the project specifications.

B. Dewatering shall not begin until the temporary monitoring piezometers have been installed and developed as shown on the Drawings.

C. Water levels shall be monitored and recorded beginning a minimum of 30 days before dewatering commences.

D. Abandonment of the existing piezometers within the landfill footprint shall be coordinated with the construction of the landfill subgrade and geosynthetic liners.

Existing piezometers within the landfill footprint shall not be abandoned without prior written approval by the Engineer.

E. The Contractor shall operate the dewatering system until all Protective Soil has been installed and approved by the Engineer.

F. Dewatering well point and/or sock drain abandonment shall be performed after dewatering activities are complete.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction over the project site.

B. Pre-installation Conference: Conduct conference at the project site to present and discuss dewatering means, methods, and monitoring program at least two weeks prior to any commencement of installation work.

C. The Dewatering Contractor shall provide persons who shall be emergency contacts at all times during the execution of this portion of the work and who shall be thoroughly familiar with the dewatering system being installed for this project, the referenced standards, environmental and permit requirements, the requirements of this work, and who shall direct all work performed under this section. The emergency contacts shall be notified automatically via a programmable auto-dialing system when the pumps malfunction by using an alarm system.

D. It shall be the responsibility of the Dewatering Contractor to determine the water levels before and during the dewatering work.

E. Water levels shall be submitted to the Engineer upon request.

1.06 QUALIFICATIONS

A. The Dewatering Contractor must have at least five years successful experience in the field of dewatering and submit the following written information verifying qualifications:

1. Evidence that the Dewatering Contractor is experienced and competent to construct and operate a dewatering system as described herein. The Contractor shall submit at least 10 example projects, three of which were performed in the past 5 years which include the installation of a dewatering system of similar size, scope, and subsurface conditions.

2. The example projects shall include project location, dewatering method, pump model(s), depth of dewatering activities, periods of operation, types of soils encountered, and date of installation. This evidence shall indicate that the Dewatering Contractor will have sufficient competent experienced personnel to carry out the operations specified.
3. The capacity to bond such a dewatering job.
4. Experience performing dewatering in Florida.
5. In-house engineering staff capable of assessing hydrogeologic conditions and preparing signed-and-sealed Dewatering Plans.
6. Sufficient competent experienced personnel to carry out the dewatering required.

1.07 MAINTENANCE

A. The Dewatering Contractor shall be responsible for operating, maintaining, and monitoring the dewatering system. Maintenance of the dewatering system shall include, but is not limited to, at least daily supervision by a responsible person skilled in the operation, maintenance, and monitoring of flow rates from wells and/or collection trenches, sumps, replacement of system components, and any other work required, to maintain the performance of the system. The system operation shall be continuous, and interruptions shall not be permitted.

1.08 RECORD DRAWINGS

A. Record Drawings shall identify and locate all existing utilities and other subsurface structural, electrical, or mechanical items and newly installed utilities during dewatering system construction.

B. Note locations and capping depth of wells and well points.

C. Note as-built location of environmental cutoff wall.

1.09 PRE-BID INSPECTION AND TESTING

A. The Dewatering Contractor is advised that site soil borings may indicate groundwater levels below the levels which may occur in response to normal, seasonal high, extreme, or prolonged rainfall. The Dewatering Contractor is further advised that site soil borings may not necessarily represent soil conditions to be encountered elsewhere on the job site, other than at the specific boring locations.

B. Before bidding, the Dewatering Contractor shall perform a detailed site inspection and, if desired, obtain the Owner’s permission to perform site-specific testing as

he deems necessary to obtain all required information relative to project dewatering requirements.

C. The Contractor shall include as part of his Bid the total cost of all dewatering as required to construct and maintain the Project in full compliance with the Drawings and these Specifications.

1.10 PROJECT CONDITIONS

A. The Dewatering Contractor shall not interrupt utilities serving facilities occupied by Owner or others unless approved by the Owner and Engineer and then only after arranging to provide temporary utility services according to requirements indicated.

B. Soil boring, slug test, and groundwater data are provided as Bid Supplementals.

1. A geotechnical report has been prepared for this Project and is available by request for information only. The opinions expressed in this report are those of the Geotechnical Engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the Geotechnical Engineer. The Owner will not be responsible for interpretations or conclusions drawn from these data.
2. The Dewatering Contractor may make additional test borings and conduct other exploratory operations necessary for dewatering design and operations.

C. Survey adjacent structures and improvements, employing a professional land surveyor licensed in Florida to establish exact elevations at fixed points to monitor settlement. Clearly identify monitoring points and reference vertical datum and benchmarks. Monitor and record existing initial elevations.

1. During dewatering, regularly resurvey benchmarks maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify the Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction and existing structures.

PART 2 PRODUCTS

2.01 PUMPS

A. Pumps shall be electrically powered and include an hour meter.

2.02 FLOWMETERS

A. Flowmeters shall measure flow in gallons per minute. The Contractor shall provide all calibration and documentation related to the operation of the flow meter. Flow meter readouts shall be accessible to the Engineer at all times.

PART 3 EXECUTION

3.01 PERFORMANCE REQUIREMENTS

A. The dewatering system shall be adequate to drain the soils to be excavated to the extent that the piezometric water level in the construction area is a minimum of 2 feet below the bottom of the excavation, side slopes of excavations, or bottom of the footings at all times, or as otherwise required to obtain the specified compaction and installation conditions. Pipeline trenches must be dewatered at least 2 feet below the trench bottom.

B. The Dewatering Contractor shall control groundwater such that softening of the bottom of excavations, or formation of "quick" conditions, or "boils" during excavation shall not occur.

C. Unless otherwise noted and before any excavating below or within 2 feet above the groundwater level, a dewatering system shall be placed into operation to lower water levels to the extent specified previously and then shall be operated continuously 24 hours a day, 7 days a week.

D. Where used, well points, sock drains, and/or collection trenches shall be installed in an Engineer-approved manner and in sufficient numbers to provide the necessary removal of water as stated previously. Well points, pumps, and header piping shall be installed so that traffic on public thoroughfares and site access roads will not be impeded.

E. The Dewatering Contractor shall be solely responsible for the arrangement, location, and depths of the dewatering system necessary to accomplish the specified work.

F. To prevent excessive noise, exhaust from all pumps and engines shall be silenced and muffled. The Dewatering Contractor shall ensure that the noise emanating from this equipment does not exceed the permissible sound levels defined in the local County ordinances.

G. Groundwater or surface water pump discharge shall be controlled to prevent erosion, undermining, and all other damage and be piped to approved locations.

H. The Dewatering Contractor shall provide adequate protection and warning signs where equipment crosses over, or is in the vicinity of dewatering equipment such as discharge piping, wells and/or collection trenches, pumps, etc.

I. The Dewatering Contractor shall provide separate flow meters at each of the main line dewatering header pipes so that flow rates can be monitored on a daily basis.

J. The Dewatering Contractor shall perform all dewatering work in strict compliance with Section 01350, Environmental Protection Procedures, and the Contract Drawings.

K. Excavations shall be kept free from water during the placing of concrete and for 36 hours after or until concrete forms are removed.

L. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and groundwater from entering excavations, ponding on prepared subgrade, or flooding the site and surrounding area.
2. Protect subgrade and foundation soils from softening and damage by rain or water accumulation.

M. Install sufficient dewatering equipment to drain water-bearing strata above and below the bottom of the landfill.

1. Open-sump pumping which leads to loss of fines, subgrade softening, and slope instability shall not be permitted.

N. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids flooding or accumulation on private property. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

O. Design dewatering system to prevent pumping of fines below grade or disturbing materials exposed at the excavation bottom. Wells shall be cased and filters shall be provided to prevent such pumping of fines.

P. Excavations shall be kept free from water and the subgrade shall be maintained in a dry condition during the placement of geomembranes and GCL until overlying geosynthetics and soil layers are installed to prevent premature hydration of the GCL or flotation of the liner system.

3.02 DESIGN REQUIREMENTS

A. The Dewatering Plan shall be prepared and stamped and signed by a Professional Engineer licensed in the State of Florida. The Professional Engineer shall be experienced in the design of dewatering systems for similar excavations.

B. The electrical service used for dewatering shall be supplied by the Contractor and shall be separate from all other Contractor electrical requirements as noted on the drawings. The service shall be dedicated solely to the operation of the dewatering systems.

C. The Dewatering Contractor shall be responsible for taking all reasonable precautions necessary to ensure continuous, successful operation of the dewatering system. This includes adequate marking of all well, pump and pipeline locations. Wherever dewatering wells and/or collection trenches, vacuum headers or discharge lines shall be crossed for access and egress, ramps shall be used to protect the system from vehicular and foot traffic. All ramps shall be capable of supporting the heaviest equipment on site and shall provide at least 6 inches of clearance between the dewatering system element and the underside of the ramp. All vehicular access points across the dewatering system shall be clearly identified on each side of the access point. Routings affecting regular vehicular traffic patterns in the vicinity of the project must be approved by the Engineer before installation.

D. Design and construct the dewatering system such that foundation soils, natural or engineered, will not be subject to fines removal upon pumping.

E. Install dewatering system to ensure minimum interference with roads and other adjacent occupied and used facilities.

1. Do not close or obstruct roads or other adjacent occupied or used facilities without permission from the Engineer and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

3.03 STANDBY EQUIPMENT

A. The Dewatering Contractor shall at all times have on hand sufficient pumping equipment, replacement parts, and staff for all reasonably predictable emergencies, including but not limited to equipment maintenance, malfunction, storms, hurricanes, and power outage. Standby pumps and generators shall be on-hand at all times.

B. The Dewatering Contractor shall maintain on site sufficient equipment and materials to ensure continuous and successful operation of the dewatering, recharge, and monitoring systems.

C. The Dewatering Contractor shall provide one hundred percent standby electrical generating capacity for the dewatering system.

D. The Dewatering Contractor shall maintain on site a minimum of one additional of each size/type of dewatering system components, including valves, flow-meters, pumps and piping, or other system hardware to insure immediate repair or modification of any part of the system as necessary.

E. Stand-by equipment shall be installed and ready to operate to assure continuous pumping in the event of an emergency.

3.04 DAMAGES

A. The Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in place, the environmental cutoff wall, the excavation, and adjacent structures as a result of dewatering activities.

B. The Dewatering Contractor shall operate the system so that there are no negative impacts to nearby private groundwater wells and on-site wetlands.

C. The Dewatering Contractor shall be responsible for any damage to the liner system due to mechanical or electrical failure of the dewatering system.

3.05 OBSERVATION WELLS

A. The Dewatering Contractor shall install observation wells as may be required to record accurate water levels.

B. The Dewatering Contractor shall be responsible for maintaining all observation wells and observing and recording the elevation of the piezometric water levels daily.

C. Wells damaged or destroyed shall be replaced at no additional cost to the Owner.

3.06 WATER LEVEL MONITORING PROCEDURES

A. The Contractor shall collect water-level monitoring data daily upon beginning dewatering activities. The frequency of data collection may be reduced to a weekly basis upon notification from the Engineer. The data collection shall continue throughout the contract duration. Upon reaching steady-state conditions

as defined in Article 1.02 of this Section and approved by the Engineer, water-level data collection may decrease to weekly.

B. The monitoring data will include, but should not be limited to, the following:

1. Water level collection dates.
2. Identification numbers of all piezometers and groundwater monitoring points in the dewatering monitoring network.
3. Water levels recorded with elevations referenced to the top of casing and land surface at each well to within 0.1 foot (NGVD 29).

3.07 ABANDONMENT

A. The Contractor shall abandon well points and sock drains upon completing dewatering activities. Methods for well abandonment shall be in accordance with the approved Dewatering Plan.

B. Sock drains shall be grouted in place. The Contractor shall fill sock drains using a Tremie or similar method to ensure that grout is filled along the entire length of each sock drain. The Contractor shall verify that the amount of grout is sufficient to fill the entire sock drainpipe.

C. Dewatering wells and well points shall be completely removed and abandoned as follows:

1. Fill well screen interval with clean silica sand to at least 1 foot above the screen interval.
2. Seal the well to be abandoned by grouting from the bottom—top of the sand filling the screen interval—to ground surface. This will be done by placing a tremie pipe to the bottom of the well and pumping grout through the pipe until undiluted grout flows from the boring at ground surface.
3. Remove the well casing and cut a minimum of 5 feet below finished grade if present.
4. Remove well protective casing and concrete pad. Properly dispose of well protective casing and concrete.
5. After 24 hours, the site representative should check the abandonment site for grout settlement. Any settlement will be filled with grout back up to ground surface. Additional grout will be installed using a tremie pipe inserted to the top of the firm grout in the well. If the top of firm grout in the well is fewer than 5 feet below land surface, using a tremie pipe is not required. This process should be repeated until firm grout remains at ground surface.
6. Cover and level the surface expression of the abandoned well with soil or concrete depending upon the composition of the original surface.

3.08 CLEANUP

A. The Contractor shall leave the project site in a neat, clean, and acceptable condition satisfactory to the Owner.

B. All excavations shall be adequately backfilled and compacted to prevent settlement.

DEWATERING REPORT

Report Completed by: _____ Date:_____

Number of Wells in Operation	
Number of Collection Trenches in Operation	
Average rate of water pumped from each trench and well (gpm)	
Total volume of water pumped from date of last report to date of current report (gal)	
Total volume of water recharged from date of last report to date of current report (gal)	
Equipment or operations problems	

Water level for the following (to be measured to the tenth of a foot)	Measured Depth Below Grade	Surveyed Elevation of Well/Piezometer	Calculated Elevation of Groundwater

Note: Resubmit revised working drawings and calculations as necessary to reflect changes required by field conditions.

END OF SECTION

SECTION 02301
EARTHWORK FOR LANDFILL CONSTRUCTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, equipment, tools, appliances, and materials and perform all operations necessary for the earthwork associated with the construction of the landfill, stormwater system, and the site access roads including the following:

1. Clearing and Stripping.
2. Excavating.
3. Loading.
4. Hauling.
5. Soil Stockpiling.
6. Preparing Existing Subgrade.
7. Backfilling.
8. Soil Filling: General Fill and Structural Fill Filling.
9. Compacting.
10. Grading.
11. Anchor Trench Backfilling.
12. Drainage Soil Filling.
13. Trench Gravel Filling.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Pre-Construction Submittals: Submit the following within 30 days of Notice to Proceed and 30 days before beginning excavation.

1. Excavation and Fill Plan:

a. The Excavation and Fill Plan shall be submitted 30 days before beginning earthwork.
b. The Contractor shall provide a detailed Excavation and Fill Plan signed by the Contractor.
c. The Owner's site soil investigation reports are available for reference but are not Contract Documents included in this Specification. The Contractor shall verify site subsurface conditions.

d. The Excavation and Fill Plan shall include procedures for site clearing and proposed disposal methods of cleared materials.

e. The Excavation and Fill Plan shall include project title, Engineer's project number, project location, methods and locations of excavation, excavation quantities, fill quantities, stockpiling areas, procedures for segregating soil for use on this project, backfilling procedures, compaction procedures, excavation slope stabilization, and shoring.

f. The Excavation and Fill Plan shall include a breakdown of estimated volume for each of the soil types specified for backfill from each of the possible sources. The Excavation and Fill Plan shall show that sufficient quantity is available from the borrow sources to complete the project.

g. The Excavation and Fill Plan shall include procedures and locations for excavation, segregating, stockpiling, loading, and removing the unsuitable soils from the site.

h. The Excavation and Fill Plan shall identify stockpile and staging areas indicated in accordance with the Drawings and the Engineer's requirements.

i. The Excavation and Fill Plan shall include safety procedures and a statement verifying that the Contractor will meet Occupational Safety and Health Administration (OSHA), Federal, State, and local safety requirements.

j. The Excavation and Fill Plan shall include a description of adjacent on-site facilities and activities and procedures for protecting the site facilities from damage and the site activities from interruption.

k. The Excavation and Fill Plan shall include controls for stormwater runoff and groundwater management in accordance with Section 02240, Dewatering, and erosion control in accordance with Section 01350, Environmental Protection Procedures. The Excavation and Fill Plan shall include procedures to prevent surface water and dewatering water from flowing into excavated areas.

2. Construction Quality Control Plan:

a. The Construction Quality Control (CQC) Plan shall be submitted 30 days before beginning earthwork.

b. The Contractor shall provide a detailed CQC Plan signed by the Contractor addressing procedures and schedules for material source certifications, testing soils, testing in-place soils, submitting test results to the Engineer for review, and retesting failed tests.

c. The CQC Plan shall include project title, project number, project location, sample test identification numbering procedures, sample soil test and retest reports, and sample test location site plans.
d. The Contractor shall retain an independent Geotechnical Testing Agency to perform CQC testing of the material sources, materials, and in-place density and moisture content (see Article 1.05).
e. The CQC Plan shall include certification that the Contractor's independent Geotechnical Testing Agency meets the requirements of ASTM E329 and ASTM D3740 to conduct material and in-place testing.
f. The CQC Agency contracted by the Contractor shall not be the same as the CQA Agency contracted by the Owner.

3. Drainage Material Installation Plan:

a. The Drainage Material Installation Plan shall be submitted 30 days before installing Trench Gravel and Drainage Soil.
b. The Contractor shall provide a detailed Drainage Material Installation Plan signed by the Contractor addressing placement methods of the Drainage Soil and Trench Gravel to demonstrate that the bottom liner geosynthetic materials will be protected and safeguarded from damage during placement of the overlying materials.
c. The Drainage Material Installation Plan shall include project title, Engineer's project number, project location, material types, minimum thickness of each lift of materials during placement, description of thickness markers, methods for measuring material thicknesses, and methods for removing markers, number and duties of personnel, make and model of equipment to be used, maximum equipment speeds, equipment handling procedures, and site plan showing placement areas and equipment travel routes.
d. The Drainage Material Installation Plan shall include a sample of the proposed marker to be used for measuring Drainage Soil and Trench Gravel thicknesses during placement. The marker shall be free standing and shall not be sharp or pointed so it cannot damage the geosynthetic liner materials if hit by equipment.
e. The Drainage Material Installation Plan shall include a method for removing markers without disturbing in-place materials. The Contractor shall obtain the Engineer's approval if markers cannot be removed without disturbing materials and will be left in-place.

B. Project-Specific Material Source Certificates of Compliance: The Contractor shall submit the Material Source Certificates before moving material to the site for filling with excavated material. The Contractor may submit duplicate samples for quality assurance testing and verification. In the event that duplicate samples fail

quality assurance testing, the Contractor shall reimburse the Owner for the cost of the failed test. The Engineer may require removal of fill material not conforming to material requirements as determined by Quality Control Testing.

1. Material Source Certificates of Compliance signed by the Contractor for each proposed material from each proposed source to the Engineer in accordance with tests listed in Table 1 and meeting material requirements listed in Part 2.

2. The Material Source Certificates of Compliance shall include project title, Engineer's project number, project location, soil type, source name and description, proposed use and material type, location of sample, time and date of sampling, test identification number, a brief description of the material, applicable test standards, and laboratory test results for tests listed in Table 1.

3. The Material Source Certificates of Compliance shall be submitted for each proposed use as General Fill, Structural Fill, Anchor Trench Fill, Drainage Soil, and Trench Gravel from each of the proposed sources.

Table 1 Material Source Certification

Property	Test Designation	Frequency
USCS Soil Classification	ASTM D2487 (excluding hydrometer)	One test per source or change in material.
Standard Classification for Sizes of Aggregate for Road and Bridge Construction (Trench Gravel)	ASTM D448	One test per source or change in material.
Compaction Characteristics (for Subgrade, General, Structural, and Anchor Trench Fill)	ASTM D1557	One test per source or change in material.
Gradation (Drainage Soil)	ASTM D6913	One test per source or change in material.
Carbonate Content	ASTM D4373	One test per source or change in material.
Organic Content	ASTM D2974 Method C or D	One test per source or change in material.
Permeability (for Drainage Soil)	ASTM D2434	One per source or change in material – samples compacted to 90% Modified Proctor dry density.

C. Construction Quality Control (CQC) Submittals

1. CQC is the responsibility of the Contractor and includes material and process control testing as listed in Table 2, inspection and control procedures, construction records, and personnel qualifications.

2. During Construction, the Contractor shall submit CQC Test Reports and documentation signed and sealed by a Professional Engineer or Geologist licensed in Florida to the Engineer for review. Electronic copies shall be submitted to the Engineer within 72 hours after sampling or testing for each test required. Signed-and-sealed test report shall be submitted to the Engineer within 7 days of sampling or testing for each test required.

3. Copies of the CQC Test Reports and documentation shall be transmitted at the same time by the testing agency as follows:

   a. One copy for the Owner.
   b. Three copies to the Engineer.
   c. One copy to the Contractor.

4. CQC Test Reports shall include project title, Engineer's project number, project location, soil type, source name and description, location of test or sample, time and date of testing or sampling, test identification number, a brief description of the material, applicable test standards, and laboratory test results.

Table 2 Construction Quality Control Testing

Property	Test Designation	Frequency
Material Source		
USCS Soil Classification	ASTM D2487 (excluding hydrometer)	Before placement: One per source or change in material.
Gradation	ASTM D448 (gravel) ASTM D6913 (soil)	One test per source or change in material.
Compaction Characteristics (for Subgrade, General, Structural, and Anchor Trench Fill)	ASTM D1557	Before placement: One per source or change in material.
Carbonate Content	ASTM D4373	Before placement: One per source or change in material.
Organic Content	ASTM D2974 Method C or D	Before placement: One per source or change in material.
Permeability (for Drainage Soil)	ASTM D2434	Before placement: Minimum One per 3,000 CY – samples compacted to 90% Modified Proctor dry density.

Table 2 Construction Quality Control Testing		
Property	Test Designation	Frequency
In-Place Testing		
USCS Soil Classification	ASTM D2487 (excluding hydrometer)	One per 10,000 CY before compaction or before covering with next lift.
Compaction Characteristics (for Subgrade, General, Structural, and Anchor Trench Fill)	ASTM D1557	One per 10,000 CY before compaction.
In-place density (for Subgrade, General, Structural, and Anchor Trench Fill)	ASTM D2937, D1556, or D6938	Two per acre (for Subgrade) One per 10,000 sf per lift (for General and Structural Fill) One per 250 linear feet per lift (for Anchor Trench Fill)
In-place moisture content (for Subgrade, General, Structural, and Anchor Trench Fill)	ASTM D2216, D4643 or D6938	Two per acre (for Subgrade) One per 10,000 sf per lift (for General and Structural Fill) One per 250 linear feet per lift (for Anchor Trench Fill)
Thickness (for Drainage Soil and Trench Gravel)	—	Four per acre ((Drainage Soil) One per 50 linear feet before covering with geotextile (for Trench Gravel)

5. The test or sample location shall be identified by giving coordinates and elevations using site control monuments for reference. A figure of potential test locations may be provided by the Engineer upon request.

6. CQC Test Reports for the in-place density and in-place moisture content of the compacted materials shall also include the referenced laboratory compaction curve according to ASTM D1557. In-place density and in-place moisture content CQC Test Reports shall include a site map showing the location of the current test, previous tests, and retests for each material or test type.

7. CQC Test Reports for different material types or standards shall receive a unique submittal number and shall not be combined with other material types on any page in the report.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM D448—Standard Classification for Sizes of Aggregate for Road and Bridge Construction
2. ASTM D653—Standard Terminology Relating to Soil, Rock, and Contained Fluids.
3. ASTM D698—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
4. ASTM D1140—Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing.
5. ASTM D1556/D1556M—Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
6. ASTM D1557—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
7. ASTM D2216—Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
8. ASTM D2423—Standard Test Method for Surface Wax on Waxed Paper or Paperboard.
9. ASTM D2434—Standard Test Method for Permeability of Granular Soils (Constant Head).
10. ASTM D2487—Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
11. ASTM D2488—Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
12. ASTM D2937—Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
13. ASTM D2974—Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils.
14. ASTM D3740—Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
15. ASTM D4220/D4220M—Standard Practices for Preserving and Transporting Soil Samples.
16. ASTM D4318—Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
17. ASTM D4373—Standard Test Method for Rapid Determination of Carbonate Content of Soils.
18. ASTM D4643—Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating.
19. ASTM D4974—Standard Test Method for Hot Air Thermal Shrinkage of Yarn and Cord Using a Thermal Shrinkage Oven.

20. ASTM D6026—Standard Practice for Using Significant Digits in Geotechnical Data.
21. ASTM D6141—Standard Guide for Screening Clay Portion and Index Flux of Geosynthetic Clay Liner (GCL) for Chemical Compatibility to Liquids.
22. ASTM D6913/D6913M—Standard Test Method for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
23. ASTM D6938—Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
24. ASTM E329—Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
25. ASTM E2586—Standard Practice for Calculating and Using Basic Statistic.

B. Occupational Safety and Health Administration (OSHA)

1. 29 CFR 1926—Safety and Health Regulations for Construction.

1.04 QUALITY ASSURANCE

A. The Owner will engage and pay for the services of an Engineer and a testing agency to perform Construction Quality Assurance (CQA) testing in addition to the Construction Quality Control (CQC) testing performed by the Contractor. The Contractor shall help the Engineer with CQA sampling and testing by providing samples, personnel, and equipment necessary.

1. The Owner will engage and pay for CQA testing of the materials in accordance with test procedures listed in Table 2. The CQC Testing Agency contracted by the Contractor shall not be the same as the CQA Testing Agency contracted by the Owner.
2. The Contractor shall provide a 10-gallon sample of Drainage Soil meeting requirements of Article 2.05 to the CQA Testing Agency for interface direct shear testing 30 days before shipment of Geocomposite in accordance with Section 02070, Geocomposite.
3. The Contractor shall provide a 10-gallon sample of Structural Fill meeting requirements of Article 2.03 to the CQA Testing Agency for interface direct shear testing 30 days before shipment of GCL in accordance with Section 02072, Geosynthetic Clay Liner.
4. The CQA tests will be the basis of acceptance of material and construction. The Contractor is responsible for the cost of retesting if the CQA test fails. The retest will be paid for by the Owner and reimbursed by the Contractor. The Contractor, at his discretion, may retain and bear all costs for a testing agency to confirm or dispute the results of the CQA tests.

B. The Contractor shall coordinate construction and CQC activities with the Engineer.

1.05 QUALIFICATIONS

A. The Contractor shall provide the CQC Geotechnical Testing Agency's qualifications as specified in Article 1.02.

1.06 TESTING REQUIREMENTS (NOT USED – SEE PRODUCTS)

1.07 RECORD DRAWINGS

A. Record Drawings shall be prepared, maintained, and submitted showing prepared Subgrade, General Fill, Structural Fill, Anchor Trench Fill, Trench Gravel, and Drainage Sand final constructed elevations in accordance with the requirements of Section 01785, Record Documents, and the Contract Documents. Record Drawings shall be updated throughout the project and are subject to field review by the Engineer any time upon request.

B. The bottom-liner slopes shall be surveyed after completion before installation of the overlying liner-system components using a 50-foot grid in areas that drain to the leachate collection trench and at 50-foot intervals where pipes of the leachate-collection system are to be installed. The surveyed slopes must demonstrate that positive drainage is shown in the direction of flow between any two grid or interval points and the slopes have been constructed in accordance with specified construction tolerances.

1.08 DEFINITIONS

A. *Anchor Trench Fill*: Soil fill that meets the characteristics in Article 2.04 and is placed over the liner in the anchor trench to specified relative compaction densities and moisture contents to lines and grades shown as Anchor Trench Fill on the Drawings.

B. *Backfill*: Soil fill that meets the characteristics of Anchor Trench Fill, General Fill, or Structural Fill installed at the required locations in accordance with the Contract Documents.

C. *Clearing*: The felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, stumps, roots, and rubbish occurring in the areas to be cleared.

D. *Compacted Subgrade*: Existing subgrade soils that meet the characteristics in Article 2.01 and that are prepared in accordance with the requirements of Article 3.08.

E. *Completed Course*: Layer that is complete and ready for testing and/or the next layer or phase of construction.

F. *Construction Quality Assurance (CQA)*: A planned system of activities that provides assurance that the materials to be installed on the project are in accordance with the Contract Plans and Specifications. CQA includes inspections, testing, and evaluations to assess the quality of the materials and the construction. CQA refers to the measures taken by the Owner to determine compliance and conformance of the materials with the Contract Specifications.

G. *Construction Quality Control (CQC)*: A planned system that provides procedures for delivering a construction project that meets the requirements defined in the Contract Plans and Specifications. CQC is performed by the Contractor and includes surveying, documentation, sampling, testing, and personnel qualifications.

H. *Drainage Soil*: Soil fill that meets the characteristics in Article 2.05 and is placed over the liner and over the Trench Gravel to lines and grades shown as Drainage Soil on the Drawings.

I. *Existing Subgrade Soil*: Soil that meets the characteristics in Article 2.01 and is in-place and proof-rolled to specified relative densities and moisture contents to lines and grades shown on the Drawings.

J. *General Fill*: Soil fill that meets the characteristics in Article 2.02 and is placed to specified relative compaction densities and moisture contents to lines and grades shown on the Drawings.

K. *Lift*: *Lift* in these Specifications refers to a constructed segment of 12 inches thick (unless otherwise stated in the Specifications), loose, soil of one material type, over a defined area performed within 1 day.

L. *Optimum Moisture Content*: Moisture content corresponding to the maximum dry density as determined by the Modified Proctor Method (ASTM D1557).

M. *Relative Compaction*: Ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by the Modified Proctor Method (ASTM D1557).

N. *Structural Fill*: Soil fill that meets the characteristics in Article 2.03 and is placed under and around structures to specified relative compaction densities and moisture contents to lines and grades shown on the Drawings.

O. *Trench Gravel*: Soil fill that meets the characteristics in Article 2.07 and is placed over the liner in the leachate trench to lines and grades shown as Trench Gravel on the Drawings.

PART 2 PRODUCTS

2.01 EXISTING SUBGRADE SOIL

A. The Contractor shall certify that Subgrade Soils meet the requirements listed in Table 3 and this Article. Unsuitable Subgrade soils shall be excavated to 2 feet below and around bottom liner or structure grades as shown on the Drawings. Excavated Subgrade shall be backfilled with General Fill that meets these requirements listed below.

B. Subgrade Soils shall be non-organic, free of debris, sticks, roots, and stones larger than 3 inches in any dimension.

C. Unsuitable Subgrade Soils

1. ASTM D2487 Soil Classification Groups: CH, MH, OH, OL, and PT.

2. Soils not meeting requirements listed in Table 3.

3. Unsuitable soils also include satisfactory soils not maintained within 3% of optimum moisture content at time of compaction.

Table 3 Subgrade Soil and General Fill Requirements

Classification (USCS)	Maximum Allowable Fines (%)	Other Requirements	Maximum Allowable Carbonate Content (%)	Maximum Allowable Organic Content (%)
CL, ML	50	PI<20, LL<50 Max Size = 3 inches	< 30	< 5
SM, SC, SC-SM, SW-SC, SW-SM, SP-SC, SP-SM	15	PI<20, LL<50 Max Size = 3 inches		
GW, GP, SW, SP	5	Max Size = 3 inches		

2.02 GENERAL FILL

A. The Contractor shall certify that General Fill meets the requirements listed in Table 3 and this Article. General Fill may be obtained from site excavation or an approved borrow source if material meets these requirements. General Fill shall be placed where structural fill is not required and compacted to lines and grades shown on the Drawings.

B. Satisfactory General Fill Soils shall be free of debris, sticks, roots, and stones larger than 3 inches in any dimension.

C. Unsuitable General Fill

1. ASTM D2487 Soil Classification Groups CH, MH, OH, OL, and PT.
2. Soils not meeting requirements listed in Table 3.
3. Unsuitable soils also include satisfactory soils not maintained within 3% of optimum moisture content at time of compaction.

2.03 STRUCTURAL FILL

A. The Contractor shall certify that Structural Fill meets the requirements listed in Table 4 and this Article. Structural Fill may be obtained from site excavation or an approved borrow source if the material meets these requirements. Structural Fill shall be placed below the liner and below and around structures and compacted to lines and grades shown on the Drawings.

B. Satisfactory Structural Fill shall be non-carbonate, non-organic, free of debris, sticks, roots, and stones larger than 1/2 inch in any dimension. Structural Fill shall be chemically compatible with GCL in accordance with ASTM D6141.

C. Unsuitable Structural Fill

1. ASTM D2487 Soil Classification Groups GW, GP, GC, GM, SC, CL, CH, SM, ML, MH, OH, OL, and PT.
2. Soils not meeting requirements listed in Table 4.
3. Unsuitable soils also include satisfactory soils not maintained within 3% of optimum moisture content at time of compaction.

Table 4 Structural Fill and Anchor Trench Fill Requirements				
Classification (USCS)	Maximum Allowable Fines (%)	Other Requirements	Maximum Allowable Carbonate Content (%)	Maximum Allowable Organic Content (%)
SW, SP	5	Max Size = 1/2 inch	< 30	< 5
SP-SC, SP-SM, SW-SC, SW-SM, SC-SM	15	PI<20, LL<50 Max Size = 1/2 inch		

2.04 ANCHOR TRENCH FILL

A. The Contractor shall certify that the Anchor Trench Fill meets the requirements listed in Table 4 and this Article. Anchor Trench Fill may be obtained from site excavation or an approved borrow source if the material meets these requirements. Anchor Trench Fill shall be placed over the liner in the anchor trench and compacted to lines and grades shown on the Drawings.

B. Satisfactory Anchor Trench Fill shall be non-carbonate, non-organic, free of debris, sticks, roots, and stones larger than 1/2 inch in any dimension. Anchor Trench Fill shall be chemically compatible with GCL in accordance with ASTM D6141.

C. Unsuitable Anchor Trench Fill

1. ASTM D2487 Soil Classification Groups GW, GP, GC, GM, SC, CL, CH, SM, ML, MH, OH, OL, and PT.
2. Soils not meeting requirements listed in Table 4.
3. Unsuitable soils also include satisfactory soils not maintained within 3% of optimum moisture content at time of compaction.

2.05 DRAINAGE SOIL

A. The Contractor shall certify that Drainage Soil meets the requirements listed in Table 5 and this Article. Drainage Soil may be obtained from site excavation or an approved borrow source if it meets these requirements.

B. Satisfactory Drainage Soils

1. Drainage Soil shall be non-carbonate, non-organic, free of debris, waste, vegetation, sticks, roots, organic, or other deleterious material and stones larger than 1/2 inch in any dimension.

2. Drainage Soil shall meet requirements of ASTM D2487 Soil Classification Groups SW or SP. See Table 5 for Satisfactory Soil Requirements.

3. Drainage Soil shall have a hydraulic conductivity of greater than or equal to 0.001 cm/sec in accordance with this Section. The laboratory hydraulic conductivity test shall be performed in accordance with ASTM D2434 on a sample compacted to 90% Modified Proctor dry density in the laboratory.

4. Drainage Soil shall meet the following gradation requirements:

Sieve Size	Maximum Percent Passing
No. 4	100
No. 200	5

5. Meet the following modified coefficient of uniformity requirements:

   If $1<Cu'<3$, then $(Cu') * (d_{50})$ must be greater than $(0.5) * (AOS)$

   Where: $Cu' = [d_{100}/d_0]^{1/2}$ = Linear Coefficient of Uniformity.
   AOS = Apparent Opening Size (AOS) of the geotextiles (see Section 02074, Geotextile).
   d_{50} = Represents the soil particle size such that 50% by weight of the soil particles are smaller – corresponding to 50% finer cumulative particle size distribution curve.

   If the $Cu' > 3$, then d_{50} / Cu' must be greater than the AOS / 18

6. Meet the minimum interface shear strength requirements as listed in Section 02070, Geocomposite, Article 1.03.

C. Unsuitable Drainage Soil

1. ASTM D2487 Soil Classification Groups GW, GP, GC, GM, SC, CL, CH, SM, ML, MH, OH, OL, and PT.

2. Soils not meeting requirements listed in Table 5.

Table 5 Drainage Soil Requirements				
Classification (USCS)	Maximum Allowable Fines (%)	Other Requirements	Maximum Allowable Carbonate Content (%)	Maximum Allowable Organic Content (%)
SW, SP	5	Max Size = 1/2 inch Hydraulic Conductivity ≥0.001 cm/sec.	< 5	< 5

2.06 PROTECTIVE SOIL (NOT USED)

2.07 TRENCH GRAVEL

A. The Contractor shall certify that the Trench Gravel meets the requirements of this Article. Trench Gravel may be obtained from site excavation or an approved borrow source if it meets these requirements. Trench Gravel shall be placed over the bottom liner in the leachate collection trench and wrapped in geotextile to lines and grades shown on the Drawings.

B. Satisfactory Trench Gravel

1. Trench Gravel shall be non-carbonate (< 5%), non-organic (< 5%), free of debris, waste, vegetation, sticks, roots, organic or other deleterious material, and stones larger than 2 inches in any dimension.

2. Trench Gravel shall be quartz or granite gravel and may be:

a. Rounded to well-rounded.
OR:
Sub-rounded or sub-angular as defined by ASTM D2488 with adequate geomembrane protection with a minimum of 32 oz/sy nonwoven geotextile that meets the requirements of Section 02074, Geotextile, between all trench gravel and geomembranes in the primary leachate collection and removal system and secondary leak detection system. The sub-rounded or sub-angular gravel shall be a processed, consistent product that is produced with a gyratory or cone crusher creating a uniform product that meets the gradation requirements without being flat or elongated.

3. Trench gravel shall meet the following gradation requirements:

Sieve Size	Maximum Percent Passing
2 inches	100
1 inch	20 to 50
½ inch	10 to 30
No. 4	0 to 5

C. Unsuitable Trench Gravel

1. ASTM D2487 Soil Classification Groups GC, GM, SW, SP, SC, CL, CH, SM, ML, MH, OH, OL, and PT.
2. Soils not meeting requirements listed in Paragraph 2.07.B.

PART 3 EXECUTION

3.01 PROTECTION

A. The Contractor shall verify that any existing vegetation or trees designated to remain are tagged or identified by the Owner. Protect vegetation and any features designated to remain.

B. Locate, identify, and protect utilities from damage.

C. Protect benchmarks, wells, and existing structures from damage or displacement, unless scheduled to be removed or relocated.

3.02 CLEARING, GRUBBING, AND STRIPPING

A. Clear areas required for access to site and execution of work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be completely removed except such trees and vegetation as may be indicated or directed to be left standing by the Owner.

B. The Contractor shall adhere to the site-clearing activities and proposed disposal methods presented in the Excavation and Fill Plan.

C. Site-clearing activities shall be conducted to ensure minimum interference with roads, streets, walks, and other adjacent in-service facilities. The Contractor shall not close or obstruct streets, walks, or other facilities or interfere with the operations of the landfill or other contractors working on-site without coordinating with the Engineer.

D. The Contractor shall provide protection as required to prevent damage to existing improvements indicated to remain in place.

E. Grub logs, boulder, stumps, debris, and other material protruding through the ground surface. This material shall be excavated and removed to a depth of not less than 18 inches below the original ground surface.

F. Place cleared and grubbed material in stockpile area identified by the Owner.

G. General: Remove shrubs, grass and other vegetation, improvements or obstructions as required to allow the installation of the Project. Soils containing roots, vegetation, organics, or other deleterious materials shall be removed until acceptable material is encountered vertically and laterally. Removal includes digging out stumps and root systems to the extent acceptable to the Engineer.

H. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable materials. Fill depressions caused by clearing and grubbing operations with General Fill - unless otherwise specified on the Drawings – to prevent ponding and direct surface water and groundwater away from excavation. Before filling, subgrade surfaces of depressions shall be free of standing water. Unsatisfactory soil materials shall be removed. Stripping of topsoil shall be to a minimum depth of 6 inches, with rocks, roots, vegetation, or other deleterious materials exceeding 1 inch in the smallest dimension being removed from the soil. The topsoil material shall be placed in a separate stockpile to be identified by the Engineer.

I. Site-clearing material shall be disposed of in accordance with the following:

1. Materials shall be incorporated into the project or transported and disposed of as directed by the Engineer.
2. On-site stockpile areas will be provided for the Contractor's use. Materials not incorporated into the project shall be segregated according to material type and stockpiled at the designated on-site stockpile area as directed by the Engineer.
3. Burning is not permitted at the site.
4. The Owner retains all rights and title of ownership to all excavated soil materials from onsite sources regardless of whether it is used for the work described in these Specifications.

3.03 PREPARATION

A. Before beginning any excavation or grading, the Contractor shall survey the project area to determine the soil excavation volume available for backfill and the volume of borrow required (see Article 1.03 – Excavation and Fill Plan). Should the Contractor discover any inaccuracies, errors, or omissions in the survey data, the Contractor shall immediately notify the Engineer of the differences and the impact to the bid. If the Contractor begins any excavation or grading, this shall be

held as an acceptance of the survey data by him, after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions, or inaccuracies of the survey data.

B. Ensure that the foundation surface is clean and free of loose material of any kind when placing fill material.

C. Ensure that all material limits shall be excavated or constructed within a tolerance of 0.1 foot except where dimensions or grades are shown or specified as minimum. All grading shall be performed to strictly maintain slopes and drainage as shown on the Drawings.

D. Perform all Material Source Certification and in-place CQC testing for the materials and fill in accordance with Table 1, Table 2, and Part 2. Rework areas that do not meet specified in-place density and moisture requirements.

E. Set required lines, levels, contours, and datum by construction staking.

F. Locate, identify, and protect utilities, benchmarks, existing structures, monitoring wells, piezometers, and paving from damage.

G. Notify utility company to locate utilities, if applicable.

H. Provide fencing or other safety barrier along the entrance road to separate the excavation area from traffic areas.

I. Coordinate excavation operations with landfill operations.

3.04 REMOVAL OF WATER

A. The Contractor shall be responsible for the control and maintenance of groundwater and stormwater through all phases of construction. Under no circumstances shall stormwater be allowed to run into the excavation or pond therein. The Contractor shall provide temporary stormwater control methods including berms, swales, ponds, and pumps, to prevent stormwater runoff from outside the construction area from entering the construction area.

B. Dewatering necessary to allow for excavation is the responsibility of the Contractor. The Contractor shall submit a Dewatering Plan in accordance with Section 02240, Dewatering, to the Engineer. The Contractor is responsible for Water Management District, County, and local agency permits.

3.05 TEMPORARY EROSION CONTROL

A. It is the Contractor's responsibility to provide temporary erosion control to protect slopes and other areas from erosion as indicated in the Plan (see Article 1.02) and in accordance with Section 01350, Environmental Protection Procedures. Measures such as toe-in silt fence, temporary slope flumes, and erosion control matting shall be used to protect completed work. Damage to facilities under construction shall be repaired at the Contractor's sole expense. Any conditions which the Contractor believes endangers the site and cannot be addressed by taking reasonable measures should be immediately brought to the attention of the Engineer in writing.

3.06 EXCAVATION

A. The Contractor shall excavate soil as required to the lines, grades, and elevations shown on the Drawings as needed to construct the subgrade. Excavate unsuitable Subgrade Soils to 2 feet vertically and horizontally from lines and grades shown on the Drawings. Backfill excavated unsuitable subgrades soil with General Fill.

B. Machine grade slopes and base to design grades.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Notify the Engineer of unexpected subsurface conditions and discontinue affected work in the area until notified to resume work.

E. Correct areas over-excavated by placing soil to meet required grade and requirements as in Article 3.08. Correction of all overexcavated areas shall be at the Contractor's sole expense unless over-excavated area was directed and authorized in writing by the Engineer.

F. Excavated material shall by stockpiled in a location identified by the Engineer or used for Soil Fill if the excavated material meets the requirements of Part 2.

3.07 SOIL STOCKPILING

A. Coordinate selective soil and debris stockpiling with the Engineer.

B. Excavate, load, haul, and stockpile excavated soil and debris so that stockpiles have maximum slopes of 3 horizontal to 1 vertical (3:1).

C. Stabilize the stockpiles and provide erosion and sedimentation controls in accordance with Section 01350, Environmental Protection Procedures. The

erosion and sedimentation control measures to be used shall be detailed in the Stormwater and Pollution Prevention Plan and the Excavation and Fill Plan.

D. The Owner retains all rights and title of ownership to all excavated soil materials from onsite sources regardless of whether it is used for the work described in these Specifications.

3.08 PREPARATION FOR SOIL FILL

A. Moisture condition and compact existing satisfactory subgrade soil to a minimum of 90% relative compaction at a moisture content within 3% of optimum as determined by ASTM D1557**.**

B. Proof-roll a minimum of six passes the finished Subgrade Soil surface before installing soil fill using a vibratory steel drum roller with vibrator on.

C. Areas that pump or rut shall be reworked.

D. Before placing soil fill, verify that no loose or poorly compacted soil is present in the fill area.

E. Before placing soil fill, verify that Subgrade Soil surface has been accepted by the Engineer.

F. The Contractor shall maintain the groundwater level during construction as required in Section 02240, Dewatering.

3.09 SOIL FILL PLACEMENT AND COMPACTION

A. Load and haul Soil Fill from the excavation, stockpile, or borrow site and place to the lines and grades shown on the Drawings. The Contractor shall not damage liner materials or previously completed courses, including Geosynthetics, during placement and compaction of Soil Fill.

B. Place in loose lift thickness not exceeding 12 inches.

C. Each lift of Soil Fill shall be compacted until moisture contents and densities have been achieved.

1. General Fill and Anchor Trench Fill: Compact each lift to a minimum of 90% relative compaction at a moisture content within 3% of optimum as determined by ASTM D1557.

2. Structural Fill: Compact each lift to a minimum of 90% relative compaction at a moisture content within 3% of optimum as determined by ASTM D1557.

D. Completed lifts of Soil Fill cannot yield under equipment loads. Compaction equipment used is at the discretion of the Contractor. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations and be maintained in such condition that it will deliver the manufacturer's rated compactive effort.

E. Areas that pump or rut shall be reworked by the Contractor, at the Contractor's expense. The groundwater level shall be maintained during construction as required in Section 02240, Dewatering.

F. Maintain moisture content within the specified range until covered with subsequent lifts.

G. Grade final surface to a vertical tolerance of 0.1 foot unless preparing surface for geosynthetic materials. See Article 3.10 for preparing Soil Fill for Geosynthetics Materials.

3.10 PREPARING SOIL FILL FOR GEOSYNTHETIC MATERIAL

A. Remove any angular or sharp rocks, debris, ruts, or protrusions from the surface greater than 1/2-inch. Smooth surface to remove rutting and tire marks. The Contractor shall avoid sharp turns, sudden starts or stops, spinning and digging of tracks, or any other operation that could damage the surface.

B. Grade to a tolerance of plus or minus 0.10 foot of straight line grade between any two points 10 feet apart. Areas of grading include all areas requiring placement of a geosynthetic.

C. Maintain soil moisture until covered by GCL and liner materials. The groundwater level shall be maintained during construction as required in Section 02240, Dewatering.

D. The Contractor shall verify in writing to the Owner and Engineer with standard subgrade acceptance forms (see Section 02072, Geosynthetic Clay Liner, Article 1.02) signed by the Contractor and the GCL Installer's representative that the surface on which the GCL will be installed meets these Specification requirements.

E. Submit Record Drawings of subgrade surface before placement of GCL and geosynthetic materials.

3.11 DRAINAGE SOIL AND TRENCH GRAVEL PLACEMENT

A. Load and haul Drainage Soil and Trench Gravel from the excavation, stockpile, or borrow site and place only when underlying geosynthetic installations are complete and approved in accordance with these Specifications. Placement of Drainage Soil and Trench Gravel shall be in accordance with the Drainage Material Installation Plan signed by the Contractor.

B. The Contractor shall submit a Drainage Material Installation Plan to the Engineer for approval in accordance with Article 1.03. Placement of Drainage Soil and Trench Gravel shall begin by placing material from outside of cell limits to create a path by which to enter the cell in accordance with the Drainage Material Installation Plan.

C. Drainage Soil shall be placed in one lift with a minimum thickness as specified in this Section and as shown on the Drawings. The Contractor shall provide sufficient thickness of Drainage Soil to maintain the minimum specified thickness and to maintain the surface grades shown.

D. Track-mounted equipment with low ground pressure treads (less than 6 psi) no larger than a Caterpillar Model D-6 or equal shall be used for spreading Drainage Soil. Equipment shall not be allowed to operate on less than 12 inches of cover over the geomembrane liner system. No other equipment, including dump trucks or scrapers, will be permitted to travel on the liner and Drainage Soil. The Contractor shall avoid sharp turns, sudden starts or stops, spinning and digging of tracks, or any other operation that could damage the liner system.

E. Maximum equipment speed over the Drainage Soil shall be 5 miles per hour.

F. Drainage Soil shall be placed in such a manner that no air is trapped underneath the geosynthetic liner. The Contractor shall exercise extreme caution in spreading sand to prevent puckering of geocomposite and geotextile damage.

G. Take precautions necessary to preclude any damage to the liner system due to thermal expansion or contraction during all phases of liner construction and especially during placement of the Drainage Soil.

H. The Contractor shall provide and maintain a means of continuously observing the depth of the Drainage Soil and Trench Gravel, such as by freestanding markers at intervals of 50 feet maximum each way as described in the Drainage Material Installation Plan (see Article 1.02). Sharpened stakes or other rigid items which may damage the underlying liner system if they were contacted by on-site equipment shall not be allowed. If possible, markers shall be removed after use and shall not be abandoned in-place unless removal will disturb the in-place

material. A sample of the proposed marker shall be submitted to the Engineer with the Drainage Material Installation Plan (see Article 1.02).

I. Trench Gravel shall be placed around leachate collection pipes as shown on the Drawings. Trench Gravel shall be worked in and provide contact with and support to the pipe. Pipe shall not be damaged during Trench Gravel placement.

3.12 ANCHOR TRENCH FILL PLACEMENT

A. The Contractor shall load and haul Anchor Trench Fill soil from the excavation, stockpile, or borrow site and place only when underlying geosynthetic installations have been completed in accordance with deployment and seaming requirements in Section 02074, Geotextile.

B. Place fill to the lines, grades, and dimensions shown on the Drawings.

C. Place in loose lift thickness not exceeding 12 inches.

D. Compact bottom lifts with a vibratory plate compactor and upper lift by tracking in with rubber tracked skid steer or wheel rolling with a rubber- tired loader.

E. Do not damage underlying geosynthetic installation.

END OF SECTION

SECTION 02305
EARTHWORK FOR UTILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall provide all materials, equipment, labor, and work necessary to completely construct the project in accordance with the Contract Documents. This work includes but is not limited to the following:

1. Excavating and removing unsatisfactory materials.
2. Preparing trench foundations.
3. Providing satisfactory material for all trenches as specified and as required.
4. Obtaining, storing, maintaining, and disposing of materials.
5. Dewatering, shoring, and sheeting.
6. Placing, compacting, testing, final grading, and demolishing subgrade.
7. Performing all other work required by the Contract Documents.

B. The Contractor is responsible for performing all work so as not to damage existing roadways, facilities, utilities, structures, etc., and shall repair and replace such damage to equal or better than its original undamaged condition without cost to the Owner.

C. The Contractor shall examine the site before submitting a bid, taking into consideration all conditions that may affect the work.

D. The Contractor shall coordinate all additional subsurface investigations and testing included with this work with the Engineer before performing the excavation and foundation preparation work. In general, if the Contractor finds different and unsuitable/unsatisfactory soil conditions during the work, the Contractor shall notify the Engineer immediately.

1.02 SUBMITTALS

The Contractor shall submit the following shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D2487 of each onsite and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D1557 for each onsite and borrow soil material proposed for fill and backfill.

B. The Contractor shall submit records before the start of this work. The Contractor shall verify that the existing conditions are correct as shown on the plans and mentioned in these Specifications. The Contractor shall note any discrepancies found immediately and notify the Engineer.

The records shall include the following:

1. Location of all existing underground utilities, structures, etc., surrounding the areas to be excavated that may be impacted by the work.
2. Location of test excavations.
3. Location of inspections.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply:

A. American Society for Testing and Materials (ASTM)

1. ASTM D1556/D1556M—Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. ASTM D1557—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. ASTM D2487—Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
4. ASTM D2937—Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.

5. ASTM D3282—Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
6. ASTM D3740—Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used In Engineering Design and Construction.
7. ASTM D6938—Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
8. ASTM E329—Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

B. Florida Statutes (FS)

1. Florida Trench Safety Act (90-96, Laws of Florida).

C. Occupational Safety and Health Administration (OSHA)

1. 29 CFR 1926, Subpart P—Safety and Health Regulations for Construction, Excavations.
2. OSHA 2226—Trenching and Excavation Safety.

1.04 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E329 to conduct soil materials and definition testing, as documented according to ASTM D3740.

B. The Contractor shall do the following:

1. Ensure that excavations provide adequate working space and clearance for the work to be performed and for installing piping and buried utilities. In no case shall excavation faces be undercut.
2. Ensure that foundation surfaces are clean and free of loose material of any kind when pipelines and buried utilities are placed on them.
3. Excavate, trench, and backfill in compliance with applicable requirements of governing authorities having jurisdiction.
4. Ensure that shoring and sheeting for excavations are designed by a Florida-registered Professional Engineer and are in accordance with OSHA 2226.
5. Before beginning any excavation or grading, ensure the accuracy of all survey data indicated on the Contract Drawings and in these Specifications and/or as provided. If the Contractor discovers any inaccuracies, errors, or omissions in the survey data, the Contractor shall immediately notify the Owner so that proper adjustments can be anticipated or ordered. If the Contractor begins any excavation or grading, this shall be considered an

acceptance of the survey data by the Contractor, after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions, or inaccuracies of the survey data.

6. Ensure that tolerances for excavation are ±0.10 foot to the required line and to the required grade. Tolerance for compaction of in-place material shall be ±0.10 foot to the required grade.
7. Ensure that all trench materials derived from the project site and imported to this site are examined, tested, and classified by an Engineer-approved soils testing laboratory.
8. Remove unsatisfactory materials and unsuitable materials including muck, silts, peat, and other loose and very loose compressible soils from excavations before placing pipe foundation, bedding, and buried utilities.

1.05 PROJECT CONDITIONS

A. Existing Utilities: The Contractor shall not interrupt utilities serving facilities occupied by the Owner or others unless permitted to do so in writing by the Engineer and then only after arranging to provide temporary utility services according to the requirements indicated.

1. Notify the Engineer not less than 2 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without the Engineer's written permission.
3. Contact utility-locator service and obtain utility locations for the Project Area before excavating.

B. The Contractor shall demolish and completely remove from the site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.06 DEFINITIONS

A. *Backfill*: Soil material or controlled low-strength material used to fill an excavation.

1. *Initial Backfill*: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. *Final Backfill*: Backfill placed over initial backfill to fill a trench.

B. *Bedding Course*: The course placed over the excavated subgrade in a trench before laying pipe.

C. *Borrow Soil*: Satisfactory soil imported from off-site for use as fill or backfill.

D. *Drainage Course*: The course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. *Excavation*: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. *Authorized Additional Excavation*: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Engineer. Authorized additional excavation and replacement material will be paid for according to the Contract provisions.
2. *Bulk Excavation*: Excavation more than 10 feet in width and more than 30 feet in length.
3. *Unauthorized Excavation*: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be without additional compensation.

F. *Fill*: Soil materials used to raise existing grades.

G. *Structures*: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. *Subgrade*: The surface or elevation remaining after completing excavation, or the top surface of a fill or backfill immediately below drainage fill, or topsoil materials.

I. *Utilities*: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.07 TESTING REQUIREMENTS

A. The Contractor shall furnish a soil survey for satisfactory material and samples of materials.

B. Testing for source material, for classification, and for prequalification of material (on or off site) shall be performed by an independent testing agency retained by the Contractor and approved by the Engineer.

C. Testing for in-place compacted fill shall be performed by the same independent testing agency as approved by the Engineer and retained by the Contractor.

D. The number and location of the tests shall be as specified in these Specifications and as directed by the Engineer during construction.

E. The Contractor shall coordinate activity with the Engineer and the testing agency to permit testing as directed in the presence of the Engineer.

F. The cost of all testing to achieve specified requirements shall be borne by the Contractor. The Contractor shall be reimbursed by the Owner for passing field tests.

G. The costs of any and all retests due to failure to achieve specified requirements shall be solely borne by the Contractor and are not reimbursable under this contract.

H. All materials proposed for use shall be tested as follows:

Material	Required Test	Min. No. Tests
Satisfactory Soil Materials	Soil Classification using ASTM D2487 (including all tests contained therein)	One per source of materials to determine conformance with materials specified in these Specifications; additional tests whenever there is any apparent change.
	Soil moisture-density relationship using Modified Proctor ASTM D1557	One per source of material or apparent change in material.

I. Soil materials shall be tested during construction as follows:

Material	Required Test	Min. No. Tests
Satisfactory Soil Material in-place after compaction	Field Density ASTM D1556/D1556M – Sand Cone Method, or ASTM D6938 – Nuclear Density Method, or ASTM D2937 – Drive Cylinder Method	For each layer of trench bottom subgrade before addition of soil materials, refill, bedding, and backfill, and for each 400 lineal feet of trench or fraction thereof, whichever is greater; two tests for each drainage, additional test whenever there is any change in native soil, groundwater, or soil moisture conditions.

J. The approved testing agency shall transmit copies of required laboratory test results as follows:

1. One copy to the Owner.
2. Three copies to the Engineer.
3. One copy to the Contractor.

The laboratory test reports shall include, at a minimum, project title; project location; location of sample; source, time, and date of testing; testing agency's name, address, and telephone number; and test results. Each test report shall be signed and sealed by the Professional Engineer representing the testing agency as specified in these Specifications.

K. The approved testing agency shall transmit copies of field testing results as follows:

1. One copy to the Owner.
2. Three copies to the Engineer.
3. One copy to the Contractor.

The field test reports shall include, at a minimum, project title; project location; location of sample(s) tested; time of testing; date of testing; testing person's full name; testing agency name, address, and telephone number; and test results.

L. No soil material shall be used until 1) the Engineer has reviewed and approved test reports and 2) the Contractor submits certification that the soil material proposed for construction is clean and meets gradation and other parameters specified in these Specifications.

M. At no cost to the Owner, the Contractor shall remove and replace or correct all materials and work that tests indicate do not conform, in the opinion of the Engineer, to the requirements of these Specifications.

N. The results of in-place density tests shall be considered satisfactory if the density in each instance is equal to or greater than the specified density. Soil moisture content at the time of testing shall conform to requirements of these Specifications.

O. Where the tests reveal unsatisfactory compaction, the Contractor shall re-excavate, backfill, recompact, and/or rework the backfill as required to obtain the required degree of compaction over the entire depth of the excavation.

P. The testing agency shall transmit to the Engineer copies of all testing agency invoices submitted to the Contractor for payment. Invoices shall clearly indicate specific services and date and time services are rendered and shall indicate if the invoiced testing cost is an initial test of the Contractor's work or is a re-test required due to the Contractor's failure to initially achieve the specified requirements.

PART 2 PRODUCTS

2.01 STRUCTURAL MATERIALS

A. Materials used for shoring and bracing, such as sheet piling, uprights, stringers, and crossbraces, shall be in good serviceable condition. Any timber used shall be sound and free from large or loose knots.

B. Pressure-treated timber shall be used where wood sheeting or piling is specified or indicated to be cut and left in place.

2.02 TRENCH SOIL MATERIALS

A. Materials used for trench construction shall be free of clumps of clay, rock or gravel, debris, waste, frozen materials, and other deleterious matter as determined by the Engineer and shall be satisfactory soil materials as follows:

Area Classification	Soil Materials
In excavations and trenches	Excavated and borrow material that has been sampled, tested, and approved as "Satisfactory Soil Material."

B. Satisfactory Soil Materials

1. Soil Classification Groups:

a. Satisfactory soil materials for each trench shall be as follows:

Satisfactory Soil Material (ASTM D3282, Soil Classification Groups)		
In-situ Foundation	Bedding, Haunching, and Initial Backfill	Final Backfill
SW SP	SW SP	SW SP

2. Maximum Particle Size Limitations for Satisfactory Soil Materials:

a. The maximum allowable particle size for satisfactory soil materials within each trench for each type of utility shall be as follows:

Conduit	Maximum Allowable Particle Size		
	In-situ Foundation	Bedding, Haunching, and Initial Backfill	Final Backfill
Plastic Pipe (PVC, CPVC, HDPE, etc.) Less than 6-inch-diameter	See Note 1	1/2 inch	3 inches
Plastic Pipe (PVC, CPVC, HDPE, etc.) 6-inch-diameter and Larger	See Note 1	3/4 inch	3 inches

Conduit	Maximum Allowable Particle Size		
	In-situ Foundation	Bedding, Haunching, and Initial Backfill	Final Backfill
Concrete Pipe			
Other Conduit Materials	See Note 2	See Note 2	See Note 2

(1) There is no requirement when satisfactory undisturbed native soil material is used. Disturbed portions of the foundation and/or unsatisfactory native soil material shall be replaced with satisfactory soil materials meeting all the requirements for Bedding Course.
(2) The maximum allowable particle size shall be in accordance with the manufacturer's written recommendation.

3. Additional Requirements of Satisfactory Materials:

a. Satisfactory soil materials shall be free of debris, waste, frozen materials, vegetation, or other deleterious matter. Soils within 4 inches of the exterior surface of the pipe shall be free of gravel, stones, or other materials that may abrade the pipe surface.

C. Unsatisfactory Materials

1. Unsatisfactory soil material shall mean ASTM D2487, Soil Classification Groups GW, GP, GM, GC, SC, CL, ML, OL, CH, MH, OH, PT, and other highly organic soils and soil materials of any classification that have a moisture content at the time of compaction beyond the range of 1 percentage point below and 3 percentage points above the optimum moisture content of the soil material as determined by moisture-density relations test.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

The Contractor shall do the following:

A. Carefully verify by hand methods the location of all surrounding underground utilities before performing utility excavations and trenches.

B. Protect utilities to be left in place from damage.

C. Do not interrupt existing utilities serving facilities occupied and used by the Owner, except when permitted in writing by the Engineer.

D. Protect benchmarks, survey points, and existing structures, roads, sidewalks, monitoring wells, paving, curbs, etc. against damage from equipment, vehicular

or foot traffic, settlement, lateral movement, undermining, washout, and all construction-related activities.

E. Repair and replace damage to existing facilities to equal or better than their original undamaged condition without cost to the Owner and to the approval of the Engineer.

F. Excavate and trench in ways that will prevent surface water and subsurface water from flowing into excavations and will also prevent flooding of the site and surrounding area.

G. Protect excavations and trenching by shoring, bracing, sheet piling, underpinning, or other methods as required to prevent cave-ins or loose dirt from falling into excavations and trenches.

H. Do not operate earth-moving equipment within 5 feet of walls of concrete structures for depositing or compacting backfill material.

I. Compact the backfill material placed next to concrete walls with hand-operated tampers or similar equipment that will not damage the structure.

J. Excavate, fill, backfill, and grade to elevations required by the Contract Documents.

K. Pile excavated materials suitable for backfill in an orderly manner a sufficient distance from excavations to prevent overloading, slides, and cave-ins.

L. Do not obstruct access ways, roadways, and plant facilities.

M. Refer to the Contract Drawings for additional requirements related to earthwork and protection of existing features.

3.02 TRENCH EXCAVATION

A. Before excavating the trench, the Contractor shall prepare the surface including clearing and grubbing as specified in Section 02230, Site Preparation.

B. The Contractor shall be required to fully comply with all applicable OSHA Excavation Safety Standards and to abide by them as covered by the most current version of the Florida Trench Safety Act (90-96, Laws of Florida).

C. The Contractor shall ensure that mechanical equipment used for trench excavation shall be of a type, design, and construction and shall be so operated that conduit/utility, when accurately laid to specified alignment, will be centered in the

trench with adequate clearance between the conduit/utility and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

D. The Contractor shall not use mechanical equipment in locations where its operation would cause damage to culverts, other existing property, utilities, structures, etc. above or below ground. In all such locations, the Contractor shall use hand-excavating methods.

E. The Contractor shall not use blasting.

F. The Contractor shall cut trenches sufficiently wide to enable proper installation of services and to allow for testing and inspection. The Contractor shall also trim and shape trench bottoms and leave them free of irregularities, lumps, and projections. Trench width shall be excavated as specified on the Contract Drawings.

G. The Contractor shall construct trench walls to avoid side wall collapse or sloughing. Trenches shall be either braced or open construction in accordance with the Contract Documents. No separate payment will be made for any special procedure used in connection with the excavation.

H. Where sheeting and bracing are not required, the Contractor shall construct trench walls in the bottom of the excavation as vertical as possible to the maximum height allowable by OSHA. Trench walls above this height shall be sloped to guard against side wall collapse or sloughing as specified on the Contract Drawings.

I. Where sheeting and bracing are required, the sheeting and bracing system shall meet the requirements in these Specifications.

J. Excavations shall be to the design elevations shown on the Contract Drawings or as specified, unless unsatisfactory or unsuitable foundation materials are encountered in the bottom of the excavation. Where unsatisfactory or unsuitable foundation materials are encountered, this material shall be undercut and removed as indicated on the Contract Drawings and replaced with satisfactory soil material meeting all the requirements for Bedding Course. The lift thicknesses and compaction requirements for the replacement soil shall also meet the requirements for Bedding Course.

K. The Contractor shall be careful not to overexcavate except where necessary to remove unsatisfactory or unsuitable materials, irregularities, lumps, rock, and projections. Unnecessary overexcavation shall be replaced as specified in these Specifications at the Contractor's sole expense.

L. The Contractor shall accurately grade bedding soil materials at the bottoms of the trenches to provide uniform bearing and support for each section of conduit/utility at every point along its entire length except where it is necessary to excavate the bedding for conduit/utility bells (e.g., pipe bells), etc., or for proper sealing of conduit/utility joints. Abrupt changes in grade of the trench bottom shall be avoided.

M. The Contractor shall dig bell holes and depressions after the bedding has been graded to ensure that the conduit/utility rests on the prepared bedding for as much of its full length as practicable. Bell holes and depressions shall be only of such length, depth, and width as required to make the joint.

N. The Contractor shall do the following:

1. Pile all excavated material in a manner that will not endanger the work or erode into stormwater management facilities or water courses.
2. Avoid obstructing roadways and landfill operations.
3. Leave hydrants, valve pit covers, valve boxes, or other utility controls unobstructed and accessible.
4. Keep gutters, drainage inlets, natural water courses, and miscellaneous drainage structures clear or make other satisfactory provisions for their proper operation.

O. The Contractor shall keep all satisfactory materials that are suitable for use/reuse in the trench construction separated from unsatisfactory materials.

P. Except where otherwise authorized, indicated, or specified, the Contractor shall replace, at the Contractor's own expense, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations with concrete or flowable fill, as directed by the Engineer.

Q. The Contractor shall adhere to these Additional Excavation Requirements for piping:

1. Excavate trenches so that the piping can be laid to the lines, grades, and elevations indicated on the Contract Drawings.

2. For piping designated to be laid to a minimum cover requirement, grade trenches to avoid high and low points to the extent practical. Record Drawings of such pipes shall present top-of-pipe and grade elevations at all high and low points along each pipe segment, at the end points of each pipe segments, and at intervals not to exceed 100 feet along each pipe segment. If, in the opinion of the Engineer, additional air release and/or

vacuum relief valves are required, the Contractor shall install the additional items as directed by the Engineer.

3. Except at locations specifically indicated otherwise on the Contract Drawings, the required minimum cover over the top of the pipe from finished grade for various pipe diameters shall be as follows:

	Pipe Diameter			
	48-inch or less	66-inch	72-inch	96-inch
Minimum Cover	3 feet	4 feet	4.5 feet	5 feet

4. Continue dewatering operations along each pipe segment until the required minimum cover is provided. During the dewatering operations, the ground water level in the trench shall remain at all times a minimum of 1 foot below bottom of trench excavations.

R. The Contractor shall adhere to these Additional Excavation Requirements for Electrical Utilities:

1. Avoid abrupt changes in grade of the trench bottom.

2. The required minimum cover over the top of electrical conduits from finished grade shall be as follows:

	Electrical Conduits (Lines less than 5 kV)	Electrical Conduits (Lines 5 kV and up)
Minimum Cover	2 feet	3 feet

3. The required minimum clearance from the bottom of mat foundations and/or footings shall be 2 feet. Provide additional cover where necessary to satisfy the minimum clearance requirement.

4. Provide additional cover depth if necessary to avoid interference of other cables, ducts, piping, structures, and other utilities.

S. The Contractor shall adhere to this Additional Excavation Requirement for Appurtenances:

1. Ensure that excavations for valves and similar appurtenances shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber used to hold and protect the walls.

3.03 PROTECTION OF PERSONS AND PROPERTY

A. The Contractor shall do the following:

1. Barricade and post excavations with warning signs for the safety of persons. Provide warning lights if construction occurs during hours of darkness.
2. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations against damage including loading, settlement, lateral movement, undermining, and washout.

B. Conduct topsoil removal operations to ensure the safety of persons and to prevent damage to existing structures and utilities, construction in progress, trees and vegetation to remain standing, and other property.

3.04 SHEETING AND BRACING

A. Where sheeting and bracing are required to support the side walls of the excavation, the Contractor shall retain a Professional Engineer, registered in Florida, to design sheeting and bracing. The design shall establish requirements for sheeting and bracing and shall comply with all applicable codes; authorities having jurisdiction; and federal, state, and local regulations.

B. The sole responsibility for the design, methods of installation, and adequacy of sheeting and bracing shall be and shall remain that of the Contractor and the Contractor's Professional Engineer. The Contractor shall provide all necessary sheeting and bracing or other procedures as required to ensure safe working conditions and to protect the excavations.

C. Sheeting and bracing shall consist of braced steel sheet piling, trench box, braced wood lagging, and soldier beams or other approved methods.

D. The Contractor shall immediately fill and compact voids formed outside the sheeting. Where soil cannot be properly compacted to fill the void, the Contractor shall use Class B concrete as backfill at no additional cost to the Owner.

E. The Contractor shall install sheeting outside the required clearances and dimensions. Sheeting shall be plumb, securely braced, and tied in position. Sheeting shall be adequate to withstand all pressure to which it may be subjected. The Contractor shall correct any movement or bulging at no expense to the Owner to provide the necessary clearances and dimensions.

F. The Contractor shall maintain sheeting and bracing in excavations and trenches for the entire time excavations will be open.

G. The Contractor shall not brace sheeting against pipe being laid. Sheeting shall be braced so that no concentrated load of horizontal thrust is transmitted to the pipe.

H. Sheeting shall not be withdrawn if driven below the spring line of any pipe. The Contractor shall cut off tops as indicated on the Contract Drawings and leave bottoms permanently in place.

3.05 DEWATERING, WATER REMOVAL, AND DRAINAGE MAINTENANCE

A. Water shall not be permitted to accumulate in excavations. The Contractor shall provide dewatering systems to convey water away from excavations so that softening of foundations bottoms, footing undercutting, and soil changes detrimental to subgrade stability and foundation will not occur.

B. Dewatering systems and equipment shall be in place as required to eliminate water during the excavation period until the work is completed. The Contractor shall provide ample means and equipment with which to remove promptly and dispose of properly all water entering any excavation. This includes the use of sand or gravel as required to maintain adequate flow during the pipe laying or installation of other items of work within the excavation.

C. Water pumped or drained shall be disposed of in a suitable manner without damage to adjacent property, to other work under construction, or to roads. Water shall not be discharged onto surface improvements without adequate protection of the surface at the point of discharge. All gutter, drains, culverts, sewers, and inlets shall be kept clean and open for surface drainage. Water shall not be directed across or over pavements except through approved pipes or properly constructed troughs. The Contractor shall obtain permission from the Owner of any property involved before constructing water courses or installing discharge pipe or hose for removal of water and provide for disposal of the water without ponding or creating a public nuisance.

D. All pumps used for dewatering shall have noise-reduction features and shall be able to run continuously with minimal attendance. If required by the Owner or Engineer, the pumps shall be enclosed on all sides with a plywood enclosure, with padded material suitable for outdoor conditions on the inside of the enclosure, to further reduce pump engine noise to an acceptable level. All applicable ordinances and codes for noise abatement shall be followed. The Contractor shall maintain pumps at all times, as necessary. When pumps are no longer required, the Contractor shall remove the pumps, wellpoints, pipes, and other apparatus from the area.

E. Trenches shall be constructed on the upstream side of the traffic way across roadways, driveways, or other traffic ways adjacent to drainage ditches or water to prevent impounding water after the pipe has been laid. The Contractor shall construct and maintain bridges and other temporary structures required to maintain traffic across such unfilled trenches. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. After backfilling is completed, the Contractor shall immediately remove all material deposited in roadway ditches or other water courses crossed by the line of trench and restore the original section, grades, and contours of ditches or water courses. Surface drainage shall not be obstructed longer than necessary.

F. Where trenches are constructed in ditches or other water courses, backfill shall be protected from surface erosion. Where the grade of the ditch exceeds 1%, the Contractor shall install ditch checks. Unless otherwise indicated on the Contract Drawings, ditch checks shall be concrete or as otherwise approved by the Engineer. Ditch checks shall extend not less than 2 feet below the original ditch or water course bottom for the full bottom width and at least 18 inches into the side slopes and shall be at least 12 inches thick.

3.06 BACKFILLING AND COMPACTION

A. The Contractor shall not backfill trenches until required tests are performed.

B. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as directed.

C. The Contractor shall perform the following steps to ensure compaction at the bottom of the trench or excavation before bedding:

1. Remove disturbed native soil material and/or any soils not meeting the requirement of satisfactory soil material as indicated on the Contract Drawings.
2. Compact the bottom of the trench excavation (undisturbed native subsurface soil) to no less than 95% of the Modified Proctor maximum dry density in accordance with ASTM D1557, before placement of foundation, bedding, piping, and backfill.

D. To backfill below and around pipe to the spring line of the pipe, the Contractor shall do the following:

1. Construct foundation and bedding as indicated on the Contract Drawings before placement of pipe.
2. Install each pipe at proper grade, alignment, and final position.

3. Deposit satisfactory soil material uniformly and simultaneously on each side of pipe in completed course layers to prevent lateral displacement.
4. Compact under pipe haunches and on each side of pipe to the pipe spring line as shown on the Contract Drawings to hold the pipe in the proper position during subsequent pipe backfilling and compaction operations.
5. Construct haunching as indicated on the Contract Drawings.

E. To trench backfill above pipe spring line to finished grade, the Contractor shall do the following:

1. Deposit satisfactory soil material around and above pipe in uniform layers as shown on the Contract Drawings.
2. Backfill and compact trenches from the spring line of the pipe to the top of the trench in completed course layers as shown on the Contract Drawings.
3. Use material previously defined in these Specifications as satisfactory soil material.
4. Compact by hand or mechanical tampers.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. The Contractor shall remove and legally dispose of waste materials, including excavated material classified as unsatisfactory soil material, trash, and debris from the property at no additional cost to the Owner.

END OF SECTION

SECTION 02330
SOIL-BENTONITE CUTOFF WALL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes the requirements for constructing multiple variable length soil-bentonite (SB) cutoff walls at the Highlands County Solid Waste Management Center Cell 5 Landfill Expansion near Sebring in Highlands County, Florida. All procedures, operations, and methods shall be in accordance with the Specifications and Drawings. The Contractor shall furnish all labor, equipment, tools, appliances, and materials and perform all operations necessary for constructing multiple variable length SB cutoff walls using the one-pass trench (OPT) method. The SB cutoff wall shall be installed to the top of the cemented silt/limestone layer.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Pre-Construction Submittals: Submit the following within 30 days of Notice to Proceed and 30 days before beginning construction of the SB cutoff wall.

1. Construction Quality Control (CQC) Plan

   a. The Contractor shall provide a detailed CQC Plan signed by the Contractor addressing procedures, test methods, and Quality Control Laboratory qualifications.
   b. The CQC Plan shall include project title, project number, project location, sample test identification numbering procedures, sample soil test and retest reports, and sample test location site plans.

2. SB Cutoff Wall Implementation Plan

   a. Detailed Implementation Plan with forms.
   b. OPT Equipment – to include details of equipment used for excavating and backfilling the trench, manufacturing and hydration of bentonite slurry, slurry delivery, etc., as required for SB Cutoff Wall construction.
   c. OPT Method – Description of approach to wall construction (e.g., start location, direction of progress, how to terminate and close the convergence of adjacent walls), a Test Section Design

and Implementation Plan, the Results of the Test Section Testing, and a Test Section Report.

d. The Implementation Plan shall include the minimum requirements for a working platform, including anticipated platform elevation required for the OPT trencher to work from.

e. SB Wall construction sequence and schedule.

B. The Contractor shall submit a Test Section Design and Implementation Plan. The Contractor will submit a proposed Test Section Design including in- situ wall sampling and an implementation plan. This will include batching and monitoring procedures for inspection of bentonite and water usage, rate of advancement, chain rotation, and a target mix design including percentage and rate of bentonite and water injection. A Test Section Report shall be submitted for review by the Owner and Engineer.

C. Test reports including a Daily Quality Control Report, a Weekly Quality Control Report, a Laboratory Test Report, and the CQC Test Results.

D. Certificates of the Bentonites Powder Manufacturer Test Results and of the Calibration of Scales and Flow Meter Test Results. Provide, for information only, bentonite manufacturer's certification of material compliance with specifications for each shipment of bentonite.

E. Closeout Submittals including the Construction Records, Construction Documentation, the Construction Log, and the As-Built Drawings.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Petroleum Institute (API)

1. API Spec 13A—Specification for Drilling Fluid Materials.
2. API RP 13B-1—Recommended Practice for Field Testing Water-Based Drilling Fluids.

B. American Society for Testing and Materials (ASTM)

1. ASTM C143/C 143M—Standard Test Method for Slump of Hydraulic-Cement Concrete.
2. ASTM D4832—Standard Test Method for Preparation and Testing of Controlled Low Strength Material Test Cylinders.

3. ASTM D5084—Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
4. ASTM D6913—Standard Test Method for Particle Seize Distribution of Soils Using Sieve Analysis.
5. ASTM D7263—Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens.

C. Occupational Safety and Health Administration (OSHA)

1. 29 CFR 1926—Safety and Health Regulations for Construction.

1.04 QUALITY ASSURANCE

A. The Owner will engage and pay for the services of an Engineer and a testing agency to perform Construction Quality Assurance (CQA) testing in addition to the CQC testing performed by the Contractor. The Contractor shall help the Engineer with CQA sampling and testing by providing samples, personnel, and equipment necessary.

1. The Owner will engage and pay for CQA testing of the materials in accordance with test procedures listed in Table 2. The CQC Testing Agency contracted by the Contractor shall not be the same as the CQA Testing Agency contracted by the Owner.
2. The CQA tests will be the basis of acceptance of material and construction. The Contractor is responsible for the cost of retesting if the CQA test fails. The retest will be paid for by the Owner and reimbursed by the Contractor. The Contractor, at his discretion, may retain and bear all costs for a testing agency to confirm or dispute the results of the CQA tests.

B. The Contractor shall coordinate construction and CQC activities with the Engineer.

1.05 QUALIFICATIONS

A. The quality control Monitor (QC Monitor) shall be an employee of, or representative of, the Contractor. He shall continuously monitor and perform testing required during the progress of the SB slurry wall construction.

B. The quality assurance monitor (QA Monitor) shall be an employee of the Engineer and will represent the Owner. He shall continuously monitor the progress of the SB slurry wall construction.

C. The QC Monitor shall be responsible for conducting all necessary quality control testing and monitoring in the field, and shall collect and transport all samples required for laboratory analysis.

D. The QA Monitor shall observe the testing performed by the QC Monitor and perform periodic quality assurance testing. The Contractor shall provide access to the QA Monitor to collect his own samples as well as provide access to observe and review all QC testing and records.

E. The QA Monitor shall have the authority to direct the Contractor's work only as it relates to the contract specifications, including stop work authority for slurry wall construction if specification requirements are not met.

1.06 TESTING REQUIREMENTS (NOT USED – SEE PRODUCTS)

1.07 RECORD DRAWINGS

A. Record Drawings shall be prepared, maintained, and submitted showing the location and depth of the SB cutoff wall depth at 10-foot intervals along the wall alignment in accordance with the requirements of Section 01785, Record Documents, and the Contract Documents. Record Drawings shall be updated throughout the project and are subject to field review by the Engineer any time upon request.

1.08 DEFINITIONS

A. *Bentonite Slurry*: Bentonite slurry is a colloidal mixture of adequately hydrated bentonite and water and other suitable material prepared in accordance with API Spec 13A.

B. *Construction Quality Assurance (CQA)*: A planned system of activities that provides assurance that the materials to be installed on the project are in accordance with the contract plans and specifications. CQA includes inspections, testing, and evaluations to assess the quality of the materials and the construction. CQA refers to the measures taken by the Owner to determine compliance and conformance of the materials with the Contract Specifications.

C. *Construction Quality Control (CQC)*: A planned system that provides procedures for delivering a construction project that meets the requirements defined in the contract plans and specification. CQC is performed by the Contractor and includes surveying, documentation, sampling, testing, and personnel qualifications.

D. *Contractor:* The Contractor referred to herein is the company chosen to perform the work. The Contractor is responsible for his own Quality Control inspection and testing.

E. *General Fill*: Soil fill that meets the characteristics in Section 02301, Earthwork for Landfill Construction, Article 2.02, and is placed to specified relative compaction densities and moisture contents to lines and grades shown on the Drawings.

F. *One-Pass Trench Method:* The OPT method is accomplished via track-mounted equipment consisting of a continuous cutter chain that rotates at high speeds on a blade that is inserted into the ground. Trenchers are equipped with metered bentonite delivery systems, underground water injection nozzles, as applicable pre-mixed slurry injection ports, speed controls for both the mixing chain and track speeds, GPS mapping and laser guides to control depth (or other Engineer approved methods for horizontal and vertical alignment). The blade and cutter chain are initially rotated from a horizontal position at the ground surface to a vertical one at the desired depth. From that point, the equipment can move in forward or reverse, cutting a continuous trench (on a straight or curved alignment) while mixing the soil in situ with metered amounts of additives (dry-mixed or slurried). Because of the high-speed rotation of the cutter chain, a relatively stiff, heavy mix can be processed. Trenching depth can be varied within a limited range before withdrawal of the blade and chain are required to replace with a longer or shorter blade and cutter chain.

G. *Owner's Representative:* The Owner's Representative is any individual designated by the Owner to act on its behalf in the execution of these specifications.

H. *Quality Control (QC)* Monitor *:* An employee of the Contractor overseeing construction and performing quality control testing to verify compliance with project requirements.

I. *Quality Assurance (QA)* Monitor*:* An employee or designated representative of the Engineer and representing the Owner, observing and documenting the construction and performing testing to verify compliance.

J. *Soil-Bentonite Slurry Cutoff Wall Backfill:* A homogeneous mixture of material produced by mixing soil, bentonite, and water and/or other materials approved by the Engineer, which is used to construct the SB slurry cutoff wall.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bentonite

1. Bentonite shall be sodium cation base montmorillonite powder that conforms to API Spec 13A, Section 9. Bentonite shall be new, pulverized, high-swelling natural sodium cation montmorillonite (Premium Grade Wyoming-type bentonite or equivalent). Chemically treated bentonite will not be allowed unless otherwise approved by the Engineer). No bentonite from the bentonite manufacturer shall be used prior to acceptance by the Engineer. All bentonite shall be subject to inspection, sampling, and verification of quality by Contractor QC testing and Engineer QA testing. Bentonite not meeting specifications shall be promptly removed from the site and replaced with bentonite conforming to specification requirements at the Contractors expense. Protect bentonite from moisture during transit and storage.
2. The Contractor shall provide a sample of the bentonite material used within the mix upon request from the Engineer. The sample shall consist of a minimum of 10 pounds of the proposed bentonite at least 5 days prior to use with certification that it meets API Spec 13A.
3. The Contractor shall submit a copy of the Bentonite Powder Manufacturer Test Results for each lot shipped to the site and a certificate of compliance stating that the bentonite complies with all applicable standards.

B. Temporary Soil Cap

1. Temporary soil cap placed over completed slurry cutoff walls shall be uncompacted general fill at least 2 feet thick.

C. Permanent Soil Cap

1. The permanent soil cap placed over completed slurry cutoff walls shall be compacted general fill. A single layer of BX-1100 (or equivalent) geogrid shall be placed over the wall and at the base of the compacted fill. The geogrid shall extend at least 30-inches out from the slurry wall trench edges on either side and be covered entirely with one 12-inch lift of fill compacted to 95% of the Modified Proctor Maximum Dry Density.

D. OPT SB Mixture

1. The Contractor shall inject, calculate, and monitor quantities of bentonite and water depending on the results of the OPT Test Section.

2. The SB mixture shall consist of in situ soil mixed with water (both in situ and added) and bentonite to form a low permeability wall. The bentonite shall consist of either a slurry mixture or dry application with water injection as needed for the OPT method. The bentonite shall meet the requirements specified. The initial mixture shall contain a minimum of four percent bentonite by dry weight of soil. The final mix proportions shall be determined by the testing results of the required test section. Based on the results of the specified test section, the bentonite quantity shall be adjusted by the Contractor as necessary, and as approved by the Engineer to achieve the properties specified below.

3. The SB mixture in the trench shall have the following properties based on a 10-specimen moving (running) average:

   a. Slump: The SB mixture shall have a 10-test average slump cone value of 5 to 7 inches determined in accordance with ASTM Cl43/Cl43M. No test result shall be less than 4 inches and no higher than 9 inches.
   b. Hydraulic Conductivity: The SB mixture shall have a 10-test running average equal to $7.5x10^{-7}$ centimeters per second (cm/sec) or less when measured at 14 days or later and tested in accordance with ASTM D5084. No test shall be greater than $1x10^{-6}$ cm/sec. Any test greater than $1x10^{-6}$ cm/sec may be retested once before rejection.

4. For gradation, the Contractor will use ASTM D6913. There are no set criteria for the gradation results.

5. The initial design mix may be adjusted by the Contractor if necessary and if approved by the Engineer based on the Results of the Test Section Testing and to adapt to changes in field conditions.

E. The Contractor must submit a record of OPT injection materials (bentonite and water quantities) introduced into the cutoff wall including any additives utilized, and adjustments for each production shift including the date mixed and stations completed.

F. Water

1. Source: Water for construction, including all piping, pumping, valving, storage, hauling, conditioning, and distribution shall be the responsibility of the Contractor.

2. The water source shall be subject to the approval of the Engineer.

3. Water Quality: The water quality shall comply with the standards specified below unless otherwise approved by the Engineer following compatibility testing. The Contractor shall furnish water quality test results for water used for mixing with the slurry to assure conformance with these standards.

Property	Property Requirement	Test Method
pH	7.0 +/- 1.0	API RP 13B-1
Total Dissolved Solids	< 500 ppm	EPA 600/4-90/027F
Oil, organics, acids, or other deleterious	< 50 ppm each	API RP 13B-1
Hardness	<= 50 ppm	API RP 13B-1

G. Disposal Site: Cutoff wall trench excavated material or excess slurry that is not suitable for use shall be disposed of within the approved disposal area as designated by the Owner.

2.02 EQUIPMENT

A. Field Laboratory Equipment

1. The field laboratory equipment used for the Contractor's quality control testing shall be made available for QA testing at any time and shall contain, at a minimum, the following:

a. Two Marsh funnel sets.
b. One standard filter press (4 single units or one 4 unit press).
c. Two mud balances (direct reading of density).
d. One slurry sampler.
e. Two No. 200 sieves.
f. One set of standard sieves and sieve shaker.
g. One oven to measure moisture content.
h. One scale.
i. One pH meter.
j. Two slump cones.
k. An adequate number of 3-inch by 6-inch cylindrical sample molds.

B. Hauling Equipment

1. Earthwork-related hauling and SB mixing equipment, if required to execute the work specified herein, shall be pneumatic-tired and track equipment suitable for hauling excavated material and mixing soil with bentonite slurry.
2. The maximum overall width of the equipment used for construction shall be 18 feet.

C. OPT Method Equipment

1. OPT Excavation Equipment:

   a. The equipment shall be capable of excavating the required minimum width of trench in a single pass of the excavating equipment. The equipment shall be able to excavate at least 5 feet deeper than the maximum target depth. The Contractor shall provide written description on the method for verifying vertical tolerance as part of the OPT Cutoff Wall Implementation Plan submittal package. The cutoff wall depth shall be documented at 10-foot intervals along the wall alignment or as otherwise approved by the Engineer to verify that required depth has been achieved.

2. OPT Mixing Equipment:

   a. The OPT equipment used for batching and mixing the bentonite and injected water shall be capable of mixing the materials into a homogeneous mixture conforming to the contract specification requirements. Mixing equipment shall be capable of continually mixing in the situ trench material to provide and maintain a uniform blended cutoff wall.
   b. The OPT equipment shall have a controlled weighing system for assuring that the dry and/or wet constituents of the mixture are properly proportioned. If a dry mixture is used, the proportions and rates of injection of bentonite and any added water shall be continuously monitored and recorded. If wet bentonite slurries are pumped, appropriate mixing and storage tanks shall be provided and the slurry density, flow rates, and total volume of slurry pumped shall be obtained using a data acquisition system. Wet slurries shall be fully hydrated (minimum 8 hours) prior to testing or placing in the trench.
   c. The equipment will have integral electronic inclinometers or similar approved instrumentation for continuously verifying and

documenting that the walls are being constructed within vertical tolerances. Accurate measurement equipment shall be included in the equipment to fully verify and document the depth of wall being constructed at all times.

d. The rate of material use will be made available for the Engineer's inspection so that the proportions of the various mixes can be checked. Data acquisition display will be easily accessible to QA Monitors and will not interfere with Contractor's activities. At the end of each shift, the Contractor shall submit a hardcopy output of all the data collected along with a digital record of the materials used.

PART 3 EXECUTION

3.01 TOLERANCES

A. The cutoff wall shall be constructed to the lines, and grades showing in the Construction Drawing Set and to the approximate elevations determined during the Cemented Silt Layer Elevation field investigations.

B. The cutoff wall shall not deviate from vertical more than two percent of the wall depth. Deviations from vertical of more than two percent may be cause for rejection for that segment of the cutoff wall. Reconstruction of an SB cutoff wall segment because of excess deviation from vertical shall not be cause for additional compensation. The Contractor shall provide written description on the method used for verifying vertical tolerance to the Engineer as part of the submittal package.

C. The cutoff wall shall be to the depth and identified above. The Engineer may direct the Contractor to modify the depth based on refusal criteria, examination of trench cuttings, and key-in material information.

D. The cutoff trench and the temporary soil cap shall be centered on the cutoff wall. The cutoff wall alignment shall be allowed to be off-center no more than 1.5 feet on either side of centerline.

3.02 OPT METHOD PREPARATION

A. The Contractor shall submit an SB Cutoff Wall Implementation Plan that includes a construction schedule, sequence of operations, equipment data, and quality control program details.

B. OPT Test Section

1. Before starting cutoff wall construction, the Contractor shall construct a cutoff wall test section to verify that the performance criteria specified herein are met. A minimum 100-foot linear test section of the Subcell III-1 cutoff wall will be constructed to verify that the mix design meets minimum project performance criteria. The Contractor will submit a proposed test section design including in- situ wall sampling and an implementation plan. This will include batching and monitoring procedures for inspection of bentonite and water usage, rate of advancement, chain rotation, and a target mix design including percentage and rate of bentonite and water injection. After completing the test section, the Contractor will perform two full depth sample explorations using techniques approved by the Engineer to verify the homogeneity of the cutoff wall mixed material.
2. The Contractor shall submit a report summarizing the procedures and results of the preconstruction OPT test section. The report shall include advancement rate, chain rotation speeds, a description of materials used (including additives), mix proportions, water ratio, densities, gradation and classification of mixed materials, slump of mixed materials, calculation relating to injection and mixing rate with minimum bentonite cement by weight of dry soil, slump of mixed materials, and permeability of a minimum of one set of cylinders of the proposed OPT cutoff wall from the top, middle, and bottom once every sheet or every 200 feet in length. The calculation needs to show how the injection and procedure ensures mixing of minimum bentonite, as per the approved design mix.
3. At least one key-in verification exploration shall be located in the test section. The location of the test section will be selected in conjunction with the Engineer.
4. Following completion of the SB cutoff wall test section, the Contractor shall either stand down until the specified laboratory test results demonstrate that the performance criteria are met or proceed at his/her own risk with cutoff wall construction. If the Contractor elects to proceed with cutoff wall construction and the test results indicate performance criteria are not met, the Contractor shall remix any completed length of cutoff wall until the performance criteria are met. Any required remedial remixing necessary to meet the performance criteria shall be performed by the Contractor at no additional cost to the Owner. As a result of the findings of a successful test section, the OPT Cutoff Wall Implementation Plan shall be revised as necessary.

3.03 OPT METHOD EXCAVATION

A. OPT Method excavation occurs simultaneously with the SB Cutoff Wall construction. No open trenches will be present at any time.

3.04 OPT METHOD SB CUTOFF WALL CONSTRUCTION

A. The Contractor shall monitor and adjust the cutter post speed as necessary during the wall excavation and mixing process. All metering and weighing equipment shall be calibrated at the beginning of the cutoff wall installation work and again at the 50 percent project completion point. The OPT Contractor shall submit the monitoring results to the Engineer at the end of each day.

B. The cutter speed and advancement rates shall be as established by the Contractor during the test section and shall be adjusted as needed to achieve adequate mixing. If the cutter speed and advancement rate vary by more than 10% from the parameter established in the test section, the Engineer may require additional testing to verify acceptable results.

C. The quantity of bentonite (dry or slurry) injected shall be in accordance with the design established during the test section. The bentonite injection rate shall be constantly monitored, calculated, and controlled. For production quality control, the real-time monitoring of the bentonite injection rate shall be performed. The injection rate shall meet the minimum rate established by the test section.

D. The Contractor may request to modify the established test section and injection ratio. All modifications are subject to review by the Engineer, and the Engineer may request additional quality control testing to verify acceptable results.

E. Cutoff wall elements shall be excavated maintaining chain rotation and excavator advancement speed to ensure a continuous, thoroughly mixed cutoff wall. At each new shift or for work stoppage greater than 12 hours, the completed cutoff wall trench shall be reworked and excavated at a distance of 5 feet at all depths. When trench excavation overlaps into previously completed cutoff wall, the excavation shall extend a minimum of 5 feet into the previously completed OPT cutoff wall at all depths. The Contractor will continuously monitor and report chain rotation speed as well as excavation advancement rate.

F. After completion of an OPT work segment (shift, day, etc.), maintain the OPT mix to within 1 foot of the ground surface. After initial setting of the OPT mix, remove any free water, all sloughed trench sidewall material, and disturbed mix material from the top of the cutoff wall, and add fresh OPT mix to the top of the cutoff wall. Repair any depression that develops within the completed cutoff wall

area, with additional OPT mix material. Place a temporary plastic sheeting cover over the top of the cutoff wall to prevent desiccation after trench is topped off.

G. Temporary Cap

1. A temporary cap shall be placed within 48 hours of the SB backfill reaching the working surface over each 100-foot reach along the trench. The temporary cap shall be constructed using embankment fill material and placed without compaction effort. The temporary cap shall be removed no sooner than 28 calendar days after placement, except that a shorter time may be allowed by the Engineer based upon monitoring of the actual cutoff wall settlement. The temporary cap shall be 2 feet thick and extend at least 2 feet laterally from each edge of the completed trench. If any depression develops within the completed SB slurry cutoff wall, it shall be repaired by placing additional material. This material shall be SB backfill if the depression is observed during cutoff wall construction and embankment fill material if the depression is observed after placement of the temporary cap. Heavy construction equipment and machinery shall only be driven over the constructed SB cutoff wall at approved heavy equipment crossing points that are bridged to support the equipment weights. Contractor will avoid heavy equipment loading adjacent to or on the temporary cap until approved by the Engineer based on the settlement plate monitoring.

H. Removal of Temporary Cap

1. The temporary cap shall be removed and a permanent cap installed before bottom liner installation. The permanent soil cap placed over completed slurry cutoff walls shall be compacted general fill. A single layer of BX-1100 (or equivalent) geogrid shall be placed over the wall and at the base of the compacted fill. The geogrid shall extend at least 30 inches out from the slurry wall trench edges on either side and be covered entirely with one 12-inch lift of fill compacted to 95% of the Modified Proctor Maximum Dry Density. Movement of construction equipment and machinery over the slurry trench is only allowed at approved heavy equipment crossing points.

I. Cutoff Wall Protection

1. After placement of the SB slurry cutoff wall, the Contractor shall take all necessary actions to protect the backfilled cutoff wall from disturbance. No construction activity on top of the cutoff wall will be permitted until the settlement monitoring period is completed. Heavy construction equipment and machinery shall only be driven over the cutoff wall at

approved equipment crossing points which are bridged with steel plates and additional cover material so as not to impose any significant equipment load on the cutoff wall.

J. Cleanup

1. The Contractor shall continually clean up all slurry waste, debris, and leftover materials resulting from the cutoff wall construction process. After completion of the Work, the site shall be cleared of all debris which may have accumulated in the execution of the work. Spoils generated by the cutoff wall construction that do not meet the requirements for use in the fill areas shall be disposed of within the area designated by the Owner.

3.05 TESTING

A. OPT Method Material Testing

1. The Contractor shall test the SB mixture following the construction of the OPT SB Cutoff Wall Test Section. The results from these tests will determine the bentonite and water quantities applied to the SB Cutoff Wall construction. Testing requirements within the Test Section are the same as within the SB Cutoff Wall.
2. The Contractor shall take at least two bulk samples of the SB cutoff wall mix material from the cutoff wall trench for every work shift and at least every 200 feet along the cutoff wall alignment. This material will be field tested for slump, density, and gradation. The Contractor, in coordination with the QA Monitor, shall also collect enough material for 4 lab tests from every 200 feet (or a minimum of one set per shift for less than 200 feet production), and shall be stored and handled in accordance with ASTM D4832. Two samples will be kept by the Contractor and two by the QA Monitor. One sample representing each of the batches collected per shift or 200 feet (whichever is more frequent) will be tested by the Contractor's QC laboratory for hydraulic conductivity. QA permeability tests will be performed at half the frequency of QC tests; roughly one test for every 400 feet of constructed wall. The remaining samples will be stored for possible tests in the future.
3. Permeability tests shall be conducted on specimens molded at the placement moisture content to the in-situ density using method ASTM D5084. The sample shall be back-pressured and tested at a hydraulic gradient between 5 and 10 psi. The maximum effective confining stress should be less than 10 psi.

B. Field Quality Control

1. The Contractor shall perform material testing to ensure the final materials conform to these specifications, using the same test methods used by the Engineer.
2. Material testing may also be performed by the Engineer. Where materials tested by the Engineer are in nonconformance with the specifications, the Contractor shall execute appropriate actions to bring the materials into conformance and then perform further testing of the materials.
3. The Engineer will perform final acceptance testing of the materials. If the materials do not meet the specification requirements at final acceptance testing, the materials shall be rejected and the Contractor shall remove the materials from the work site and replace the materials at no additional cost to the Department. The testing procedure described above will be repeated.
4. The Contractor is responsible for determining the depth of the trench excavation and the final depth of the SB cutoff wall. The depths shall be recorded at 10-foot intervals along the alignment.

END OF SECTION

SECTION 02370
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall take every reasonable precaution throughout construction to prevent the erosion of soil and the sedimentation of the stormwater system, wetlands, streams, or other water impoundments, ground surfaces, or other property as required by federal, state, and local regulations.

B. The Contractor shall provide protective covering for disturbed areas upon suspension or completion of land-disturbing activities. Permanent vegetation shall be established at the earliest practicable time. Temporary and permanent erosion-control measures shall be coordinated to ensure economical, effective, and continuous erosion and siltation control throughout the construction and post-construction period.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. Florida Department of Transportation (FDOT)

1. FDOT Section 103—Temporary Work Structures.
2. FDOT Section 104—Prevention, Control, and Abatement of Erosion and Water Pollution.
3. FDOT Section 530—Revetment Systems.
4. FDOT Section 982—Fertilizer.
5. FDOT Section 985—Geosynthetic Materials.

1.04 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

1.06 REGULATORY REQUIREMENTS

A. The Contractor shall prevent damage to properties outside the construction limits from siltation due to construction of the project and assume all responsibilities to the affected property owners for correction of damages which may occur. Erosion-control measures shall be performed conforming to the requirements of and in accordance with plans approved by applicable state and local agencies and as specified by the erosion-control portion shown on the Drawings and as required by these Specifications. The Contractor shall not allow mud and debris to accumulate in the streets or enter drainage ditches, or stormwater system. Should the Contractor pump water from excavations during construction, appropriate siltation preventative measures shall be taken before the pumped water is discharged.

1.07 PRACTICES

The Contractor shall adhere to the following:

A. Avoid dumping soil or sediment into any stream bed, pond, ditch, or watercourse.

B. Maintain an undisturbed vegetative buffer where possible between a natural watercourse and trenching and grading operations.

C. Avoid equipment crossings of and the stormwater system where practicable.

1.08 EROSION AND SEDIMENT-CONTROL DEVICES AND FEATURES

A. The Contractor shall construct all devices (silt fences, retention areas, etc.) for sediment control at the locations required to protect federal, state, and local water bodies and water courses and drainage systems before beginning to excavate the site. All devices shall be properly maintained in place until a structure, paving, or other completed construction makes the device unnecessary or until directed by the Engineer to permanently remove the device.

B. The Contractor shall use mulch to temporarily stabilize areas subject to excessive erosion and to protect seed beds after planting where required.

C. Filter fabric, hay bales, or other approved methods shall be placed and secured over the grates of each existing inlet, grating, or storm pipe opening near the area of excavation to prevent silt and debris from entering the storm systems.

D. The Contractor shall use silt fences, hay bales, and floating turbidity barriers as shown on the plans or as directed by the Engineer to restrict movement of sediment from the site.

E. The Contractor shall establish vegetative cover on all unpaved areas outside the lined landfill area disturbed by the work.

PART 2 PRODUCTS

2.01 GENERAL

A. Open-mesh biodegradable mulching cloth.

B. Fertilizer shall be 10-10-10 grade or equivalent.

C. Lime shall be Dolomitic Agricultural Ground limestone, in accordance with FDOT Section 982.

D. Grass shall be in accordance with Section 02920, Seeding and Sodding.

E. Silt fence shall consist of non-biodegradable filter fabric (Trevira, Mirafi, etc.), in accordance with FDOT Section 985, wired to galvanized wire mesh fencing and supported by wood or metal posts.

F. Floating or staked turbidity barriers as specified in FDOT Section 985 and FDOT Section 104.

G. Erosion Stone: FDOT Section 530.

1. Sand-Cement Riprap.
2. Concrete Block.
3. Rubble 20 to 300 pounds each.

H. Filter Fabric for placing under Riprap shall meet the requirements of FDOT Section 985.

I. Baled hay or straw in accordance with FDOT Section 104.

PART 3 EXECUTION

3.01 CLEARING

A. The Contractor shall schedule and perform clearing and grubbing so that subsequent grading operation and erosion-control practices can follow immediately after. Excavation, borrow, and embankment operations will be conducted as a continuous operation. All construction areas not otherwise protected shall be planted with permanent vegetative cover within 30 working days after completing active construction.

3.02 STABILIZING

A. The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion-control devices or structures or as otherwise indicated in the Construction Documents. All disturbed areas outside of embankment left exposed will, within 30 working days of completion of any phase of grading, be planted or otherwise provided with either temporary or permanent ground cover, devices, or structures sufficient to restrain erosion.

3.03 REGULATORY REQUIREMENTS

A. Whenever land-disturbing activity is undertaken on a tract, a ground cover sufficient to restrain erosion must be planted or otherwise provided within 30 working days on that portion of the tract upon which further active construction is to be undertaken.

B. If any earthwork is to be suspended for any reason for longer than 30 calendar days, the areas involved shall be seeded with vegetative cover or otherwise protected against excessive erosion during the suspension period. Suspension of work in any area of operation does not relieve the Contractor of the responsibility to control erosion in that area.

3.04 VEGETATIVE COVER

A. Preparation of Seedbed. Areas to be seeded shall be scarified a depth of 4 inches until a firm, well-pulverized, uniform seedbed is prepared. Fertilizer shall be applied during the scarification process in accordance with the following rates:

1. Fertilizer—10 to 15 pounds per 1,000 square feet.

B. Seeding. Disturbed areas along embankments shall be permanently seeded with mix specified in Section 02920, Seeding and Sodding.

C. The Contractor shall mulch all areas immediately after seeding. Mulch shall be applied.

3.05 MAINTENANCE

A. The Contractor shall maintain all temporary and permanent erosion-control measures in functioning order. Temporary structures shall be maintained until such time as vegetation is firmly established and grassed areas shall be maintained until completion of the project. Areas which fail to show a suitable stand of grass or which are damaged by erosion shall be immediately repaired. No additional payment will be made to the Contractor for re-establishing erosion-control devices, which may become damaged, destroyed, or otherwise rendered unsuitable for their intended function during the construction of the project.

B. The Contractor shall remove all silt, sediment, and debris buildup regularly to maintain functioning storm systems and erosion-control devices.

3.06 REMOVAL OF SEDIMENT CONTROL DEVICES

A. Near completion of the project, when directed by the Engineer, the Contractor shall dismantle and remove the temporary devices used for sediment control during construction. All erosion-control devices in seeded areas shall be left in place until the grass is established. The Contractor shall seed areas around devices and mulch after removing or filling temporary control devices.

B. The Contractor shall clean up all areas at the completion of the project.

END OF SECTION

SECTION 02526
GROUNDWATER MONITORING WELL CONSTRUCTION AND
WELL ABANDONMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section details the installation requirements for monitoring wells/ piezometers, the correct methods for sediment sample collection, and boring log sample description.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. The Contractor will acquire all necessary permits from the appropriate agencies, including the State of Florida Permit Application to Construction, Repair, Modify, or Abandon a Well.

B. The Contractor will provide the completed Well Completion Form attached to this Section.

C. Cement Grout. The submittal shall include the type and brand of the cement, the gradation of the fine aggregate, product data on any proposed admixtures, and the proposed mix of the grout.

1.03 WORK SEQUENCE

A. The Contractor shall have all materials necessary to complete the specified work on site at the time of drilling, including a local source for potable water.

B. The Contractor should be prepared and make provisions for difficult drilling conditions, including loss of circulation, voids or cavities, collapsing or running sands, consolidated rock (possibly requiring a coring bit), stiff or swelling clays, or other conditions.

C. The Engineer will maintain a log recording the boring number, date, sample data, including blow counts and percent sample recovery, general comments on progress of drilling, lost circulation zones and approximate percent loss of circulation, depth to any water levels encountered, and general lithology encountered. The boring log should include descriptions of minerals, mineral

coatings, matrix description, color, moisture, fossil description, grain size, roundness, surface texture, organics, and USCS letter symbol. At the time of well installation, the Engineer will record depths of the borehole and well; depth to water; lengths, amounts, and depths of emplacement of material used; and general comments on progress of installation. The boring log format shall be similar to the sample log attached at the end of this Specification.

1.04 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM A53/A53M—Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM C33/C33M—Standard Specification for Concrete Aggregates.
3. ASTM C150/C150M—Standard Specification for Portland Cement.
4. ASTM D1586—Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.
5. ASTM D1587/D1587M—Standard Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes.
6. ASTM D5092/D5092M—Standard Practice for Design and Installation of Groundwater Monitoring Wells.

B. Florida Administrative Code (FAC)

1. Chapter 62-532.440, FAC—Abandonment of Water Wells – Water Well Permitting and Construction Requirements.

1.05 QUALIFICATIONS

A. All drilling and well installation shall be performed by an experienced environmental driller approved by the Engineer. No portion of these Specifications may be waived or altered without the expressed consent of the Engineer.

B. The Contractor or Contractor’s subcontractor will maintain a current license for all work performed as may be required by all local, regional, or state agencies. The Contractor shall obtain all permits and file all necessary completion forms as required by the regulating agency.

1.06 RECORD DRAWINGS

A. The Engineer will provide the locations of wells or borings to the Contractor.

1.07 DEFINITIONS

A. *Monitoring well:* well constructed with a surface seal and a sand filter pack in accordance with accepted design practices to collect a representative groundwater sample.

B. *Piezometer:* permanent or temporary well that may be designed and constructed without the surface sealing or sand filter pack requirements of a monitoring well.

PART 2 PRODUCTS

2.01 GENERAL

A. The Contractor will use clean silica sand size 20/30 for the filter pack unless site-specific conditions require use of an alternate sand size. The Contractor will submit alternative material to the Engineer for review and approval.

B. The Contractor shall use 2-inch-diameter Schedule 40 or greater, flush joint, PVC. Solvents or PVC glues are not allowed.

C. Cement Grout

1. Cement grouts shall be a mixture of 1 part Portland cement conforming to ASTM C150/C150M, Types I, II, or III and 1 to 2 parts sand conforming to ASTM C33/C33M with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow. Water for mixing shall be potable water, free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

PART 3 EXECUTION

3.01 DRILLING PROCEDURES AND BORING REQUIREMENTS

A. Before any drilling at a test boring or monitoring well location, all equipment shall be decontaminated by steam cleaning and rinsed with clean potable water.

B. The Contractor is responsible for appropriate handling and disposal of Investigative Derived Waste (IDW), which includes drilling cuttings, fluids, water, and other materials and substances resulting from the Contractor's work.

When drilling at possibly contaminated sites the Contractor will supply drums with sealable lids for IDW. All IDW drums will be labeled with the name of the project manager, the company, the company's address and phone number, and labeled as nonhazardous or hazardous, whichever is correct.

C. The drill rig shall be free from leaks of fuel, hydraulic fluid, and oil that may contaminate the borehole, ground surface, or drilling tools.

D. Wells shall be installed using mud rotary, hollow stem auger, solid stem auger, or hand auger drilling methods as appropriate. Mud rotary drilling is the preferred method when drilling in karst environments where hard rock will likely be encountered. Hollow Stem Auger drilling is used mostly in sands, clays, and light rock. Limited use of solid stem auger or hand auger may be appropriate in areas with clayey sands and shallow total depths. The driller will use clean, clear, potable water during drilling. Drilling fluid additives or lubricants must be inert.

E. Borings will be of sufficient diameter to allow at least 2 inches of annular space between the boring wall and the outer diameter of the monitoring well screen and riser pipe to allow sufficient space for installing a sand pack around the well screen.

F. Total borehole depth will be as shown in the Drawings or as determined by the Engineer.

3.02 TEST BORING PROCEDURES

A. The Contractor shall sample soil or sediment in substantial accordance with ASTM D1586. Samples shall be extracted with a stainless-steel split-tube (spoon) sampler on intervals of 5 feet or less. The Contractor will decontaminate samplers with clean potable water between sample intervals. The Contractor will decontaminate all downhole tools by steam decontamination between boring locations. The Engineer will collect representative portions of the spoon samples in clean, unused, sample containers labeled with the project name, boring number, depth interval of sample, collector's initials, and date.

B. Thin-wall tube sampling (Shelby tubes) may be required as needed by the Engineer. The sampler is attached to the drill rods and pushed without rotation into the bottom of the borehole in one continuous motion. The sampler is then withdrawn and sealed according to ASTM D1587/D1587M standards for laboratory analysis. The Engineer is responsible for the labeling and delivery of the Shelby tube sample. The label should include the project name, boring number, depth interval of sample, collector's initials, date, and indicate the top and bottom of sample. The sample should be transported upright.

C. Any exploratory borehole that is more than 5 feet deeper than the planned monitoring well should be grouted and the monitoring well should be placed in a new boring to the specified well depth. If the overdrilled depth is less than 5 feet, the borehole should be back filled with sediment to within 1 foot of the bottom of the well screen. Monitoring wells installed in clusters—within 10 feet of each other—with a contemporary exploratory boring that has a complete field log, may be installed without the requisite spoon sampling. This allowance may be adjusted if specific lithological information is being sought by the Engineer.

D. Any borehole that is not to be finished with a monitoring well or piezometer must be properly abandoned in accordance with Water Management District requirements (grouting from bottom up).

3.03 WELL INSTALLATION

A. Monitoring wells construction consists of 2-inch Schedule 40 polyvinyl chloride (PVC) solid riser pipe. The Engineer may adjust the well diameter and material.

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B. Do not use solvents, glues, or other adhesives at any time during well installation. Casing sections, screens, and tremie pipes must be physically joined and made watertight by flush-joint threading or force-fittings. Clean disposable gloves should be worn during well installation.

C. Typical monitoring wells screen shall be constructed of flush joint PVC with 0.010-inch slot size. If the sections cannot be connected with threaded joints, mechanically fasten joints with slip couplers that are permanently fastened with stainless steel screws. Do not use glued or welded joints.

D. The Engineer shall provide approximate well depths and screen lengths for each location. Actual depths may vary based on field conditions. Additional depth and well materials will be paid for under the Additional Well Depth bid item in the Bid Form. The Engineer may adjust the slot-size based on the lithology of the screened section.

E. The annular space between the drilled hole and the monitoring well screen shall be packed with filter material to a height of at least 2 feet above the top of the well screen, or as specified. For wells that have the top of the well screen beginning at depths less than 5 feet, the amount of sand above the screen should be decreased to obtain a proper filter pack seal and a surface seal for the well. The filter pack shall consist of clean-washed 20/30 silica sand. The Engineer may adjust the filter pack grain-size based on the lithology of the screened section. A tremie pipe must be used for filter pack placement in monitoring wells. No PVC glue shall be used on the tremie pipe. A cap must be placed on the top of the riser before placing the filter pack to prevent sand from entering. The filter pack sand may be poured through the tremie pipe or directly into the annular space of the

borehole provided that a PVC pipe is used as a tamping device to prevent bridging of the filter pack and that the amount of filter pack sand is continuously tagged during emplacement by the Contractor.

F. An annular fine clean washed sand (30/65 silica sand) seal with a minimum thickness of 1 foot shall be placed directly above the filter pack. A bentonite pellet/chip seal with a minimum thickness of 3 feet shall be placed above the fine sand seal. Fine, clean washed sand (30/65 silica sand) seal with a minimum thickness of 6 inches shall be placed above the bentonite seal.

G. The annular space between the drilled hole and the monitoring well casing shall be grouted with cement/bentonite grout (maximum 4% bentonite) from the top of the annular seal to ground surface. The water/cement ratio shall be 6.5 gallons of water per sack (94 pounds) of cement. The tremie pipe method must be used to install the grout seal; all other methods will not be acceptable except in cases where the depth of the grout seal is sufficiently shallow to allow visual confirmation of grout placement. Following the initial grouting of the hole, the grout shall be allowed to set, and the hole shall be topped off with grout if significant settling has occurred.

H. Well Completion

1. The riser pipe shall extend from the well screen to 36 inches above the ground surface. The top of the monitoring well casing shall be neatly cut with a pipe cutter at a right angle to the riser pipe. The monitoring wells will be completed by placing a 6-inch-by-6-inch aluminum or steel protective casing with a locking cap set in a 4-foot-by-4-foot-by-4-inch concrete pad. The Contractor will label the monitoring well with the designated well number punched in the case cap and painted in black on the side of the case.
2. The well may be completed flush mount—below ground surface—if it is in an area of very heavy traffic. Flush mount wells will be completed with 8-inch or 12-inch bolt-down manhole covers.

I. If the well is installed in an area that will receive traffic, including construction traffic, at least three protective bollards must be installed around the well. Bollards shall be a minimum 4-inch-diameter, ASTM A53/A53M galvanized steel pipe, filled with concrete, and extend 36 inches above ground surface.

J. The Contractor shall be responsible for the effective development of all monitoring wells installed. Wells shall be developed to produce clean, sediment-free groundwater to an NTU below 20. The Engineer will determine the adequacy of development procedures. The preferred method of well development is the pump-and-surge technique.

3.04 WELL ABANDONMENT

A. Monitoring wells will be abandoned according to Chapter 62-532.440, FAC and applicable rules of the governing Water Management District.

B. Typical Well Abandonment Procedures

1. Fill well screen interval with clean silica sand to at least 1 foot above the screen interval.
2. Seal the well to be abandoned by grouting from the bottom—top of the sand filling the screen interval—to ground surface. This will be done by placing a tremie pipe to the bottom of the well and pumping grout through the pipe until undiluted grout flows from the boring at ground surface.
3. Remove well protective casing and concrete pad. Properly dispose of the well protective casing and concrete.
4. After 24 hours, the site representative should check the abandonment site for grout settlement. Any settlement will be filled with grout back up to ground surface. Additional grout will be installed using a tremie pipe inserted to the top of the firm grout in the well. If the top of firm grout in the well is fewer than 5 feet below land surface, using a tremie pipe is not required. This process should be repeated until firm grout remains at ground surface.
5. Cover and level the surface expression of abandoned well with soil or concrete depending upon the composition of the original surface.

STATE OF FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL

☐ Southwest
☐ Northwest
☑ St. Johns River
☐ South Florida
☐ Suwannee River

CHECK BOX FOR APPROPRIATE DISTRICT ADDRESS ON BACK OF PERMIT FORM

THIS FORM MUST BE FILLED OUT COMPLETELY.

The water well contractor is responsible for completing this form and forwarding the permit to the appropriate delegated county where applicable.

Permit No. 782151
Florida Unique I.D.
Permit Stipulations Required (See attached)
39, 55, 23
62-524 Quad # Q4116 Delineation #
CUP/WUP Application No.

ABOVE THIS LINE FOR OFFICIAL USE ONLY

Fold at this line in order that address is visible through envelope window

1. MARION COUNTY — 601 SE 25TH Ave — OCALA FL — 34471- 0000
Owner, Legal Name of Entity if Corportation — Address — City — Zip — Telephone Number

2. 13000 SE 115TH AVE, N/A
Well Location _ Address, Road Name or number, City
Parcel # (Pin) 45006-000-00

3. STEPHANIE S STALLSMITH — 9342 — (352) 567-9500
Well Drilling Contractor — License No. — Telephone No.

35920 STATE ROAD 52
Address

DADE CITY — FL — 33525
City — State — Zip

4. ____ smallest 1/4 of ____ biggest 1/4 of Section 1
(Indicate Well on Chart)
5. Township 17 Range 23

NW NE SW SE

6. MARION
County — Subdivision Name — Lot — Block — Unit

7. Number of proposed wells 2 Check the use of well: (See back of permit for additional choices) ____ Domestic Monitor (type) ✓
____ (See Back) Irrigation (Type) Public Water Supply (type) ____ (See Back) List Other ____
Distance from septic system 0 ft. Description of facility ____ Estimated start of construction date 2/23/2009

8. Application for: ✓ New Construction ____ Repair/Modify ____ Abandonment ____ (Reason for Abandonment)

Date Stamp

9. Estimated: Well Depth 180 Casing Depth 170 Screen Interval from 170 to 180
Casing Material: ~~XXXXXX~~ / ~~XXX~~ / PVC Casing Diameter 2 smallest Seal Material Cement

10. If applicable: Proposed Grouting Interval From 0 to 166 Seal Material Cement
From ____ to ____ Seal Material ____
From ____ to ____ Seal Material ____

Received: Monday, February 23, 2009

11. Telescope Casing ____ or Liner ____ (check one) Diameter ____
Blk-Steel / Galvanized / PVC Other (specify:) ____

12. Method of Construction: ✓ Rotary ____ Cable Tool ____ Combination
____ Auger ____ Other (specify:) ____

13. Indicate total No. of wells on site 76. List number of unused wells on site 0.

14. Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Consumptive/Water Use Permit (CUP/WUP) or CUP/WUP Application? ✓ No ____ Yes
(IF YES, COMPLETE THE FOLLOWING) CUP/WUP No. ____
District well I.D. No. ____
Latitude 29° 02' 04.35" Longitude 81° 57' 48.09"
Data obtained from GPS ____ or map ____ or survey ____ *(map datum NAD 27 ____ NAD 83 ____)*

Draw a map of well location and indicate well site with an "X" identify known roads and landmarks: provide distances betwen well and landmarks.

North

Site is located at 128th Place and 115th Ave.

West — East

South

15. I hereby certify that I will comply with the applicable rules of Title 40, Florida Administrative Code and that a water use permit or artificial recharge permit, if needed, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling or the permit expiration, whichever occurs first.

Digitally Signed — 9342
Signature of Contractor — License No.

I certify that I am the owner of the property, that the information provided is accurate, and that I am aware of my responsibilities under Chapter 373, Florida Statutes, to maintain or properly abandon this well; or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above. Owner consents to personnel of the WMD or a representative access to the well site.

Digitally Signed
Owner's or Agent's Signature — Date

DO NOT WRITE BELOW THIS LINE - FOR OFFICIAL USE ONLY

Approval Granted By: CYNDI BELLINGAR STATUS: ISSUED Issue Date: 2/24/2009 Hydrologist Approval ____ Initials
Owner Number: ____ Fee Received: $ 25.00 Receipt No.: IN093855905 Check No.: ____

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OR REPRESENTATIVE OF THE WMD. IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS. *This permit is valid for 90 days from the date of issue.*

FORM 41.10 - 410 (1) REV. 12/04

WHITE: ORIGINAL FILE
YELLOW: DRILLING CONTRACTOR
PINK: OWNER

WELL COMPLETION REPORT (Please complete in black ink or type.)

PERMIT #: 782151.1 CUP/WUP#: _____ DID#: _____
Indicate the number of wells drilled/abandoned for this report: 1
Indicate the number of wells permitted but not drilled/abandoned that are being cancelled: _____

WATER WELL CONTRACTOR'S
SIGNATURE Digitally Signed License # 9342
I certify that the information provided in this report is accurate and true.

Grout	No. of Bags	From (ft.)	To (ft.)
Neat Cement:	33	0	170
Bentonite:	0	170	180
(Other)			

WELL LOCATION: County Marion
_____ 1/4 of _____ 1/4 of Section 1, Township 17, Range 23
Latitude: 29° 2' 4.35", Longitude: -81° 57' 48.09"

DATE STAMP
Mar 03 2009
Official Use Only

Sketch of well location on property

Give distances from septic tank and house, or other reference points

CHEMICAL ANALYSIS WHEN REQUIRED
Iron: ____ppm Sulfate: ____ppm
Chlorides: ____ ppm TDS _____ mg/l
Conductivity _____ umhos/cm
[ ] Lab Test [ ] Field Test Kit

Pump Type
[ ] Centrifugal [ ] Jet [ ] Submersible [ ] Turbine
Horsepower: _____ Capacity: _____ GPM: _____
Pump Depth: _____ft. Intake Depth: _____ft.

Form LEG-R.005.00(10/05)

OWNER'S NAME: MARION COUNTY
COMPLETION DATE: 02/27/2009 Florida Unique I.D.: _____
Parcel # (Pin): 45006-000-00
WELL USE:
[ ] Public Supply [ ] Irrigation [ ] Domestic [X] Monitor
[ ] Injection [ ] Other

DRILL METHOD:
[X] Rotary [ ] Cable Tool [ ] Combination
[ ] Jet [ ] Auger [ ] Other _____

Measured Static Water Level: _____ Measured Pumping Water Level: _____
After ____Hours at _____GPM. Measuring Pt. (Describe): _____
Which is _____ft. [ ] above [X] below land surface
Casing: [ ] Black Steel [ ] Galvanized [X] PVC [ ] Other: _____

[ ] Open Hole
[X] Screen

Casing Diameter and Depth (ft.)

Diameter: 2
From: 0
To: 170

Diameter: 2
From: 170
To: 180

Liner [ ] or Casing [ ]
Diameter: _____
From: _____
To: _____

Depth (feet)

From	To	DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes. Note cavities, depth to producing zones. *Color | Grain Size | Type of Material*
0	20	tan fine sand
20	80	orange not applicable sandy clay
80	180	white not applicable limestone

Driller's Name (print or type): Eddie Palmer

END OF SECTION

SECTION 02600
STORMWATER FACILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall construct stormwater handling facilities, including filter point erosion control mat (FPM), culverts, and swales as shown on the Drawings.

B. The work includes excavating, embankment, trenching, and backfilling (including excavating unsuitable material and backfill with satisfactory material) for the construction of stormwater facilities. The work also includes work associated with removing, replacing, and disposing of unsuitable soils encountered in the work.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance. In general, shop drawings and related manufacturer's product certification shall be done in accordance with the General and Special Conditions of the Contract for approval before construction or fabrication of the material by the manufacturer.

1.03 REFERENCE STANDARDS

A. The latest edition of the Florida Department of Transportation (FDOT) *Standard Specifications for Road and Bridge Construction* (Standard Specifications) and the *Roadway and Traffic Design Standards* shall be referred to for specific and general standards for materials, details, construction, workmanship, and quality control as specified in this Section with exceptions as noted.

B. Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

1. American Association of State Highway and Transportation Officials (AASHTO)

    a. AASHTO M294—Standard Specification for Corrugated Polyethylene Pipe, 300 to 1,500-mm (12- to 60-Inch) Diameter.
    b. AASHTO SECTION 12—Buried Structures and Tunnel Liner.

2. American Society of Testing and Materials (ASTM)

a. ASTM C31/C31M—Standard Practice for Making and Curing Concrete Test Specimens in the Field.
b. ASTM C33/C33M—Standard Specification for Concrete Aggregates.
c. ASTM C39/C39M—Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
d. ASTM C76—Standard Specification for Reinforced Concrete, Culvert, Storm Drain and Sewer Pipe.
e. ASTM C150/C150M—Standard Specification for Portland Cement.
f. ASTM C361—Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
g. ASTM C443—Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
h. ASTM C939/C939M—Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
i. ASTM D422—Standard Test Method for Particle-Size Analysis of Soils.
j. ASTM D698—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)).
k. ASTM D1248—Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
l. ASTM D1556/D1556M—Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
m. ASTM D1777—Standard Test Method for Thickness of Textile Materials.
n. ASTM D1784—Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
o. ASTM D2321—Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
p. ASTM D2412—Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
q. ASTM D3212—Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
r. ASTM D3350—Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

s. ASTM D4355/D4355M—Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

t. ASTM D4632/D4632M—Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

u. ASTM D5034—Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).

v. ASTM D6938—Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

w. ASTM E329—Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

x. ASTM F477—Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

y. ASTM F794—Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

z. ASTM F949—Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings.

aa. ASTM F1803—Standard Specification for Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter.

bb. ASTM F2306—Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.

1.04 QUALITY ASSURANCE

A. Before beginning any excavation or grading, the Contractor shall satisfy himself as to the accuracy of all survey and other data as indicated on the Drawings and in the Specifications. Should the Contractor discover any inaccuracies, errors, or omissions in the survey data, he shall immediately notify the Engineer so that proper adjustments can be anticipated or ordered. If the Contractor begins any excavation or grading, this shall be held as an acceptance of the survey and drawing data.

B. The Contractor shall certify backfill and subgrade material, perform density and moisture testing, and perform in-place density and moisture testing in accordance with Section 02305, Earthwork for Utilities.

1. Trench bottoms, each lift of backfill for culvert installation, and under FPM installations shall have densities tested on intervals not to be less than two tests per installation per lift or one per 100 linear feet per lift, whichever is greater.

2. Line and grade shall be field-checked on intervals not to exceed 100 feet. Such checking shall apply to all stormwater-related facilities. Line and grade tolerance shall be ±0.10 foot; however, grading shall in no case be allowed which will permit ponding to occur outside the stormwater retention basins.
3. The Engineer may require additional testing as deemed necessary. The Engineer shall be responsible for interpreting test results and the Contractor shall perform remedial work, at the Contractor's own expense, as directed by the Engineer. The Contractor shall provide labor as required by the Engineer to help perform tests and/or check line and grade.

C. The Contractor shall test the grout mix used in FPM installation for each FPM installation or as required by the Engineer. It should be noted that one test includes three cylinders, three sets of mortar cubes, or three nylon bags. If selected, cylinders shall be 3 inches by 6 inches.

D. The Contractor shall remove and replace or correct, at no cost to the Owner, all materials and work that tests indicate do not conform to the requirements of these Specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with the manufacturer's recommendations and Section 01650, Delivery, Storage, and Handling.

1.06 RECORD DRAWINGS

A. Record Drawings shall be in accordance with Section 01785, Record Drawings.

PART 2 PRODUCTS

2.01 GENERAL

A. The Contractor shall provide all new materials free from defects impairing strength and durability and of the best commercial quality for the purpose specified. All materials shall have structural properties sufficient to safely sustain or withstand strains and stresses which they will be normally subjected to and be true to detail.

2.02 FILL MATERIALS

A. *Satisfactory trench backfill materials* are defined as those soils meeting the requirements of Section 02301, Earthwork for Landfill Construction.

B. *Unsatisfactory soil materials* are defined in Section 02301, Earthwork for Landfill Construction.

2.03 PIPE CULVERTS

A. RCP Stormwater Culvert Piping

1. The following sections of the Standard Specifications shall apply:

a. Section 430-1, Description.
b. Section 430-2, Materials.
c. Section 449-4, Concrete Pipe.
d. Joints shall be profile rubber gaskets in accordance with Section 430-7. All joints shall be covered with filter fabric wrap.

B. CMP Stormwater Culvert Piping

1. The following sections of the Standard Specifications shall apply:

a. Section 430-1, Description.
b. Section 430-2, Materials.
c. Section 943, Corrugated Steel Pipe and Pipe Arch.
d. Section 945, Corrugated Aluminum Pipe and Pipe Arch.

2. Field joints shall be made in accordance with Section 430-8.

2.04 INLETS, MANHOLES, AND JUNCTION BOXES

A. Inlets

1. The following sections of the Standard Specifications shall apply:

a. Section 425-1, Description.
b. Section 425-2, Composition and Proportioning.
c. Section 425-3, Materials.
d. Section 425-4, Forms.
e. Section 425-5, Precast Inlets, Manholes, and Junction Boxes.

2.05 FILTER POINT MAT (FPM) EROSION-CONTROL MATERIAL

A. FPM-type erosion-control material shall be a formed mat of cement-filled, double-layer, filter-point-type fabric.

B. Filter-point fabric forming material shall consist of double-layer, open-selvage fabric joined in a mat configuration to provide filter points 5 inches on center when cast in place. Fabric shall be woven of 100% continuous multifilament nylon (tire cord) of which more than 50% by weight consists of textured nylon fiber for optimum filtering characteristics and adhesion to the injected fine aggregate concrete (grout). Nylon fabric shall have a minimum thickness of 22 mils (as stated in ASTM D1777), minimum grab breaking load of 270 pounds per inch in the fill and warp (as in ASTM D4632/D4632M), and minimum UV light resistance of 85.0% strength retention after 500 hours (as in ASTM D4355/D4355M). The filter points shall be designed and installed to provide relief of hydrostatic uplift beneath the completed mat. The average mat thickness shall be 2.2 inches with a dry weight of 25 pounds per square foot (lb/sf).

C. Grout shall consist of a mixture of ASTM C150/C150M Portland cement, fine aggregate, water, and entrapped air so proportioned and mixed as to provide a pumpable grout. The mix shall exhibit a minimum compressive strength of 2,500 psi at 28 days when specimens are made and tested in accordance with ASTM C31/C31M and ASTM C39/C39M. Grout consistency shall be in the 9- to 11-second range through the 3/4-inch orifice of the standard flow cone described in the ASTM C939/C939M.

2.06 MITERED END SECTIONS

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

1. Section 430-1, Description.
2. Section 430-4.6, End Treatment.

PART 3 EXECUTION

3.01 PROTECTION

A. Before starting earthwork, the Contractor shall accurately locate and record abandoned and active utility lines, rerouted or extended, on project record documents.

B. Do not interrupt existing utilities serving occupied facilities except when permitted, in writing, by the Engineer.

C. Maintain, reroute, or abandon existing utility lines that pass through the work area as indicated on the Drawings.

D. Protect benchmarks and existing structures, roads, sidewalks, paving, and curbs against damage from equipment, vehicular or foot traffic, settlement, lateral

movement, undermining, and washout. The Contractor shall repair and replace damage to existing facilities to equal or better than original condition without cost to the Owner and to the approval of the Engineer.

E. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods as required to prevent cave-ins or loose dirt from falling into excavations.

F. The Contractor shall stockpile excavated materials suitable for backfill a sufficient distance from excavations to prevent overloading, slides, and cave-ins, and shall prevent obstruction of accessways and roadways.

G. Underpin adjacent structure(s) that may be damaged by excavation work, including service lines.

H. Notify the Engineer of unexpected subsurface conditions and discontinue work in area until the Engineer provides notification to resume work.

I. The Contractor shall perform excavations so as to prevent surface and subsurface water from flowing into excavations and also prevent flooding of the site and surrounding area.

J. Do not operate earth-moving equipment within 5 feet of walls of concrete structures for depositing or compacting backfill material. Compact backfill adjacent to concrete walls with hand-operated tampers or similar equipment that will not damage the structure.

K. Protect the bottom of excavations to prevent soil loss around and beneath foundations and slabs as required. All excavations shall be conducted in-the-dry.

L. The Contractor shall barricade and post excavations with warning signs for the safety of persons. Warning lights shall be provided during hours of darkness.

3.02 PIPING

A. The Contractor shall perform backfilling as specified and shall provide full contact between the backfill material and the full perimeter of the pipe.

B. Before final acceptance, the Contractor shall completely flush and clean all parts of the system. Remove all accumulated construction debris, rocks, sand, gravel, and any other foreign material.

C. The Contractor shall ensure that the installation provides watertight piping from water inlet to outlet.

D. The Contractor shall install stormwater culverts as specified in this Section and in accordance with the manufacturer's written recommendations.

E. The following sections of the Standard Specification shall apply:

1. Section 430-4, Laying Pipe.
2. Section 430-7, Specific Requirements for Concrete Pipe.

F. The Contractor shall supply the Engineer with Drawings showing as-constructed pipe invert elevations at every 50 feet of pipeline for inclusion in the Record Documents.

G. During laying operations, do not permit debris, tools, clothing, or similar items to be placed in pipes. Pipe interior shall be free of mud and kept clean at all times.

H. Pipe ends shall be kept clear and clean and the Contractor shall ensure that inside surfaces are maintained smooth and free from any projections that may interfere with joint assembly or flow through the completed line.

I. Care shall be exercised when lowering pipe into trenches or on subgrade to prevent damaging or twisting the pipe. After laying and before completing backfill or cover operations, pipe shall be protected from any vehicular traffic.

3.03 TRENCH EXCAVATION

A. Before excavating the trench, the Contractor shall prepare the surface including clearing and grubbing as specified in Section 02230, Site Preparation.

B. The Contractor shall be required to fully comply with all applicable OSHA Excavation Safety Standards and to abide by them as covered by the most current version of the Florida Trench Safety Act (90-96, Laws of Florida).

C. The Contractor shall ensure that mechanical equipment used for trench excavation shall be of a type, design, and construction and shall be so operated that conduit/utility, when accurately laid to specified alignment, will be centered in the trench with adequate clearance between the conduit/utility and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

D. The Contractor shall not use blasting.

E. The Contractor shall cut trenches sufficiently wide to allow for proper installation of services and to allow for testing and inspection. The Contractor shall also trim and shape trench bottoms and leave them free of irregularities, lumps, and

projections. Trench width shall be excavated as specified on the Contract Drawings.

F. The Contractor shall construct trench walls so as to avoid side wall collapse or sloughing. Trenches shall be either braced or open construction in accordance with the Contract Documents. No separate payment will be made for any special procedure used in connection with the excavation.

G. Where sheeting and bracing are not required, the Contractor shall construct trench walls in the bottom of the excavation as vertical as possible to the maximum height allowable by OSHA. Trench walls above this height shall be sloped to guard against side wall collapse or sloughing as specified on the Contract Drawings.

H. Where sheeting and bracing are required, the sheeting and bracing system shall meet the requirements in these Specifications.

I. Excavations shall be to the design elevations shown on the Contract Drawings or as specified, unless unsatisfactory or unsuitable foundation materials are encountered in the bottom of the excavation. Where unsatisfactory or unsuitable foundation materials are encountered, this material shall be undercut and removed as indicated on the Contract Drawings and replaced with satisfactory soil material meeting all the requirements for Bedding. The lift thicknesses and compaction requirements for the replacement soil shall also meet the requirements for Bedding.

J. The Contractor shall be careful not to overexcavate except where necessary to remove unsatisfactory or unsuitable materials, irregularities, lumps, rock, and projections. Unnecessary overexcavation shall be replaced as specified in these Specifications at the Contractor's sole expense.

K. The Contractor shall accurately grade bedding soil materials at the bottoms of the trenches to provide uniform bearing and support for each section of conduit/utility at every point along its entire length except where it is necessary to excavate the bedding for conduit/utility bells (e.g., pipe bells), etc., or for proper sealing of conduit/utility joints. Abrupt changes in grade of the trench bottom shall be avoided.

L. The Contractor shall dig bell holes and depressions after the bedding has been graded to ensure that the conduit/utility rests on the prepared bedding for as much of its full length as practicable. Bell holes and depressions shall be only of such length, depth, and width as required to make the joint.

M. The Contractor shall do the following:

1. Pile all excavated material in a manner that will not endanger the work or erode the stormwater management facilities or water courses.
2. Leave hydrants, valve pit covers, valve boxes, or other utility controls unobstructed and accessible.
3. Keep drainage inlets and miscellaneous drainage structures clear or make other satisfactory provisions for their proper operation.

N. The Contractor shall keep all satisfactory materials that are suitable for use/reuse in the trench construction separated from unsatisfactory materials.

3.04 REMOVAL OF UNSATISFACTORY SOIL MATERIALS

A. Areas of unsatisfactory soils, as specified in Section 02305, Earthwork for Utilities, and established by the Engineer, shall be undercut to competent soils and replaced with suitable fill as specified in Section 02305, Earthwork for Utilities. Unsuitable soils located under FPM and culverts shall be excavated to a minimum depth of 2 feet 0 inch below the finished installation. Backfill of undercut areas shall comply with Section 02305, Earthwork for Utilities.

3.05 BACKFILLING AND COMPACTION

A. The Contractor shall not backfill trenches until required tests are performed.

B. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified or the condition shall be otherwise corrected as directed.

C. The Contractor shall perform the following steps to ensure compaction at the bottom of the trench or excavation before bedding:

1. Remove disturbed native soil material and/or any soils not meeting the requirement of satisfactory soil material as indicated on the Contract Drawings.
2. Compact the bottom of the trench excavation (undisturbed native subsurface soil) to no less than 95% of the Modified Proctor maximum dry density in accordance with ASTM D1556, before placing foundation, bedding, piping, and backfill.

D. To backfill below and around pipe to the spring line of the pipe, the Contractor shall do the following:

1. Construct foundation and bedding as indicated on the Contract Drawings before placing pipe.
2. Install each pipe at proper grade, alignment, and final position.
3. Deposit satisfactory soil material uniformly and simultaneously on each side of pipe in completed course layers to prevent lateral displacement.
4. Compact under pipe haunches and on each side of pipe to the pipe spring line as shown on the Contract Drawings to hold the pipe in the proper position during subsequent pipe backfilling and compaction operations.

E. To backfill above pipe spring line to finished grade, the Contractor shall do the following:

1. Deposit satisfactory soil material around and above pipe in uniform layers as shown on the Contract Drawings.
2. Backfill and compact trenches from the spring line of the pipe to the top of the trench in completed course layers as shown in the Contract Drawings.
3. Use material previously defined in these Specifications as satisfactory soil material.
4. Compact by hand or mechanical tampers.

3.06 FILTER POINT MAT EROSION-CONTROL MATERIAL

A. Fabric Storage: Immediately after fabric is received on the job site, the Contractor shall inspect and store the fabric in a clean dry area where it will not be subject to mechanical damage or exposure to moisture or direct sunlight.

B. Fabric Placement: Fabric form panels shall be joined, placed, and injected with grout in accordance with the fabric manufacturer's written instructions and as approved by the Engineer r. In no case will simple butt joints between panels be allowed. Before injecting grout, the Contractor shall stake, lay out, and staple the fabric for final approval by the Engineer.

C. Anchor Trench: All edges of the inclined FPMs shall be placed in an anchor trench a minimum of 2 feet long at an angle of 45 degrees from horizontal grade except adjacent to the concrete wall where the anchor trench shall be vertical. When grout placement is completed, all anchor trenches shall be backfilled and compacted as specified in this Section for excavations. The finished appearance of the FPM shall be such that the elevation of the mat top is flush with the surrounding grade. Dimensions of FPM shown on the Drawings do not include additional material required to construct the FPM anchor trench.

D. Grout Injection: Grout injection shall begin with the anchor trench and then proceed from the lower portions of the mat working back up the slope. The sequence of grout injection shall be such as to ensure complete filling of the fabric to thickness specified by the fabric manufacturer. Foot traffic shall not be permitted on the freshly pumped mat when such traffic will cause permanent indentations in the mat surface. Vehicular traffic shall not be permitted on the mat surface at any time. Grout shall be vibrated during placement. Mortar shall be washed out of the filter points.

E. Grout Thickness Testing: During grout injection, mat thickness shall be measured by inserting a short piece of wire through the crowns of the mat midway between filter points at several locations from the crest to the toe of the slope. Any mat measuring less than 90% of the average of all thickness measurements shall be reinjected with grout until average thickness in accordance with the manufacturer's recommendations has been attained. The results of this testing shall be recorded by the independent testing laboratory and reported to the Engineer, as specified in this Section.

3.07 MITERED END SECTIONS

A. Mitered end sections shall be installed as specified in FDOT Index 272.

3.08 INLETS

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

1. Section 425-6, Construction Methods.

3.09 DEWATERING

A. If subsurface water is encountered, the Contractor shall use approved means to dewater the excavation. A well point system or other approved equipment shall be installed, if necessary, to maintain the excavation in a dry condition for placing of concrete and laying pipelines. Dewatering shall be in accordance with Section 02240, Dewatering.

END OF SECTION

SECTION 02635

REINFORCED CONCRETE DRAIN PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary and install and test reinforced concrete pipe for drains complete as shown on the Drawings and as specified in this Section.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Within 30 days of the Effective Date of the Agreement submit the name of the pipe and fitting supplier and a list of materials to be furnished.

B. Submit shop drawings showing layout and details of reinforcement, joint, method of manufacture and installation of pipe, specials and fittings, and a schedule of pipe lengths by diameter for the entire job.

C. Submit with the shop drawings certification from the manufacturer that the fine and coarse aggregates used in manufacture of the concrete pipe comply with the requirements of Paragraph 2.01C.

D. Before each shipment of pipe, submit the manufacturer's certification that the pipe for this Contract conforms to the ASTM Standards specified in this Section.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of

this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM C33/C33M—Standard Specification for Concrete Aggregates.
2. ASTM C76—Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
3. ASTM C150/C150M—Standard Specification for Portland Cement.
4. ASTM C361—Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
5. ASTM C443—Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
6. ASTM E329—Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.04 QUALITY ASSURANCE

A. The manufacturer shall perform the acceptance tests specified in ASTM C76, Paragraph 5.1.2.

B. Reinforced concrete pipe manufactured for this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory provided by the Owner. The manufacturer's cooperation in these inspections shall be required. The cost of this inspection of all pipe approved for this Contract plus the cost of inspection of a reasonable amount of disapproved pipe will be borne by the Owner. The pipe manufacturer shall be required to:

1. Have sufficient pipe made in advance so that pipe can be approved in one inspection. Pay for additional plant inspections if the inspection does not result in all reinforced concrete pipe being approved, the cost being deducted from monthly progress payments.
2. Notify the independent testing laboratory at least 48 hours before requesting pipe inspection.

C. The Engineer will examine the pipe after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements

specified in this Section even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Except as otherwise specified in this Section, pipe should conform to ASTM C76, Class III. The pipe interior shall be smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. The concrete mass shall be dense and uniform. The manufacturer in accordance with Section 7.2 of ASTM C76 shall design minimum reinforcement and wall thickness for sizes not tabulated in ASTM C76.

B. Cement shall be non-air-entraining Portland cement conforming to ASTM C150/C150M, Type II. The use of any admixture shall be subject to the specific approval of the Engineer.

C. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33/C33M, except for gradation, with a maximum loss of 8% when subjected to five cycles of the soundness test using magnesium sulfate. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33/C33M, except for gradation, with a maximum loss of 8% when subjected to five cycles of the soundness test using magnesium sulfate. Documentation that the aggregates to be used in the manufacture of reinforced concrete pipe meet these requirements shall be submitted to the Engineer as stated in Article 1.02.

D. The 28-day compressive strength of the concrete, as indicated by cores cut from the pipe, shall be equal to or greater than the design strength of the concrete. The concrete mass shall be dense and uniform. Reinforcement shall be circular for all concrete pipes. Quadrant steel shall not be used. Reinforcement shall be installed in both the bell and the spigot. At least one circumferential reinforcement wire shall be in both the bell and spigot area and reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling, and after installation. When cores indicate that reinforcing steel has less than 85% bond the pipe shall be subjected to a 3-edge bearing test to 13 pounds per square inch (psi) to verify strength and water tightness.

E. Pipe may be rejected for any of the following reasons:

1. Exposure of any wires, positioning spacers or chairs used to hold the reinforcement cage in position, or steel reinforcement in any surface of the pipe, except as permitted by Section 8.2 of ASTM C76.

2. Transverse reinforcing steel found to be in excess of 1/4 inch out of specified position after the pipe is molded.

3. Any shattering or flaking of concrete at a crack.

4. Voids, with the exception of a few minor bugholes, on the interior and exterior surfaces of the pipe exceeding 1/4-inch in depth unless properly and soundly pointed with mortar or other approved material.

5. Unauthorized application of any wash coat of cement or grout. Any pipe dressing procedures shall be subject to approval of the Engineer.

6. A hollow spot (identified by tapping the internal surface of the pipe), which is greater than 30-inch in length or wider than three times the specified wall thickness. Repair of such defective areas not exceeding these limitations may be made as specified in Paragraph 2.01R.

7. Defects that indicate imperfect molding of concrete; or any surface defect indicating honeycomb or open texture (rock pockets) greater in size than area equal to a square with a side dimension of 2-1/2 times the wall thickness or deeper than two times the maximum graded aggregate size. Repair of such defects not exceeding these limits may be made as specified in Paragraph 2.01R.

8. Any of the following:

   a. A crack having a width of 0.005 to 0.01 inch throughout a continuous length of 36 inches or more.

   b. A crack having a width of 0.0 to 0.03 inch or more throughout a continuous length of 1 foot or more.

c. Any crack greater than 0.005 inch extending through the wall of the pipe and having a length in excess of the wall thickness.

d. Any crack showing two visible lines of separation for a continuous length of 2 feet or more or an interrupted length of 3 feet or more anywhere in evidence, both inside and outside.

e. Cracks anywhere greater than 0.03 inch in width.

F. The pipe shall be clearly marked as required by ASTM C76 in a manner acceptable to the Engineer. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until the compressive strength of the concrete has attained 4,000 psi.

G. Pipe shall have a minimum laying length of approximately 8 feet, except for closure and other special pieces as approved by the Engineer. Sufficient pipe of various lengths should be available at the site to affect closure at manholes or structures that cannot be located to accommodate standard lengths. Short lengths of pipe made for closure, etc. may be used in the pipeline at the end of construction if properly spaced. The length of the incoming and outgoing concrete pipe at each structure shall not exceed 4 feet, except where the joint is cast flush with the exterior wall of the structure, where steel wall fittings are provided or where otherwise noted on the Drawings. Maximum laying length shall not exceed 16 feet, but the installation of 16-foot lengths will depend upon the ability to handle such lengths of pipe in sheeted trenches, comply with trench width requirements, maintain the integrity of the sheeting, and avoid disturbance to the adjacent ground. If in the opinion of the Engineer the use of 16-foot lengths is impracticable, shorter lengths shall be used.

H. Each length of pipe shall be checked against the length noted on the shop drawings. Pipe more than 1 1/2 inches longer than that shown on the shop drawings shall not be used on this project. Variations in length of the same pipe shall not exceed ASTM C76 requirements.

I. During manufacturing, measuring devices shall be used to ensure joint assembly is within the tolerance of ASTM C76 and this Section.

J. The Engineer shall have the right to take samples of the concrete after it has been mixed or as it is being placed in the forms or molds and to make such inspection and tests of the concrete as he/she may wish.

K. At the start of the work, a set of test cylinders shall be taken each day on which pipe is manufactured for the project or more often if required. This may ultimately be reduced to one set of three specimens for every 50 cubic yards of concrete placed, if the uniformity of results warrants and if approved by the Engineer. At the start of the work, a relationship shall be established between ultimate strength of test cylinders stored in a standard manner compared to cylinders steam cured with the pipe and compared to cores taken from the corresponding finished pipe. At least five sets of tests shall be made.

L. The Engineer shall have the right to cut cores from such pieces of the finished pipe as he/she selects for inspection and such tests as he/she may wish to apply. Holes left by the removal of cores shall be filled in an approved manner by and at the expense of the manufacturer. Core drilling shall be carried out by the pipe manufacturer at his/her expense. The number of cores shall not exceed the requirements of ASTM C76.

M. Test cores may be taken for every 500 linear feet of pipe manufactured, but not less than once each day on which pipe is manufactured for the project. Cores may be reduced to one set of two per week (or possibly fewer, but not less than one set for every 1,500 linear feet), if a satisfactory relationship is established between cores and cylinders made and cured in the standard manner. This relationship shall not vary by more than 10% more or less from the average ratio. Cores may be drilled in any manner that will provide a smooth core face. All pipe cylinders and cores shall be 4 inches in diameter. Cores shall be carefully saw-trimmed and capped in a vertical position with a sulfur cap of minimum thickness, at least 1 day before being tested.

N. Core testing shall conform to Standard ASTM Methods.

O. At the time of inspection, the pipe will be carefully examined for compliance with the appropriate ASTM standard, as specified in this Section and shop drawings. All pipes shall be inspected for general appearance, dimension, "scratch-strength," blisters, cracks, roughness, soundness, etc. All pipes will be checked for soundness by being tapped and scratched at least once on every 50 square inches of pipe surface. The surface shall be dense and close-textured. Cores also shall serve as a basis for rejection of pipe, particularly if lamination or poor bond of reinforcement is apparent.

P. The manufacturer shall use measuring devices to ensure joint assembly is within tolerances of ASTM C76 and as specified in this Section. If, during construction, the pipes cannot be satisfactorily joined, the manufacturer shall pre-join the pipe at the plant.

Q. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. Only pipe actually conforming to the Specifications and accepted will be listed for approval, shipment, and payment. Approved pipe will be so stamped or stenciled on the inside before it is shipped. All pipe which has been damaged after delivery will be rejected and if such pipe already has been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.

R. Pits, blisters, rough spots, breakage, and other imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days, when tested in 3-inch cylinders stored in the standard manner. Subject to the approval of the Engineer, epoxy mortar may be used for repairs.

2.02 JOINTS FOR CONCRETE PIPE

A. Joints for concrete pipe less than 72 inches in diameter shall be concrete and rubber tongue-and-groove or bell-and-spigot-type joint conforming to ASTM C361 with provisions for using a round rubber O-Ring gasket in a recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2º and 2-1/2º. The diameters of the joint surfaces that compress the gasket shall not vary from the true diameters by more than 1/16 inch.

B. The round rubber O-Ring gaskets shall conform to ASTM C443 except as otherwise specified in this Section.

C. The gaskets shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of 13 psi for 10 minutes without showing any leakage by the gasket or displacement of it. The pipe manufacturer shall provide facilities for testing the effectiveness of the joints against leakage and one such test may be required for each 500 feet of pipe for each type of joint manufactured. Such tests shall be made by an internal or external pressure against the joint of at least 13 psi for 10 minutes in accordance with ASTM C443. The completed joint, when installed in place in the work, shall be capable of withstanding a groundwater pressure of 13 psi without exceeding the allowable leakage specified for the pipe testing.

D. The ends of the pipe shall be made true to form and dimension and the bell shall be made by casting against steel forms. The manufacturer shall inspect all pipe joint surfaces for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all pipe meets the requirements of ASTM C76, as specified in this Section and the joint design.

PART 3 EXECUTION

3.01 LAYING CONCRETE PIPE

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or fittings and the joint surfaces. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective.

B. As soon as the excavation is completed to the normal grade of the bottom of the trench, place crushed stone in the trench and the pipe shall be firmly bedded in this stone to conform accurately to the lines and grades indicated on the Drawings. Crushed stone shall conform to the requirements of Section 02230, Site Preparation. Blocking under the pipe will not be permitted.

C. Crushed stone shall be placed and compacted to give complete vertical and lateral support for the lower section of the pipe as indicated on the Drawings. A depression shall be left in the supporting gravel at the joint to prevent contamination of the rubber gasket immediately before being forced home. Before the pipe is lowered into the trench, the spigot and bell shall be cleaned and free from dirt. A vegetable lubricant that is not soluble in water, furnished by the pipe manufacturer and harmless to the rubber gasket, shall lubricate the gasket and bell. The pipe shall be properly aligned in the trench to avoid any possibility of contact with the side of the trench and fouling the gasket. As soon as the spigot is centered in the bell of the previously laid pipe, it shall be forced home with jacks or come-alongs. After the gasket is compressed and before the pipe is brought fully home, each gasket shall be carefully checked for proper position around the full circumference of the joint. Steel inserts shall be used to prevent the pipe from going home until the feeler gauge is used to check the final position of the gasket. The jacks or come-alongs shall be anchored sufficiently back along the pipeline (a minimum of five lengths) so that the pulling force will not dislodge the pieces of pipe already in place. Only a jack or come-along shall be employed to force the pipe home smoothly and evenly and hold the pipe while backfilling is in progress. Under no circumstances shall crowbars be used nor shall any of the motor-driven equipment be used.

D. As soon as the pipe is in place and before the come-along is released, backfill shall be placed as indicated on the Drawings and compacted for at least one-half the length of pipe. Not until this backfill is placed shall the come-along be released. If any motion at joints can be detected, a greater amount of backfill shall be placed before pressure is released. When pipe laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by a watertight plug or other approved means.

E. Carefully regulate the equipment and construction operations so that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall promptly and satisfactorily be repaired or replaced at the Contractor's expense.

3.02 TESTING

A. General

1. Drains shall be tested by an exfiltration test using water.
2. Test the first section of pipeline as soon as it is installed to demonstrate that the work conforms to this Section.

B. Exfiltration Test

1. Leakage tests by exfiltration shall be made before or after backfilling at the discretion of the Engineer. The length of pipe to be tested shall be such that the head over the crown at the upstream crown is not less than 2 feet and the head over the downstream crown is not more than 6 feet. The pipe shall be plugged by pneumatic bags or mechanical plugs in such a manner that the air can be released from the pipe while it is being filled with water. Before any measurements are made, the pipe shall be kept full of water long enough to allow absorption and the escape of any trapped air to take place. Following this, a test period of at least 1 hour shall begin. Provisions shall be made for measuring the amount of water required to maintain the water at a constant level during the test period.
2. If any joint shows an appreciable amount of leakage, the jointing material shall be removed and the joint repaired. If any pipe is defective, it shall be removed and replaced. If the quantity of water required to maintain a constant level in the pipe does not exceed 100 gallons per inch of diameter per day per mile of pipe and if all the leakage is not confined to

a few joints, workmanship shall be considered satisfactory. If the amount of leakage indicates defective joints or broken pipes, they shall be corrected or replaced.

3.03 CLEANING

A. At the conclusion of the work, thoroughly clean all pipelines by flushing or power jetting with water or other means to remove all dirt, stones, pieces of wood, or other material that may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Engineer will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired.

END OF SECTION

SECTION 02700
PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section covers the work necessary to provide for the construction of all pavement where indicated on the Drawings.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Limerock material submittal is to be made to include liquid limit, plastic index, gradation, certification regarding deleterious material, limerock bearing ratio (LBR), Florida Department of Transportation (FDOT) pit number, and other information as required to indicate performance in accordance with the specifications.

B. Information regarding asphaltic materials and mix shall be submitted as required by the referenced FDOT specifications.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time, unless otherwise noted. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. The latest edition of the FDOT Standard Specifications for Road and Bridge Construction (Standard Specifications) and Roadway and Traffic Design Standards shall be referred to for construction, workmanship, and quality control as specified with exceptions as noted in this Section.

1. Where the referenced FDOT Specifications cite "the Department," this shall be modified to “Engineer” by this contract.
2. The Contractor shall retain an independent testing agency, as approved by the Engineer, to perform all tests, including tests referenced to be performed by the Engineer.

3. Payment is on a Lump-Sum Basis if defined as Lump Sum on the Bid Form. The FDOT sections defining the Basis of Payment shall be applied only when unit price work is defined on the Bid Form.

B. American Society of Testing and Materials (ASTM)

1. ASTM D1556/D1556M—Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. ASTM D1557—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
3. ASTM D2167—Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D6938—Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.04 QUALITY ASSURANCE

A. The Contractor shall perform field-density tests along the centerline of construction or as directed by the Engineer and in accordance with the FDOT's *Standard Specifications for Road and Bridge Construction*, latest edition.

B. The Contractor shall field check the depth of stabilization and/or limerock at each road crossing with a pipeline.

C. The Engineer may require additional testing as deemed necessary. The Engineer shall interpret test results and the Contractor shall perform remedial work as directed by the Engineer. The Contractor shall provide labor to the Engineer for help in performing tests and/or checking line and grade at no additional cost to the Owner.

D. Laboratory maximum dry density of soil mixtures at optimum moisture shall be determined by ASTM D1557 for subgrade, stabilized subgrade, and limerock base course.

E. Field density of stabilized subgrade and soils or soil mixtures in fill or backfill shall be determined by ASTM D1556/D1556M, ASTM D2167, or ASTM D6938 for limerock base course.

F. Bearing value of stabilized subgrade shall be determined by the methods required for determining limerock bearing ratio (LBR) according to the FDOT, Standard Specification FM 5-515.

G. Field density of stabilized subbase shall be 98% or greater of the Modified Proctor maximum dry density, ASTM D1557.

H. The Contractor shall be responsible for the cost of testing. The Engineer shall have sole responsibility for interpreting all test results. The Contractor shall bear the cost of all retests due to failure to achieve specified requirements.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

PART 2 PRODUCTS

2.01 GENERAL (NOT USED)

2.02 ROCK BASE

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

1. Section 200-1, Description.
2. Section 200-2, Materials.

2.03 STABILIZING MATERIALS

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

1. Section 160-1, Description.
2. Section 160-2, Materials.

2.04 PRIME AND TACK COATS FOR BASE COURSES

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

1. Section 300-1, Description.
2. Section 300-2, Materials.

2.05 ASPHALT

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

1. Section 334-1, Description.
2. Section 334-2, Materials.
3. Section 334-3, General Composition of Mixture.
4. Section 334-5, Acceptance of the Mixture.

PART 3 EXECUTION

3.01 EXCAVATION AND EMBANKMENT

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

1. Section 120-1, Description.
2. Section 120-2, Classifications of Excavation.
3. Section 120-3, Preliminary Soils Investigation.
4. Section 120-4, Removal of Unsuitable Materials and Existing Roads.
5. Section 120-5, Disposal of Surplus and Unsuitable Material.
6. Section 120-6.1, Materials for Borrow.
7. Section 120-7, Materials for Embankment.
8. Section 120-8, Embankment Construction.
9. Section 120-9, Compaction Requirements.
10. Section 120-10, Acceptance Program.
11. Section 120-11, Maintenance and Protection of Work.
12. Section 120-12, Construction.

B. Exceptions

1. Section 120-4.1, Subsoil Excavation: Unsuitable soils shall be those in Classifications A-6, A-7, or A-8 in the American Association of State Highway and Transportation Officials (AASHTO) System.
2. Section 120-4.2, Construction Over Existing Old Road: Where removal of existing pavement is called for, it shall be removed to the full depth as indicated in the cross-sections and replaced with new limerock and paving or other treatment in accordance with the Drawings and details.
3. Section 120-5.3, Disposal of Paving Materials: Disposing of muck on side slopes shall not apply.
4. Section 120-9.2.1, General: Laboratory maximum dry density shall be determined by Modified Proctor, ASTM D1557. Field densities shall be determined by ASTM D1556/D1556M, ASTM D2167, or ASTM D6938. All embankments shall be compacted to not less than 95% of the maximum dry density, as determined by modified Proctor, ASTM D1557.

5. Section 120-12.1, Construction Tolerances: No tolerance greater than 0.1 foot above or below the plan cross-section will be allowed.

3.02 STABILIZING

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

1. Section 160-3, Construction Methods.
2. Section 160-4, Acceptance Program for Mixed Materials.

B. Exceptions

1. Section 160-2.4, Granular Subbase: Contractor may not substitute 6 inches of Granular Subbase for 12 inches of Stabilization unless such substitution is specifically indicated on the Drawings.
2. Section 160-4.2.1.2, Undertolerance in Bearing Value Requirements: no undertolerance will be acceptable.

3.03 LIMEROCK BEARING RATIO AND DENSITIES

A. Stabilized finish grade and stabilized shoulders shall have a minimum Limerock Bearing Ration (LBR) value of 40.

B. Field density of stabilized finished grade shall be a minimum of 98% of the Modified Proctor maximum dry density as specified in ASTM D1557 to a minimum depth of 12 inches as shown on the Drawings.

3.04 PRIME AND TACK COATS

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

1. Section 300-3.1, Pressure Distributor.
2. Section 300-3.2, Sampling Device.
3. Section 300-3.3. Temperature Sensing Device.
4. Section 300-5, Cleaning Base and Protection of Adjacent Work.
5. Section 300-6, Weather Limitations.
6. Section 300-7, Application of Prime Coat.
7. Section 300-8, Application of Tack Coat.

3.05 ROCK BASE

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

1. Section 200-3, Equipment.

2. Section 200-4, Transporting Rock.
3. Section 200-5, Spreading Rock.
4. Section 200-6, Compacting and Finishing Base.
5. Section 200-7, Acceptance Program.
6. Section 200-8, Priming and Maintaining.

B. Exceptions

1. Section 200-7.2.1, Density: The minimum density that will be acceptable for paved areas will be 98% of the maximum dry density as determined by Modified Proctor, ASTM D1557.
2. Section 200-7.3.1.2, Depth and Surface Testing Requirements: Thickness of base shall be measured at intervals not to exceed 200 feet.

3.06 ASPHALT

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

1. Section 320-6, Preparation of the Mixture.
2. Section 320-7, Transportation of the Mixture.
3. Section 330-1, Description.
4. Section 330-2, Quality Control (QC) Requirements.
5. Section 330-3, Limitations of Operations.
6. Section 330-4, Surface Preparation.
7. Section 330-5, Paving Equipment.
8. Section 330-6, Placing Mixture.
9. Section 330-7, Compacting Mixture.
10. Section 330-8, Joints.
11. Section 330-9, Surface Requirements.
12. Section 330-10, Protection of Finished Surface.

3.07 PAVEMENT REPAIR

A. At his own expense the Contractor shall repair all damage to pavement as a result of work under this Contract in a manner satisfactory to the Engineer. Pavement shall be repaired to match the original surface material thickness and original grade. The repair shall include preparing the subgrade, placing and compacting the applicable base, priming the limerock base, and placing and maintaining the surface treatment as specified in this Section.

B. The width of all repairs shall extend at least 12 inches beyond the limit of the damage. The edge of the pavement to be left in place shall be cut to a true edge with a saw or other approved method so as to provide a clean edge to abut the

repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities.

3.08 JOINTS

A. General pavement joints within asphalt roadways and where specified or directed by the Engineer, shall be mechanically sawed butt joints. The edges of asphalt pavement shall be trimmed to straight lines (which a roller can follow) or formed.

END OF SECTION

SECTION 02920
SEEDING AND SODDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes requirements for the following areas of work:

1. Fine grading.
2. Preparation of areas to receive seeding and sodding.
3. Fertilizing of areas to receive seeding and sodding.
4. Maintenance.
5. Seeding.
6. Hydroseeding.
7. Sodding of new areas to receive seeding and sodding.
8. Mulching.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

B. Certificates

1. Fertilizer, seed, hydroseed, and sod shall be accompanied by certificate from vendors certifying these items meet the requirements of these Specifications, stating botanical name, percentage by weight, and percentage of purity.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. FS O-F-241D—Fertilizer, Mixed, Commercial.

B. American Society for Testing and Materials (ASTM)—Equivalent AASHTO standards may be substituted as approved.

C. The Florida Department of Transportation (DOT) Standard Specifications for Road and Bridge Construction (Standard Specifications) shall be referred to for both specific and general standards for materials, construction, workmanship, and quality control as specified in this Section with exceptions, as noted herein. Note that any reference in the Standard Specifications to the terms “Department” or “District Materials Engineer” shall be replaced by the term “Engineer.”

1.04 QUALITY ASSURANCE

A. The Contractor shall provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. Deliver, store, protect, and handle products to the site and prevent damage from wetness and weather conditions.

C. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

D. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of the manufacturer.

E. No sod that has been cut for more than 72 hours may be used unless specifically authorized. A letter of certification from the grassing Contractor as to when the sod was cut and what type shall be provided to the Engineer upon delivery of the sod to the job site.

1.07 MAINTENANCE

A. Maintenance shall be as indicated under Part 3, Execution, of this Section.

1.08 DEFINITIONS

A. Weeds: Weeds include but are not limited to Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragqwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.09 REGULATORY REQUIREMENTS

A. The Contractor shall comply with regulatory agencies for fertilizer and herbicide composition.

PART 2 PRODUCTS

2.01 TOPSOIL

A. The Contractor shall provide topsoil from off-site borrow or from project on-site excavation as approved by the Engineer.

2.02 SEED MIXTURE

A. March 15 to October 15

1. Argentine Bahia.

B. Remainder of the Year

1. 1/3 Argentine Bahia.
2. 1/3 Common Bermuda grass.
3. 1/3 Rye.

2.03 SOD

A. The Contractor shall provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted (viable, not dormant) Sod shall be provided in rectangles a minimum of 12 by 24 inches or in rolls at least 12 inches in width and length consistent with the equipment used to handle the rolls and place the sod. Provide sod composed principally of the following:

1. Argentine Bahia (Palletized Sod).
2. Argentine Bahia (Rolled Sod).

2.04 FERTILIZER FOR SOD

A. The Contractor shall provide commercial fertilizer of neutral character, with some elements derived from organic sources, containing not less than 8% phosphoric acid, 8% potassium, and percentage of nitrogen required to provide 0.5 pound of actual nitrogen per 1,000 square feet of area. Provide nitrogen in form that will be available to the seeded and sodded area during initial period of growth. The chemical designation shall be 5-10-10.

B. The Contractor shall ensure that the fertilizer is delivered to the site in labeled bags or containers.

2.05 FERTILIZER FOR SEED

A. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with 50% of the elements derived from organic sources, of a proportion necessary to eliminate any deficiencies of topsoil to the following proportions:

1. Seeded Areas – 5% nitrogen, 10% phosphoric acid, 10% soluble potash.

2.06 WATER FOR SEEDING AND SODDING

A. Water shall be free of acid, alkali, or organic materials and shall have a pH of 7.0 to 8.5. The Contractor shall provide all water needed for grassing by providing permanent or temporary piping valves and temporary trucks to convey water from the source to the point of use. The Contractor shall provide any meters required and pay for water used if the water is taken from a public water system. Water shall be free of petroleum products, pesticides, and any other deleterious impurities.

2.07 EROSION-CONTROL FABRIC

A. The Contractor shall provide 70% agricultural straw with 30% coconut fiber matrix stitches with degradable nettings designed to degrade within 18 months. Erosion-control anchors shall be as recommended by the manufacturer.

2.08 STRAW MULCH

A. Straw mulch shall be used on all newly graded and topsoiled areas sloped 3:1 or steeper to protect areas against washouts and erosion. Straw mulch shall consist of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold, or other objectionable material. The straw mulch shall contain at least 50% by weight of material that is 10 inches or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

2.09 TACKIFIER

A. Latex acrylic copolymer shall be Soil Sealant with coalescing agent as manufactured by Soil Stabilization Products Company, Inc., Merced, CA, or equal and shall be used as straw mulch tackifier.

PART 3 EXECUTION

3.01 COORDINATION OF WORK

A. The Contractor shall coordinate all work activities to provide for establishing grass cover at the earliest possible time in the construction schedule to minimize erosion of topsoil.

3.02 SOIL PREPARATION

Concerning soil preparation, the Contractor shall do the following:

A. Dispose of any existing sod, growth, rocks, or other obstructions that might interfere with tilling, seeding, sodding, or later maintenance operations. Remove stones over 1-1/2 inches in any dimensions and sticks, roots, rubbish, and other extraneous matter. Remove from work area or site; do not stockpile.

B. Till to a depth of not less than 12 inches. Thoroughly loosen and pulverize topsoil.

C. Grade areas to be seeded and sodded to a smooth, even surface with loose, uniformly firm texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared areas to be seeded and sodded before planting if the soil is dry. Water thoroughly and allow the surface to dry off before seeding and sodding. Do not create a muddy soil condition.

E. Restore prepared areas to specified condition if eroded or otherwise disturbed after the fine grading and before planting.

F. Spread the planting soil mixture to depth required to meet thickness, grades, and elevations indicated after light rolling and natural settlement. Do not spread if the material is frozen or if the subgrade is frozen.

G. Preparing Unchanged Grades

1. Where seeding and sodding in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil as follows:

a. Till to a depth of not less than 12 inches.
b. Apply soil amendments and initial fertilizers.
c. Remove high areas and fill in depressions.
d. Till soil to a homogeneous mixture of fine texture, free of lumps, clods, stones, roots, and other extraneous matter.

H. Allow for a 3-inch sod thickness in areas to be added next to paving.

I. Before preparing unchanged areas, remove existing grass, vegetation, and turf. Dispose of such material outside of the Owner's property: do not turn over into soil being prepared for seeding and sodding.

J. Place approximately one-half of the total amount of planting soil required. Work into the top of the loosened subgrade to create a transition layer and then place the remainder of the planting soil.

3.03 FERTILIZING FOR SEEDING

A. Seeding: The Contractor shall spread fertilizer uniformly at a rate of 10 pounds per 1,000 square feet.

B. Apply after smooth raking of topsoil and before roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

A. Apply seed at minimum rate or 120 pounds per acre or greater as needed to obtain satisfactory growth. Apply seed evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on the same day.

C. Do not sow immediately following rain, when ground is too dry, or during windy periods.

D. Roll seeded area with appropriate equipment to achieve seed embedment and soil compaction.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.05 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at the rate designated on schedule evenly in two intersecting directions.

B. Do not hydro-seed area in excess of that which can be mulched on the same day.

C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

D. Use mulch that does not contain reprocessed wood or paper fibers. Ensure that 50% of the fibers will be retained on a 25-mesh screen.

3.06 SEED PROTECTION

A. When seeding is complete, apply straw mulch at a rate of 4,000 lb/acre. Apply tackifier as required.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6-inch-deep excavated topsoil trench. Provide a 2- to 4-inch overlap of adjacent rolls. Backfill the trench and rake smooth, level with the adjacent soil.

D. Secure outside edges and overlaps in accordance with the manufacturer’s recommendations.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At the sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges a minimum of 6 inches.

3.07 SODDING NEW AREAS

When sodding new areas, the Contractor shall do the following:

A. Before laying sod, contact the Engineer to observe soil preparation work. Lay sod within 24 hours of the time of stripping. Do not plant dormant sod or if the ground is frozen.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger to offset joints in adjacent courses. Employ installation methods to avoid damage to subgrade or sod. On slopes install the sod with an overlap that allows water to flow over the adjacent strip and not under it. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering adjacent grass.

C. Anchor sod on slopes greater than 3:1 with wood pegs as required to prevent slippage. Pegs shall not be used over lined areas.

D. Water sod thoroughly with a fine spray immediately after planting.

3.08 RECONDITIONING SEEDED AND SODDED AREAS

The Contractor shall ensure that seeded and sodded areas are properly reconditioned at no additional expense to the Owner by doing the following:

A. Recondition seeded and sodded areas that are damaged by work operations, including storage of materials or equipment and movement of vehicles. Also recondition seeded and sodded areas where settlement or washouts occur or where minor regrading is required. Recondition other existing seeded and sodded areas where indicated.

B. Provide fertilizer, topsoil, seed, or sod amendments as specified for new seeded and sodded areas and as required to provide satisfactory reconditioning. Provide new planting soil as required to fill low spots and meet new finish grades.

C. Cultivate bare and compacted areas thoroughly to provide a good deep planting bed.

D. Remove diseased or unsatisfactory seeded and sodded areas; do not bury into soil. Remove topsoil containing foreign materials resulting from operations including oil drippings, stone, gravel, and other construction materials. Replace with new topsoil.

E. Where substantial seeding and sodding remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps and cultivate soil, fertilize, and seed. Remove weeds before seeding or, if extensive, apply selective chemical weed killers as required. Apply a seedbed mulch, if required, to maintain moist condition.

F. Water newly planted areas and keep moist until new grass is established.

3.09 PROTECTION

A. The Contractor shall erect barricades, warning signs, and fencing to protect newly planted areas from traffic. Maintain barricade fencing and warning signs throughout the maintenance period until project is substantially completed.

3.10 MAINTENANCE

To maintain the seeded and sodded area, the Contractor shall do the following:

A. Mow sod to a height of 2 inches as soon as there is enough top growth to cut with a mower. Remove no more than 40% of grass leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted.

B. Maintain grass growth by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading, and replanting as required to establish a smooth, acceptable seeding and sodding, free from eroded or bare areas.

C. Remove weeds by pulling or chemical treatment.

D. Perform maintenance until the date of final completion of project.

E. Apply the second fertilizer application after the first mowing and when grass is dry. Use fertilizer that will provide 0.5 pound of actual nitrogen per 1,000 square feet of seeded and sodded areas.

F. Replant bare areas using the same materials specified for seeded and sodded areas.

G. Watering: Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep seeded and sodded areas uniformly moist as required for proper growth.

H. Lay out temporary watering system and arrange watering schedule to avoid walking over muddy areas. Use equipment and water to prevent puddling and water erosion and displacing seed or mulch (if any).

I. Apply water in sufficient quantities and as often as seasonal conditions require to keep the grassed areas moist.

J. Provide supplemental water and irrigation to sod areas when the rainfall is not adequate to maintain soil moisture necessary for growth of the grass. The Contractor is responsible for determining the quantities of water required and when to irrigate. This obligation shall remain in full force and effect until final acceptance of the work by the Engineer and shall be provided at no additional cost to the Owner.

K. The Owner, at its discretion, may relieve the Contractor of this obligation at such time as the Owner is able to provide irrigation if available. This action, however, does not relieve the Contractor of the provisions and guarantees set forth in the Contract Documents.

3.11 ACCEPTANCE OF SEEDED OR SODDED AREAS

A. When seeding or sodding work, including maintenance, is substantially complete, the Engineer will, upon request, observe to determine satisfactory growth and acceptability:

1. The term "Satisfactory Growth" as used in this Section is defined as even plant growth in healthy condition without bare spots larger than 1 square foot in seeded areas and without bare spots in sodded areas. Bare spots in sodded areas shall be resodded. The Contractor shall maintain all grassed and sodded areas until satisfactory growth has been demonstrated at project final completion. If the subsequent stand of grass is found contaminated with weeds or other obnoxious or undesirable growth, the Contractor shall eliminate such undesirable growth at the Contractor's own expense.

B. The Contractor shall re-plant rejected work and continue specified maintenance until the work is accepted by the Engineer and found to be acceptable.

C. Sodded areas will be acceptable provided requirements, including maintenance, have been complied with and a healthy, well-rooted, even-colored, viable seeded or sodded area is established, free of weeds, open joints, bare areas, and surface irregularities.

3.12 CLEANUP

A. The Contractor shall promptly remove soil and debris created by seeding and sodding work from paved areas. Clean the wheels of vehicles before they leave the site to avoid tracking soil onto surfacing of roads, walks, or other paved areas.

END OF SECTION

DIVISION 9

FINISHES

SECTION 09900
PAINTING AND COATING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes materials for and application of painting and coating systems for the following surfaces:

1. Exposed metal.
2. Buried metal.
3. PVC.
4. Metal in contact with concrete.
5. Fusion-bonded epoxy coated steel.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

B. Submit manufacturer's data sheets showing the following information:

1. Percent solids by volume.
2. Minimum and maximum recommended dry-film thickness per coat for prime, intermediate, and finish coats.
3. Recommended surface preparation.
4. Recommended thinners.
5. Statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.
6. Application instructions including recommended equipment and temperature limitations.
7. Curing requirements and instructions.

C. Submit color swatches.

D. Submit certificate identifying the type and gradation of abrasives used for surface preparation.

E. Submit material safety data sheets for each coating.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM A780/A780M—Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
2. ASTM C501—Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
3. ASTM D520—Standard Specification for Zinc Dust Pigment.
4. ASTM D522/D522M—Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
5. ASTM D1002—Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal).
6. ASTM D2240—Standard Test Method for Rubber Property—Durometer Hardness.
7. ASTM D2697—Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings.
8. ASTM D2794—Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
9. ASTM D3734—Standard Specification for High-Flash Aromatic Naphthas.
10. ASTM D4060—Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
11. ASTM D4138—Standard Practices for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive, Cross-Sectioning Means.
12. ASTM D4258—Standard Practice for Surface Cleaning Concrete for Coating.
13. ASTM D4260—Standard Practice for Liquid and Gelled Acid Etching of Concrete.
14. ASTM D4261—Standard Practice for Surface Cleaning Concrete Masonry Units for Coating.
15. ASTM D4263—Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
16. ASTM D4787—Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.

17. ASTM D6386—Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
18. ASTM D7091—Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
19. ASTM E84—Standard Test Method for Surface Burning Characteristics of Building Materials.

B. American Water Works Association (AWWA)

1. AWWA C203—Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied.
2. AWWA C209—Cold-Applied Tape Coatings for Steel Water Pipe, Special Sections, Connections, and Fittings.

C. International Concrete Repair Institute (ICRI)

1. ICRI CSP 3-5—Light to Medium-Heavy Shotblast.
2. ICRI CSP 5—Medium-Heavy Shotblast.

D. National Association of Corrosion Engineers International (NACE)

1. NACE SP0188—Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

E. NSF International (NSF)

1. NSF 61—Drinking Water System Components – Health Effects.

F. Steel Structure Painting Council (SSPC)

1. SSPC PA-1—Shop, Field, and Maintenance Painting of Steel.
2. SSPC PA-2—Procedure for Determining Conformance to Dry Coating Thickness Requirements.
3. SSPC SP-1—Solvent Cleaning.
4. SSPC SP-2—Hand Tool Cleaning.
5. SSPC SP-3—Power Tool Cleaning.
6. SSPC SP-5/NACE No. 1—White Metal Blast Cleaning.
7. SSPC SP-6/NACE No. 3—Commercial Blast Cleaning.
8. SSPC SP-7/NACE No. 4—Brush-Off Blast Cleaning.
9. SSPC SP-8—Pickling.
10. SSPC SP-10/NACE No. 2—Near-White Blast Cleaning.

11. SSPC SP-11—Power Tool Cleaning to Bare Metal.
12. SSPC SP-13—Surface Preparation of Concrete.
13. SSPC SP WJ-1—Waterjet Cleaning of Metals – Clean to Bare Substrate.
14. SSPC SP WJ-2—Waterjet Cleaning of Metals – Very Thorough Cleaning.
15. SSPC SP WJ-3—Waterjet Cleaning of Metals – Thorough Cleaning.
16. SSPC SP WJ-4—Waterjet Cleaning of Metals – Light Cleaning.

G. U.S. Department of Defense (MIL)

1. MIL-C-5541—Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
2. MIL-C-18480B—Coating Compound, Bituminous, Solvent, Coal-Tar Base.
3. MIL-DTL-24441—General Specification for Paint, Epoxy-Polyamide.
4. MIL-P-21035—Paint High Zinc Dust Content, Galvanizing Repair.

PART 2 PRODUCTS

2.01 PAINTING AND COATING SYSTEMS

The following index lists the various painting and coating systems by service and type:

PAINT COATINGS SYSTEM INDEX		
No.	Title	Generic Coating
Submerged Metal Coating Systems		
7.	Submerged Metal, Potable or Nonpotable Water	Epoxy
Exposed Metal Coating Systems		
10.	Exposed Metal, Corrosive Environment	High-build epoxy (two-coat system) with polyurethane topcoat
13.	Exposed Metal, Corrosive Environment	Epoxy with urethane topcoat
15.	Exposed Metal, Atmospheric Weathering Environment	Alkyd
18.	Exposed Metal, Organic Zinc Primer for Shop Coating and Field Touch-Up	Organic zinc
Buried Metal Coating Systems		
21.	Buried Metal	Epoxy
23.	Buried Metal	Thixotropic coal-tar pitch
24.	Buried Metal	Corrosion-resisting grease
Coating Systems for Nonferrous Metals		
51.	Insulate Aluminum (Insulation) from Concrete and Carbon Steel	Bituminous

PAINT COATINGS SYSTEM INDEX		
No.	Title	Generic Coating
PVC, CPVC, and FRP Coating Systems		
52.	PVC, CPVC, and FRP, Ultraviolet Exposure or Color Coding	Epoxy/aliphatic acrylic polyurethane

These systems are specified in detail in the following Paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses.

A. Submerged Metal Coating Systems

1. System No. 7—Submerged Metal, Potable or Nonpotable Water:

a. Type: Epoxy: 100% sbv Polyamine Epoxy with near "0" VOC.
b. Service Conditions: For use with structures, valves, piping, or equipment immersed in potable or nonpotable water.
c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-10/NACE No. 2.
d. Coating System: Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness. Products: Devoe Bar-Rust 233H; Tnemec N140; Sherwin-Williams Tank Clad HS B62-80 Series/B60V80; PPG AQUAPON® LT NSF Low Temperature Epoxy Coatings 95-172; Carboline Super Hi-Gard 891; Ameron 395; International Interline 785HS; Wisconsin Protective Coating Corp. Plasite 9133, Keysite 740, or equal; 30 mils total. Color of topcoat: white. Each coat shall be a different color than the one preceding it. Tnemec Series N140 Pota-Pox Plus Polyamidoamine epoxy at 6.0 to 8.0 mils/coat. Apply two coats. Total system should not exceed 17 mils.

B. Exposed Metal Coating Systems

1. System No. 10—Exposed Metal, Corrosive Environment:

a. Type: High-build epoxy finish coat having a minimum volume solids of 60%, with an inorganic zinc prime coat Service Conditions: For use with metal structures or pipes subjected to

water condensation, chemical fumes such as hydrogen sulfide, salt spray, and chemical contact.

b. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-10/NACE No. 2.

c. Prime Coat: Self-curing, two-component inorganic zinc-rich coating recommended by the manufacturer for overcoating with a high-build epoxy finish coat. Minimum zinc content shall be 12 pounds per gallon. Apply to a thickness of 3 mils. Products: Tnemec Series 90-97; Devoe Catha-Coat 304 or 304V; International Interzinc 180HS; Ameron 9HS; Carboline 11 HS; Sherwin-Williams Zinc-Clad II Plus, B69VZ12/B69VZ13/B69D11 at 2.5 to 4.0 mils DFT; PPG METALHIDE® 28 Inorganic Zinc-Rich Primer 97 – 672, or equal.

d. Intermediate Coat: Tnemec Series 104; ICI Devoe Devran 224 HS; International Interguard 760HS; Ameron 385; Carboline 888 or 890; Sherwin-Williams Macropoxy 646 B58-600/B58V600 at 4.0 to 8.0 mils DFT; PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 Series, or equal; 5 mils. Film thickness 5.0 to 8.0 mils/coat. Minimum solids by volume should be 82%.

e. Finish Coat: Two-component pigmented acrylic or aliphatic polyurethane, minimum 70% sbv recommended by the manufacturer for overcoating a high-build epoxy coating. Apply to a thickness of at least 2 mils. Products: Tnemec Series 1075; ICI Devoe Devthane 379; International Interline 990HS; Ameron 450 HS; Carboline 134 HG; Sherwin-Williams Hi-Solids Polyurethane B65-300 Series/B60V30 at 2.5 to 4.0 mils DFT; PPG PITTHANE® Ultra-Gloss Urethane Enamel 95-812 Series; or equal.

2. System No. 13—Exposed Metal, Corrosive Environment:

a. Type: High-build self-priming Cycloaliphatic Amine epoxy minimum 82% sbv prime coat with a pigmented high-build aliphatic with a minimum 71% sbv.

b. Service Conditions: For use with metal structures or pipes subjected to water condensation, chemical fumes such as hydrogen sulfide, salt spray, and chemical contact.

c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-10/NACE No. 2.

d. Prime Coat: Two-component high-build epoxy. Apply to a thickness of 8 mils. Products: Ameron 400; ICI Devoe 235; Tnemec Series 104; International Interseal 670HS; Carboline

890LT; Sherwin-Williams Macropoxy 646 B58-600/B58V600 at 4.0 to 8.0 mils DFT; PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 Series; or equal.

e. Finish Coat: Two-component pigmented high-build Aliphatic Acrylic polyurethane. Apply one or more coats to a total thickness of 5 mils. Products: Ameron "Amershield"; ICI Devoe Devthane 359; Tnemec Series 1075; International Interthane 990HS; Carboline 133 HB; Sherwin-Williams Hi-Solids Polyurethane B65-300 series/B60V30 at 2.5 to 4.0 mils DFT/coat; PPG PITTHANE® Ultra Gloss Urethane Enamel 95-812 Series; or equal.

3. System No. 15—Exposed Metal, Atmospheric Weathering Environment:

a. Type: Gloss alkyd enamel having a minimum volume solids content of 46% with alkyd primer.

b. Service Conditions: For use on exterior metal and piping subject to sunlight and weathering.

c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-6/NACE No. 3.

d. Prime Coat: Carboline Shop Primer No. 1; ICI Devoe 4140; Ameron 5105; International Interlac 260HS; Sherwin-Williams Kem-Bond HS B50NZ Series at 2.0 to 4.0 mils DFT; PPG SPEEDHIDE® Int/Ext Rust Inhibitive Steel Primer 6-208 Series; or equal, applied to minimum dry-film thickness of 2 mils. Tnemec Series 10 primer at 2.0 to 3.5 mils DFT with 56% sbv.

e. Finish Coat: Two coats of Carboline Carbocoat 139; two coats of ICI Devoe 4348; two coats of Tnemec Series 2H; two coats of Ameron 5401 HS; two coats of International Interlac 820; two coats of Sherwin-Williams Industrial Enamel B54Z Series at 2.0 to 3.0 mils DFT/coat; two coats of PPG MetalMax Int/Ext Gloss Alkyd 7-914 Series, or equal. Apply to a minimum dry-film thickness of 1.5 to 3.5 mils DFT/coat.

4. System No. 18—Exposed Metal, Organic Zinc Primer for Shop Coating and Field Touch-Up:

a. Type: Organic zinc primer having a minimum zinc content of 14 pounds per gallon.

b. Service Conditions: For use as a shop-applied primer or field touch-up primer over inorganic zinc prime coatings on exposed metal.

c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-10/NACE No. 2.
d. Coating: Coating shall be of the two- or three-component converted epoxy, epoxy phenolic, or urethane type. Products: Tnemec 90-97; International Interzinc 308; Ameron 68HS; ICI Devoe 313; Carboline 859; Sherwin-Williams Zinc-Clad III HS B69A100/B69D11/B69D11 at 3.0 to 5.0 mils DFT; PPG Durethane™ MCZ 97-679; or equal. Applied to a minimum dry-film thickness of 3 mils. Organic zinc primer shall be manufactured by the prime coat manufacturer.

C. Buried Metal Coating Systems

1. System No. 21—Buried Metal:

a. Type: High solids Cycloaliphatic Amine epoxy or phenolic epoxy having minimum volume solids of 80% (ASTM D2697).
b. Service Conditions: Buried metal, such as valves, flanges, bolts, nuts, structural steel, and fittings.
c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-10/NACE No. 2.
d. Coating System: Apply three or more coats of Ameron 400; Tnemec 104 HS (6.0 to 8.0 mils per coat); ICI Devoe Bar-Rust 233H; Carboline 890LT; Sherwin-Williams Tank Clad HS B62-80 Series/B60V80 Series at 5.0 to 8.0 mils/coat or equal; 30 mils total. Maximum thickness of an individual coating shall not exceed the manufacturer's recommendation.

2. System No. 23—Buried Metal:

a. Type: Thixotropic, coal-tar pitch having minimum volume solids of 68% and complying with MIL-C-18480B.
b. Service Conditions: Buried metal, such as flanges, nuts and bolts, fittings, and structural steel especially subjected to corrosive conditions such as acidic groundwater.
c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Abrasive blast in accordance with SSPC SP-10/NACE No. 2.
d. Prime Coat: Not required.
e. Finish Coat: Apply two coats of Carboline Bitumastic 50, 15 mils each; two or more coats of Tnemec 46-465, to a total thickness of 30 mils; or equal. Apply two to three coats.

3. System No. 24—Buried Metal:

    a. Type: Corrosion-resisting grease.
    b. Service Conditions: Buried metal, such as bolts, bolt threads, tie rods, and nuts.
    c. Surface Preparation: Solvent clean in accordance with SSPC SP-1 to remove contaminants from the surface. Power tool clean in accordance with SSPC SP-3 as a minimum. Abrasive blasting in accordance with SSPC SP-6/NACE No. 3 is preferred.
    d. Coating: NO-OX-ID GG-2 as manufactured by Sanchem, Inc. Apply to a minimum thickness of 1/4 inch.
    e. All buried ductile iron fittings and valves shall be bagged before backfilling in accordance with Article 3.04 of Section 15110, Manual, Check, and Process Valves.

D. Coating Systems for Miscellaneous Metals

1. System No. 51—Insulate Aluminum (Insulation) from Concrete and Carbon Steel:

    a. Type: Bituminous paint having a minimum volume solids of 68% coal-tar pitch based.
    b. Service Conditions: Coat areas of aluminum grating, stairs, structural members or aluminum fabrications, in contact with concrete or carbon steel with this system.
    c. Surface Preparation: Solvent or steam clean in accordance with SSPC SP-1; do not use alkali cleaning. Then dust blast.
    d. Prime Coat: Apply synthetic resin or epoxy primer to metal surface before finish coats. Products: International Intervinux VTA528/529, or equal. No primer required for Carboline or Tnemec.
    e. Finish Coat: Carboline Super Service Black; Tnemec 46-465; International Intertuf 100; or equal. Apply two coats to a minimum dry-film thickness of 8.0 to 12.0 mils/coat.

E. PVC, CPVC, and FRP Coating Systems

1. System No. 52—PVC, CPVC, and FRP, Ultraviolet Exposure or Color Coding:

    a. Type: Tnemec Series 1095 Endura-Shield Aliphatic Acrylic Polyurethane (66% sbv) finish with a Series 66 Hi-Build

Epoxoline Polyamide Epoxy (56% sbv) prime coat at a total dry film thickness of 4.5 to 10.0 mils.

b. Service Conditions: Color coding of PVC, CPVC, or FRP exposed to sunlight.

c. Surface Preparation: Clean the surface in accordance with SSPC SP-1. Then, thoroughly and uniformly scarify and de-gloss the surface.

d. Prime Coat: Tnemec Series 66 at 2.0 to 3.0 mils.

e. Finish Coat: Tnemec Series 1095 Endura-Shield at 2.5 to 5.0 mils. Series 1095 is semi-gloss. For a different sheen, apply Series 1094 (gloss) or Series 1096 (eggshell) at the same thickness.

F. Abrasives for Surface Preparation

1. Abrasives used for preparation of ferrous (excluding stainless steel) surfaces shall be one of the following:

a. 16- to 30- or 16- to 40-mesh silica sand or mineral grit.
b. 20- to 40-mesh garnet.
c. Crushed iron slag, 100% retained on No. 80 mesh.
d. SAE Grade G-40 or G-50 iron or steel grit.

2. In the above gradations, 100% of the material shall pass through the first stated sieve size and 100% shall be retained on the second stated sieve size.

PART 3 EXECUTION

3.01 WEATHER CONDITIONS

A. Do not paint in the rain, wind, snow, mist, or fog or when steel or metal surface temperatures are less than 5°F above the dew point.

B. Do not apply paint when the relative humidity is above 85%.

C. Do not paint when temperature of metal to be painted is above 120°F.

D. Do not apply alkyd, inorganic zinc, silicone aluminum, or silicone acrylic paints if air or surface temperature is below 40°F or expected to be below 40°F within 24 hours.

E. Do not apply epoxy, acrylic latex, and polyurethane paints on an exterior or interior surface if air or surface temperature is below 60°F or expected to drop below 60°F in 24 hours.

3.02 SURFACE PREPARATION PROCEDURES

A. Remove oil and grease from metal surfaces in accordance with SSPC SP-1. Use clean cloths and cleaning solvents and wipe dry with clean cloths. Do not leave a film or greasy residue on the cleaned surfaces before abrasive blasting. Powerwashing with a biodegradable degreaser is also acceptable.

B. Remove weld spatter and weld slag from metal surfaces and grind smoothly rough welds, beads, peaked corners, and sharp edges including erection lugs in accordance with SSPC SP-2 and SSPC SP-3. Grind 0.020 inch (minimum) off the weld caps on pipe weld seams. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4 inch.

C. Do not abrasive blast or prepare more surface area in one day than can be coated in one day; prepare surfaces and apply coatings the same day. Remove sharp edges, burrs, and weld spatter. Prime all areas before rust bloom forms and within the same day.

D. Do not abrasive blast PVC, CPVC, or FRP piping or equipment. Do not abrasive blast epoxy- or enamel-coated pipe that has already been factory coated, except to repair scratched or damaged coatings.

E. For carbon steel, do not touch the surface between the time of abrasive blasting and the time the coating is applied. Apply coatings within 2 hours of blasting or before any rust bloom forms.

F. Surface preparation shall conform to the SSPC specifications as follows:

Solvent Cleaning	SP-1
Hand Tool Cleaning	SP-2
Power Tool Cleaning	SP-3
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off Blast Cleaning	SP-7
Pickling	SP-8
Near-White Blast Cleaning	SP-10
Power Tool Cleaning to Bare Metal	SP-11
Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Before Recoating	SP-12
Surface Preparation of Concrete	SP-13

G. Wherever the words “solvent cleaning,” “hand tool cleaning,” “wire brushing,” or “blast cleaning” or similar words are used in these Specifications or in the paint manufacturer’s specifications, they shall be understood to refer to the applicable SSPC (Steel Structure Painting Council), surface preparation specifications listed above.

H. *Dust blasting* is defined as cleaning the surface through the use of very fine abrasives, such as siliceous or mineral abrasives, 80 to 100 mesh. Apply a fine etch to the metal surface to clean the surface of any contamination or oxide and to provide a surface profile for the coating.

I. *Brush-off blasting* of concrete and masonry surfaces is defined as opening subsurface holes and voids and etching the surface for a coating to bond.

J. For carbon steel surfaces, after abrasive blast cleaning, the height of the surface profile shall be 2 to 3 mils. Verify the surface profile by measuring with an impresser tape acceptable to the Engineer. Perform a minimum of one test per 100 square feet of surface area. Testing shall be witnessed by the Engineer. The impresser tape used in the test shall be permanently marked with the date, time, and locations where the test was made. Test results shall be promptly presented to the Engineer.

K. Do not apply any part of a coating system before the Engineer has reviewed the surface preparation. If coating has been applied without this review, if directed by the Engineer, remove the applied coating by abrasive blasting and reapply the coat in accordance with this Specification.

3.03 ABRASIVE BLAST CLEANING

A. Use dry abrasive blast cleaning for metal surfaces. Do not use abrasives in automatic equipment that have become contaminated. When shop or field blast cleaning with handheld nozzles, do not recycle or reuse blast particles.

B. After abrasive blast cleaning and before coating is applied, dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within an 8-hour working day. Do not apply coating over damp or moist surfaces. Reclean any blast-cleaned surface not coated within the 8-hour period before applying primer or touch-up coating.

C. Keep the area of the work in a clean condition and do not permit blasting particles to accumulate and constitute a nuisance or hazard.

D. During abrasive blast cleaning, prevent damage to adjacent coatings. Schedule blast cleaning and coating so that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

E. Dust, dirt, blast particles, old coatings, rust, mill scale, etc., from abrasive blast cleaning shall not be discharged into any water, including stormwater ditches and ponds. If these materials are discharged to the ground, they shall be removed and properly disposed after painting and coating operations are complete.

3.04 PREPARATION OF CONCRETE AND MASONRY SURFACES TO BE COATED (NOT USED)

3.05 COATING STAINLESS STEEL (NOT USED)

3.06 PROCEDURES FOR ITEMS HAVING SHOP-APPLIED PRIME COATS

A. After applying primer to surfaces, allow coating to cure for a minimum of 2 hours before handling to minimize damage.

B. When loading for shipment to the project site, use spacers and other protective devices to separate items to prevent damaging the shop-primed surfaces during transit and unloading. If wood spacers are used, remove wood splinters and particles from the shop-primed surfaces after separation. Use padded chains or ribbon binders to secure the loaded items and minimize damage to the shop-primed surfaces.

C. Cover shop-primed items 100% with protective coverings or tarpaulins to prevent deposition of road salts, fuel residue, and other contaminants in transit.

D. Handle shop-primed items with care during unloading, installation, and erection operations to minimize damage. Do not place or store shop-primed items on the ground or on top of other work unless the ground or work is covered with a protective covering or tarpaulin. Place shop-primed items above the ground upon platforms, skids, or other supports.

3.07 FIELD TOUCH-UP OF SHOP-APPLIED PRIME COATS

A. Remove oil and grease surface contaminants on metal surfaces in accordance with SSPC SP-1. Use clean rags wetted with a degreasing solution, rinse with clean water, and wipe dry.

B. Remove dust, dirt, salts, moisture, chalking primers, or other surface contaminants that will affect the adhesion or durability of the coating system. Use a high-pressure water blaster or scrub surfaces with a broom or brush wetted with

a solution of Trisodium Phosphate, detergent, and water. Before applying intermediate or finish coats to inorganic zinc primers, remove any soluble zinc salts that have formed by scrubbing with a stiff bristle brush. Rinse scrubbed surfaces with clean water.

C. Remove loose or peeling primer and other surface contaminants not easily removed by the previous cleaning methods in accordance with SSPC SP-7. Take care that the remaining primers are not damaged by the blast cleaning operation. The remaining primers shall be firmly bonded to the steel surfaces with blast-cleaned edges feathered.

D. Remove rust, scaling, or primer damaged by welding or during shipment, storage, and erection in accordance with SSPC SP-10. Take care that the remaining primers are not damaged by the blast cleaning operation. Areas smaller than 1 square inch may be prepared in accordance with SSPC SP-11. The remaining primers shall be firmly bonded to the steel surfaces with cleaned edges feathered.

E. Use repair procedures on damaged primer that protect adjacent primer. Blast cleaning may require the use of lower air pressure, smaller nozzles and abrasive particle sizes, short blast nozzle distance from surface, shielding, and/or masking.

F. After abrasive blast cleaning of damaged and defective areas, remove dust, blast particles, and other debris by dusting, sweeping, and vacuuming; then apply the specified touch-up coating.

G. Surfaces that are shop primed with inorganic zinc primers shall receive a field touch-up of organic zinc primer as specified in System No. 18 to cover scratches or abraded areas.

H. Other surfaces that are shop primed shall receive a field touch-up of the same primer used in the original prime coat.

3.08 PAINTING SYSTEMS

A. All materials of a specified painting system, including primer, intermediate, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer for the particular coating system.

B. Deliver paints to the jobsite in the original, unopened containers.

3.09 PAINT STORAGE AND MIXING

A. Store and mix materials only in areas designated for that purpose by the Engineer. The area shall be well ventilated, with precautionary measures taken to prevent fire hazards. Post “No Smoking” signs. Storage and mixing areas shall be clean and free of rags, waste, and scrapings. Tightly close containers after each use. Store paint at an ambient temperature from 50°F to 100°F.

B. Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touch-up painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

3.10 PROCEDURES FOR THE APPLICATION OF COATINGS

A. Conform to the requirements of SSPC PA-1. Follow the recommendations of the coating manufacturer, including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application, and safety precautions.

B. Stir, strain, and keep coating materials at a uniform consistency during application. Power mix components. For multiple component materials, premix each component before combining. Apply each coating evenly, free of brush marks, sags, runs, and other evidence of poor workmanship. Use a different shade or tint on succeeding coating applications to indicate coverage where possible. Finished surfaces shall be free from defects or blemishes.

C. Do not use thinners unless recommended by the coating manufacturer. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material. Stir coating materials at all times when adding thinner. Do not flood the coating material surface with thinner before mixing. Do not reduce coating materials more than is absolutely necessary to obtain the proper application characteristics and to obtain the specified dry-film thicknesses.

D. Remove dust, blast particles, and other debris from blast cleaned surfaces by dusting, sweeping, and vacuuming. Allow ventilator fans to clean airborne dust to provide good visibility in working area before applying coating. Remove dust from coated surfaces by dusting, sweeping, and vacuuming before applying succeeding coats.

E. Apply coating systems to the specified minimum dry-film thicknesses as determined in accordance with SSPC PA-2.

F. Apply primer immediately after blast cleaning and before any surface rusting occurs, or any dust, dirt, or any foreign matter has accumulated. Before applying coating, re-clean surfaces that have surface colored or become moist by blast cleaning.

G. Apply a brush coat of primer on welds, sharp edges, nuts, bolts, and irregular surfaces before applying the primer and finish coat. Apply the brush coat before and in conjunction with the spray coat application. Apply the spray coat over the brush coat.

H. Before applying subsequent coats, allow the primer and intermediate coats to dry for the minimum curing time recommended by the manufacturer. In no case shall the time between coats exceed the manufacturer's recommendation.

I. Each coat shall cover the surface of the preceding coat completely and there shall be a visually perceptible difference in applied shade or tint of colors.

J. Applied coating systems shall be cured at 75°F or higher for 48 hours. If temperature is lower than 75°F, curing time shall be in accordance with printed recommendations of the manufacturer, unless otherwise allowed by the Engineer.

K. Assembled parts shall be disassembled sufficiently before painting or coating to ensure complete coverage by the required coating.

3.11 SURFACES NOT TO BE COATED

A. Do not paint the surfaces listed below unless otherwise noted in the Drawings or in other Sections. Protect the following surfaces during the painting of adjacent areas:

1. Stainless steel.
2. Nameplates.
3. Grease fittings.
4. Buried pipe, unless specifically required in the piping Sections.
5. Aluminum handrail, stairs, and grating.

3.12 PROTECTION OF SURFACES NOT TO BE PAINTED

A. Remove, mask, or otherwise protect hardware, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from

falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. Mask openings in motors to prevent paint and other materials from entering the motors.

3.13 SURFACES TO BE COATED

A. The exact coating to be applied in any location is not designated by the descriptive phrases in the coating system titles such as “corrosive environment,” “buried metal,” or “submerged metal.” Coat surfaces with the specific coating systems as described below:

1. Coat mechanical equipment, such as pumps, as described below or in the various mechanical equipment specifications. The color of the finish coat shall match the color of the connecting piping.

2. Coat aboveground and exposed piping or piping in vaults and structures as described below. The color of the finish coat shall be as shown below.

Piping Designation	Color of Finish Coat
Leachate	Yellow

3. Coat valves as described the same as the adjacent piping. Aboveground valves, or valves in vaults and structures, shall match the color of the connecting piping.

4. Coat aluminum surfaces in contact with concrete as specified in System No. 51.

5. Coat buried flanges, nuts, and bolts, valves, flexible pipe couplings, exposed rebar in thrust blocks, and valve boxes as specified in System No. 21. Coat buried bolt threads, tie bolt threads, and nuts as specified in System No. 24.

3.14 DRY-FILM THICKNESS TESTING

A. Measure coating thickness specified for carbon steel surfaces with a magnetic-type dry-film thickness gauge in accordance with SSPC PA-2. Measure coating thickness specified for stainless steel, and aluminum surfaces with an eddy-current-type thickness gauge in accordance with ASTM D7091. Provide certification that the gauge has been calibrated by a certified laboratory within the past 6 months. Provide dry-film thickness gauge as manufactured by Mikrotest or Elcometer.

B. Check each coat for the correct dry-film thickness. Do not measure within 8 hours after application of the coating.

C. For metal surfaces, make five separate spot measurements (average of three middle readings) spaced evenly over each 100 square feet of area (or fraction thereof) to be measured. Make three readings for each spot measurement of either the substrate or the paint. Move the probe or detector a distance of 1 to 3 inches for each new gauge reading. Discard any unusually high or low reading that cannot be repeated consistently. Take the average (mean) of the three readings as the spot measurement. The average of five spot measurements for each such 100-square-foot area shall not be less than the specified thickness. No single spot measurement in any 100-square-foot area shall be less than 80% nor more than 120% of the specified thickness. One of three readings which are averaged to produce each spot measurement may underrun by a greater amount as defined by SSPC PA-2.

D. Perform tests in the presence of the Engineer.

3.15 REPAIR OF IMPROPERLY COATED SURFACES

A. If the item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Sandblast or power-sand visible areas of chipped, peeled, or abraded paint, feathering the edges. Then prime and finish the coat in accordance with the Specifications. The work shall be free of runs, bridges, shiners, laps, or other imperfections.

3.16 CLEANING

A. During the work, remove discarded materials, rubbish, cans, and rags at the end of each day’s work.

B. Thoroughly clean brushes and other application equipment at the end of each period of use and when changing to another paint or color.

C. Upon completion of painting work, remove masking tape, tarps, and other protective materials, using care not to damage finished surfaces.

END OF SECTION

DIVISION 11

EQUIPMENT

SECTION 11000
GENERAL EQUIPMENT REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies general work requirements regarding the products and execution services that are specified in the Division 11 Sections incorporated in the Contract Documents. The requirements specified shall apply to all of the Division 11 Sections, unless noted otherwise.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. The submittal contents for equipment, instrumentation, controls, and appurtenances specified in the Division 11 Sections shall contain the general information listed below. Additional submittal requirements are contained in the Division 11 Sections.

1. A list and description of all deviations from the Contract Documents.
2. A list of equipment and components on each drawing with each product identified by legend reference. Include product name, manufacturer, and model number.
3. Completely dimensioned plans, elevations, and cross-sections of system equipment and sub-assemblies.
4. Shop and erection drawings showing details, anchor bolt locations, and field connections.
5. Manufacturers' equipment installation instructions.
6. Descriptive literature, technical bulletins, and catalog data sheets for all equipment and purchased sub-components.
7. Installation, operation, maintenance and start-up procedures.
8. Total equipment weight (while operating).
9. Drive mechanism torque rating and bearing life rating.
10. Motor data and catalog information.
11. Submit complete electrical drawings, schematics, and interconnecting wiring diagrams and schedules for the equipment control system, instrumentation, and control panel(s) showing numbered wiring terminals in the control panel conforming to NEMA ICS-1-101. Identify field device terminals, wire number, wire sizes, control and power wire types, and interfaced elements.

12. Control panel construction and panel layout drawings.
13. Complete technical literature for all factory-applied paint systems. Clearly indicate the components to be coated and the corresponding paint system.
14. Manufacturers' descriptive literature, product specifications, and published details.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. National Electrical Manufacturers Association (NEMA)

1. NEMA ICS-1—Industrial Control and Systems: General Requirements.

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: The Contractor shall comply with construction requirements of State, County, and other local political subdivision specifications as may exceed the requirements of the codes, standards, and approving bodies referenced in this Section.

1. NFPA Standards: The Contractor shall comply with requirements of the National Fire Protection Association (NFPA) Standards referenced in the various Specifications Sections and as directly appropriate to the work and workmanship.
2. Electrical Requirements: The Contractor shall comply with requirements for both the Underwriters' Laboratories, Inc. (UL) Listings, Labels, and Approvals and the National Electrical Manufacturers' Associations (NEMA) Stamps or Seals as applicable to electrical equipment or apparatus forming parts of the Mechanical Equipment.

B. Certificates and Permits: Upon completion of work and before final payment, the Contractor shall furnish to the Engineer formal certification of final inspections from authorities having jurisdiction over the work in this project and secure required permits, if any, from such authorities. Additionally, the Contractor shall prepare any detailed diagrams and drawings that are required by those authorities having jurisdiction over the work of this project at no additional cost to the Owner.

C. Source Quality Control: Products used throughout these Specifications and as indicated on the Drawings shall be from companies having established reputations

in the manufacture of the particular materials, equipment, or apparatus specified. Such products may be of their own make or products of others for which they assume full responsibility when used in finished products which are not manufactured completely by them and with replacement parts available.

D. Products: The equipment specified in the Division 11 Sections was based on the latest models that were available from the specified equipment manufacturers at the time the Contract Documents were developed. If any equipment models specified in the Division 11 Sections have been discontinued or will be discontinued within 1 year after the bid date, the Contractor shall furnish and install the latest and most recent equipment model at no additional cost to the Owner.

E. For each category of materials and equipment (Products) specified in the Division 11 Sections, the Contractor shall provide Products of the same manufacturer and type.

F. Equipment Selection: The Contractor may furnish equipment of higher electrical characteristics, physical dimensions, capacities, and ratings provided such proposed equipment is approved by the Engineer in writing. Upon receiving the Engineer's approval to provide such equipment, the Contractor shall furnish the connecting mechanical and electrical services including but not limited to circuit breakers, conduit, increased control panel enclosure size, motors, bases, and any other electrical equipment needed to accommodate the higher electrical characteristics at no additional cost to the Owner.

G. If minimum energy ratings or efficiencies of equipment are specified in Division 11, Equipment, the Contractor shall furnish and install equipment that meets or exceeds the specified design and commissioning requirements (no exceptions) as determined by the Engineer.

H. All the equipment specified in the Contract Documents shall be standard units of proven ability as manufactured by a competent organization that is fully experienced, reputable and qualified in the manufacture of the equipment to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practice and methods and shall operate satisfactorily when installed.

1.05 WARRANTIES

A. Warranties shall be in accordance with the General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

1.07 QUALIFICATIONS

A. The manufacturer of each piece of equipment described in the Division 11 Sections shall meet the following requirements, unless noted otherwise:

1. Have a record of operation, manufacturing and servicing the items specified in the Division 11 Sections for a minimum of 10 years before the Bid Date.
2. Have a minimum of five installations of equipment similar to that specified in this Section.
3. Have been in business for at least the 10 consecutive years before the Bid Date.

B. If the equipment manufacturer that the Contractor proposes to furnish and install the equipment described in the Division 11 Sections does not meet these qualifications and is not specified in the Contract Documents, the Engineer reserves the right to reject the equipment from this manufacturer for use on this project. Any costs incurred by the Contractor as a result of providing equipment from a manufacturer that does not meet the qualifications described in this Section shall not be incurred by the Owner.

C. The Contractor shall furnish documentation that the manufacturer meets these qualifications as part of the submittals specified in Section 01330, Submittals and Acceptance.

1.08 MAINTENANCE

A. Spare Parts

1. The Contractor shall furnish the spare parts specified in the Division 11 Sections. The Contractor shall also submit a list of recommended spare parts, special tools, and lubricants for each equipment item. The list shall include contact information for local sources for supply of all parts and professional service.

1.09 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

PART 2 PRODUCTS

2.01 MOTORS

A. All motors identified in Division 11 Sections shall be furnished and installed under Division 11, Equipment, and in accordance with Division 16, Electrical.

2.02 CONTROLS

A. General

1. All control panels specified in the Division 11 Sections shall be furnished and installed under Division 11, Equipment, and in accordance with Division 16, Electrical.

2. The Contractor shall furnish and install controls designed to operate on 120-volt, single-phase, 60 Hertz electric service unless otherwise specified. The Contractor shall furnish and install 120-volt step-down voltage transformers as specified in Division 16, Electrical, in each control panel as required.

3. The Contractor shall furnish and install elapsed time meters in each control panel for each piece of motor-driven equipment being controlled by that control panel. All elapsed-time meters shall be furnished and installed in accordance with Division 16, Electrical.

4. All control panels shall be furnished with a main circuit breaker to enable/disable electric service to the panelboard.

5. All control panels that will annunciate a local and/or remote alarm shall be furnished with an ALARM ACKNOWLEDGE reset pushbutton switch (momentary contact) wired to each alarm contact.

6. All indicating lamps in each control panel shall be furnished in accordance with the color-coded scheme:

   a. ON indicating lamps: Green.
   b. OFF indicating lamps: Red.

c. Alarm indicating lamps: Amber.
d. POWER ON indicating lamp: White.

7. Provide a heater inside of each control panel enclosure to prevent condensation. Heater size shall be in accordance with the equipment manufacturer's recommendations.

8. The face of each control panel shall be installed so it is facing north whenever possible, or provided with a sunshield when not possible.

2.03 EQUIPMENT ANCHORING SYSTEMS

A. All anchoring systems including, but not limited to, expansion anchors, adhesive anchors, anchor bolts, cinch anchors, and screws that are required to install the equipment and appurtenances specified in the Division 11 Sections shall be AISI Type 316 stainless steel unless noted otherwise. The Contractor shall furnish and install all equipment anchoring systems in accordance with the manufacturer's recommendations.

2.04 EQUIPMENT NAMEPLATES

A. The Contractor shall provide engraved laminated phenolic nameplates with white legend and black field that provides the following information for each piece of equipment described in the Division 11 Sections.

1. Equipment Description (i.e., Leachate Collection Pump, Leak Detection Pump, etc.).
2. Equipment Identification Label No.

B. Letter height on each nameplate shall not be less than 3/4-inch. Nameplates shall be factory drilled for fasteners. Secure nameplates to equipment or nearby wall using AISI Type 304 stainless steel fasteners. The locations of each nameplate shall be coordinated with the Engineer and approved by the Engineer before their installation.

C. The Contractor shall obtain the Engineer's approval for the nameplate information for each equipment item described in the Division 11 Sections before ordering these nameplates from the manufacturer.

2.05 PRESSURE GAUGE ASSEMBLIES – PUMPING UNITS

A. General: The Contractor shall provide a pressure gauge assembly as specified in Section 15125, Piping Appurtenances, on the suction and discharge piping. The intent of the Drawings is not to show the locations of every pumping unit pressure

gauge. Rather, the Contractor shall mount each pressure gauge as close to the pump suction and discharge connections as possible, but so as not to impede the operation and maintenance of the pressure gauge assembly, pumping unit, and valves installed on the pumping unit suction and discharge piping. Coordinate the location of all pressure gauge assemblies with the Engineer before installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: The Contractor shall install the equipment in accordance with the manufacturer's instructions and recommendations and approved submittals at the locations shown on the Drawings. If the equipment locations shown on the Drawings are in conflict with the manufacturer's recommendations or will interfere with the installation or operation of any other item indicated in the Contract Documents, the Contractor shall relocate this equipment and provide the necessary appurtenances to install the equipment in accordance with the manufacturer's recommendations at no additional cost to the Owner. The Contractor shall not install any equipment at locations not in accordance with the Contract Documents or approved submittals.

B. The Contractor shall install equipment, slabs, walls level and plumb, parallel, and perpendicular to other components unless otherwise shown on the Drawings.

C. The Contractor shall apply an anti-seize compound to threaded fasteners of equipment components that require removal, replacement, or adjustment as part of any maintenance or inspection procedure.

D. The Contractor shall furnish and install the required oil and grease for initial operation in accordance with the manufacturer's recommendations.

E. The Contractor shall furnish and apply touch-up paint to any equipment's factory painting finish that is chipped or damaged during installation. All factory-finish touch-up paint shall be mutually compatible with the factory finish on the equipment and shall be furnished by the manufacturer of the equipment to be touched up in the field.

F. The Contractor shall furnish and install all mechanical equipment to facilitate service, maintenance, and repair or replacement of the equipment components. The Contractor shall connect equipment for ease of disconnecting, with minimum interference to other installations.

3.02 FIELD TESTING

A. General: The Contractor shall provide services of a factory-authorized service representative to perform, approve, and certify the field testing specified in this Section. Field testing shall generally consist of performing the pre-startup and startup tests as specified in the Division 11 Sections and the final mechanical performance test specified in this Section. The Contract Documents may require the Contractor to perform factory testing on equipment items before the Engineer approves their use for this project. The Contractor shall refer to the Division 11 Sections regarding equipment shop testing requirements.

B. The Contractor shall adhere to the following requirements regarding the field testing to be provided for this project:

1. The service representative shall be employed by the manufacturer of the equipment specified at the time field testing is being performed. The service representative shall be authorized by the factory to perform the field testing specified in Division 11, Equipment. Upon request by the Engineer, the Contractor shall submit a letter from a company officer of the equipment manufacturer stating that the service representative performing the field testing is authorized by the manufacturer.
2. Before scheduling each field test with the equipment manufacturer, the Contractor shall coordinate with the Engineer to obtain a list of dates that both parties would be available to attend the testing. The Contractor shall notify the Engineer of the field testing dates no less than 14 calendar days before the date of the field test.
3. If directed by the Engineer, the Contractor shall perform a second pre-startup and/or startup test, in accordance with the procedures specified in the Division 11 Sections, at no additional cost to the Owner if the original pre-startup and/or startup test did not pass because of any work that was deemed by the Engineer to be non-compliant with the Contract Documents and/or manufacturer's recommendations.
4. The Contractor shall furnish, install, and remove any temporary piping, valves, appurtenances, and equipment necessary to perform the pre-startup and startup testing to the Engineer's satisfaction.
5. All field testing shall be performed Monday through Friday at the project site, unless otherwise approved by the Engineer.
6. The duration that the manufacturer's representative is required to be on site to perform the pre-startup and startup training is specified in the Division 11 Sections.

C. Operating Costs

1. Costs for Pre-startup and Startup Testing: The Contractor shall include in the Contract Price the following operating costs for satisfactorily completing the Initial Mechanical Performance Tests on equipment being tested:

    a. Lubricating grease.
    b. Lubricating oils.
    c. Such other materials or utilities not specifically identified in this Section, but required to conduct the pre-startup and startup testing.

D. The intent of the field testing for each equipment item specified in the Division 11 Sections is provided in this Section. If the individual equipment field testing procedures specified in the Division 11 Sections are not sufficient to obtain a Manufacturer's Certification or to demonstrate compliance with the Contract Documents, the Contractor shall perform these additional field test procedures at no additional cost to the Owner.

1. Pre-startup Testing: Upon the Contractor's completion of the installation and adjustment of the equipment; the Contractor, with his own forces and with the manufacturer's representative(s), shall demonstrate to the Engineer's satisfaction that the equipment has been furnished and installed in accordance with the Contract Documents and the manufacturer's recommendations.

    a. The Contractor shall repair any equipment items that do not pass the pre-startup test, as identified by the Engineer and/or manufacturer's representative, to the satisfaction of the Engineer before performing the startup testing for that equipment.

2. Startup Testing: Upon successful completion of the pre-startup testing, the Contractor shall demonstrate that the mechanical performance and controls of each equipment item, when operated in accordance with the design intent indicated by the Contract Documents, are satisfactory to the Engineer.

    a. Startup testing shall be performed with each equipment item simulated under operating conditions. For equipment that will operate while being submerged as shown on the Drawings, the Contractor shall fill the respective sump with sufficient water to operate the system and perform startup testing while that equipment is submerged.

b. After the startup testing procedures specified in the Division 11 Sections have been completed to the satisfaction of the Engineer, the Contractor shall operate that equipment for one successful continuous 72-hour period unless otherwise approved by the Engineer without assistance from the Owner or Engineer as a condition of startup testing. If the equipment needs to be taken out of service for repair during this 72-hour period because it is not operating in accordance with the intent of the Contract Documents, this operating period shall cease. A new operating period will not begin until the equipment has been operating in accordance with the Contract Documents and manufacturer's recommendations for at least 72 consecutive hours. The Contractor shall furnish any additional supervision or provisions necessary to verify that each equipment item was successfully operated during this 72-hour operating period.

3. Final Mechanical Performance Testing: The Contractor shall perform final mechanical performance testing of the equipment specified in the Division 11 Sections once the following conditions have been satisfied:

a. The Contractor has successfully completed the pre-startup and startup testing requirements specified in the Division 11 Sections.
b. The Contractor has performed the training services specified in this Section.
c. The Engineer has received and approved all of the manufacturer's certifications of compliance, warranties, and O&M manuals for all required items as specified in the Contract Documents.

3.03 TRAINING SERVICES

A. Upon completion of the pre-startup and startup testing, the manufacturer of the equipment specified in Division 11 and 15 Sections shall provide an authorized representative to train the Owner's personnel in the operation and maintenance of the equipment. The representative shall provide additional onsite startup and troubleshooting services during this training upon request by the Engineer while performing these training services. The duration of the training services for each equipment item are specified in the Division 11 Sections.

3.04 MANUFACTURER'S CERTIFICATIONS OF COMPLIANCE

A. Upon successful completion of the pre-startup testing, startup testing, and training services specified in this Section, the Contractor shall obtain the equipment manufacturer's certification that the equipment specified in the respective Division 11 Sections has been installed, adjusted, and tested in accordance with

the manufacturer’s recommendations. The Contractor shall furnish the Engineer with Manufacturer's Certificates of Compliance and Equipment Manufacturer’s Certificate of Installation Testing and Instruction for each specified equipment item before performing the final mechanical performance testing specified in this Section.

MANUFACTURER'S CERTIFICATE OF COMPLIANCE

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been: (Check Applicable)

_____ Installed in accordance with Manufacturer's recommendations.

_____ Inspected, checked, and adjusted.

_____ Serviced with proper initial lubricants.

_____ Electrical and mechanical connection meet quality and safety standards.

_____ All applicable safety equipment has been properly installed.

_____ System has been performance tested, and meets or exceeds specified performance requirements (when complete system of one manufacturer).

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment, and (iii) authorize the make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer: _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION TESTING AND INSTRUCTION

OWNER _____

PROJECT _____

CONTRACT NO. _____

Jones Edmunds No. _____

EQUIPMENT SPECIFICATION SECTION _____

EQUIPMENT DESCRIPTION _____

I _____, Authorized representative of
(Print Name)

_____
(Print Manufacturer's Name)

hereby CERTIFY that _____
(Print equipment name and model with serial No.)

Installed for the subject project has/have been installed in a satisfactory manner, has/have been satisfactorily tested, is/are ready for operation, and that Owner assigned operating personnel have been suitably instructed in the operation, lubrication, and care of the units on Date:

_____ Time: _____.

CERTIFIED BY: _____ DATE: _____
(Signature of Manufacturer's Representative)

OWNER'S ACKNOWLEDGEMENT OF MANUFACTURER'S INSTRUCTION

I/We the undersigned, authorized representatives of the _____ and/or Plant Operating Personnel have received classroom and hands on instruction on the operation, lubrication, and maintenance of the subject equipment and am/are prepared to assume normal operational responsibility for the equipment:

_____ DATE: _____

_____ DATE: _____

_____ DATE: _____

END OF SECTION

SECTION 11300
LEACHATE PUMPS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, new materials, equipment, and incidentals necessary for the complete installation of the Cell 5 Landfill Expansion submersible leak detection and leachate collection pumps, including but not limited to pumps, motors, retrieval cables, junction boxes, transducers, flow sensors, controls, instrumentation, and other appurtenances as shown on the Drawings and specified in this Section and other applicable sections. Seven total pumps to be provided with six pumps installed and one spare.

B. The Contractor shall furnish controls, instrumentation, conduit, wiring, appurtenances, and all labor for the complete electrical installation of the submersible leak detection and leachate collection pumps as shown on the Drawings and specified in this Section and other applicable sections.

C. The pump supplier shall be responsible for overall supply and quality of these items and shall be responsible for testing, start-up, troubleshooting, and personnel training for the submersible leachate collection and leak detection pumps.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Shop Drawings: The Contractor shall submit integrated shop drawings for the pumping systems at each of the three pump stations illustrating the mechanical and electrical equipment and components specified in this Section and including the following:

1. Product Data: For each mechanical and electrical component include the manufacturer’s descriptive literature, product specifications, published details, technical bulletins, performance, and capacity-rating curves with primary and secondary design conditions clearly noted, charts, and schedules, catalog data sheets, and other submittal materials as required to

verify that the proposed products conform to the quality and function of the specified products.

a. Identification: Clearly indicate by an arrow on submissions covering more than one product type or style exactly which product is being submitted for approval.
b. Equipment Characteristics: Provide bearing ratings, complete motor data, service factors, and weights of principal parts and assembled equipment.
c. Manufacturer: Include the catalog name, company name, address, and telephone number for each product submitted.
d. Full description and schematic of mechanical seal design, operation and protection devices, including oil lifter design and operation. A mechanical seal oil lifter must be included in the seal design.
e. Full description and schematic of motor cable entrance. Must indicate anti-wicking device as well as cable strain relief design.

2. Equipment Drawings: Submit completely dimensioned plan, elevations, and cross-sections of system equipment and sub-assemblies. Comprehensive two-dimensional CAD drawing of the pump stations control panel exterior as viewed from the front and side. Submittal shall also include complete control panel interior layout showing location of panel component parts as well as full electrical schematic of control panel operation and associated ladder logic diagrams.

3. Layout Drawing: Submit completely dimensioned drawing of a riser pump assembly that includes pump wheel/skid details, pump discharge and riser connections and materials, installation notes, and other pertinent details.

4. Product List: Provide a list of equipment and components on each drawing with each product identified by legend reference. Include product name, manufacturer, and model number. The Contractor shall submit a complete list of materials and equipment to be incorporated in the control panel. The list shall include catalog numbers, cut sheets, diagrams, and other descriptive data required to demonstrate conformance with the Specifications. Partial lists shall not be acceptable. The basis of acceptance shall be the manufacturer’s published ratings for the equipment. The manufacturer shall be regularly engaged in the manufacture of products specified.

5. Additional Requirements: See Division 16, Electrical, for additional submittal requirements for the control panels furnished under this Section and specified below.

B. The Contractor shall submit written certification from the pump supplier that the riser size and layout are acceptable for the pump installation.

C. Pump Test Report: Submit certified copies of factory-run pump performance test curves. Factory certified performance test curves shall indicate the following:

1. Flow in gallons per minute.

2. Pressure in feet of water.

3. Horsepower.

4. Pump efficiency.

5. Pump data:

   a. Model number.
   b. Serial number.
   c. Impeller diameter and type.
   d. Impeller speed.

6. Test condition data:

   a. Date of test.
   b. Mean water temperature.

D. Operating Instruction: For the pump furnished under this Section, the Contractor shall submit operation and maintenance manuals. At a minimum these manuals shall include:

1. General—Equipment function, description, normal and limiting operating characteristics.
2. Installation instructions.
3. Operation instructions—start-up procedure, normal operating conditions, and emergency and normal shut-down procedures.
4. Lubrication and maintenance instructions.
5. Troubleshooting guide.
6. Suggested parts that should be held on site as spares that are mandatory.
7. Drawings—Cross-sectional views, assembly and wiring diagrams.
8. Pump performance curves.

E. Factory Performance Test Data: A qualified technician shall be provided for 1 day to instruct representatives of the Owner and the Engineer on proper operation and

maintenance. With the permission of the Engineer, this work may be conducted in conjunction with the inspection of the installation and system start up per Part 3 of this Section. If during start up there is an equipment failure due to the pump manufacturers design or fabrication of the equipment, additional services shall be provided at no additional cost to the Owner. System start up shall be completed by a factory technician. This technician should be a direct employee of the manufacturer who has had first-hand dealings with the equipment through its production at the factory.

F. Certifications: The Contractor shall furnish the Consultant with a written certification signed by the manufacturer that the equipment has been properly installed and is free from stress imposed by piping or mounting bolts. The form should indicate that all equipment has been operated without fault under load conditions and that satisfactory operation has been obtained.

G. Warranty: Submittals shall include manufacturer's warranty that is in accordance with Article 1.05, Warranties, of this Section and Section 01780, Warranties and Bonds.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American National Standards Institute (ANSI)

1. ANSI C2—National Electrical Safety Code (NESC).
2. ANSI C62.41—Guide on Surge Voltages in AC Power Circuits Rated up to 600V.
3. ANSI C62.45—Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and less) AC Power Circuits.

B. American Society for Testing and Materials (ASTM)

C. Federal Specifications and Standards (FSS)

1. FSS W-C-596G(2)—Connector, Electrical Power (General Specification).
2. FSS W-P-115C—Panel, Power Distribution.

D. Hydraulic Institute (HI)

1. HI-01—Standards for Centrifugal, Rotary and Reciprocating Pumps.

E. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 112—Standard Test Procedure for Polyphase Induction Motors and Generators.
2. IEEE 117—Standard Test Procedure for Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery.

F. International Standards Organization (ISO)

1. ISO 5199—Technical Specifications for Centrifugal Pumps, Class II.
2. ISO 7005-2—Metallic Flanges Part 2: Cast Iron Flanges.

G. National Electrical Manufacturer's Association (NEMA)

1. NEMA ICS 1—Industrial Control and Systems: General Requirements.
2. NEMA ICS 6—Industrial Controls and Systems: Enclosures.
3. NEMA MG 1—Motors and Generators.
4. NEMA PB 1—Panelboards.
5. NEMA ST 20—Dry-Type Transformers for General Applications.
6. NEMA WD 1—General Color Requirements for Wiring Devices.

H. National Fire Protection Association (NFPA)

1. NFPA 70—National Electrical Code (NEC).
2. NFPA 79—Electrical Standard for Industrial Machinery.
3. NFPA 101—Life Safety Code.

I. Underwriters Laboratories (UL)

1. UL 50—Enclosures for Electrical Equipment.
2. UL 67—Panelboards.
3. UL 83—Thermoplastic-Insulated Wires and Cables.
4. UL 467—Grounding and Bonding Equipment.
5. UL 508—Industrial Control Equipment.
6. UL508A—Industrial Control Panel.
7. UL 698A—Standard for Safety Industrial Control Panels Relating to Hazardous (Classified) Locations.

1.04 QUALITY ASSURANCE

A. Unit Responsibility: The pumps shall be supplied by the pump supplier. The pump supplier shall have experience in providing equipment for leachate removal.

B. Factory Tests: The pump supplier shall perform the following tests on each pump before shipment from the factory.

1. Pump performance test.
2. Megger the pump to check for insulation breaks or moisture.

C. Each submittal for equipment, components or system components shall be accompanied by an "Equipment Warranty and Certification Form." The form shall be duly executed by an authorized principal of the manufacturer warranting and certifying that the equipment and system components proposed meet or exceed the specifications, is suitable for its intended purpose, and will provide satisfactory performance at the design criteria specified. In the event that the manufacturer is not the supplier, an authorized principal of the supplier shall also execute the equipment warranty and certification form.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

B. All work, equipment, and materials furnished and installed shall be warranted against defective design, materials, and workmanship for 2 years. The warranty period shall begin at the date of Substantial Completion.

C. The warranty shall cover replacement equipment materials, parts, and/or repair, including labor, travel time, shipping costs, and other miscellaneous expenses, at no additional cost to the Owner for the full warranty period.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, and this Section for storing and protecting the items specified in this Section.

B. The Contractor shall deliver a complete system including all parts listed in the submittal sent to the Engineer.

C. Store in a weather-tight building or suitable covering to protect against damage of any nature.

1.07 QUALIFICATIONS

A. The manufacturer(s) of the equipment specified shall meet the following requirements:

1. Shall have been in business for at least 10 years before the Bid Date.
2. Shall have a record of operating, manufacturing, and servicing the types of items specified for a minimum of 10 years before the Bid Date.
3. Shall have a minimum of five installations of equipment similar to and meeting the requirements specified in this Section at landfills in Florida before the bid date.

1.08 TESTING REQUIREMENTS

A. Testing shall be performed as specified in Part 3 of this Section.

1.09 OPERATIONS AND MAINTENANCE (O&M) MANUALS

O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals, and shall include the following:

A. Installation instructions.

B. Functional description of the pumping control system for each mode of operation of equipment.

C. Automatic and manual operation.

D. Alarms and fail-safe features.

E. Interlocked and/or interfaced equipment operation and control.

F. Exploded view drawings and illustrations with descriptions for assembly and disassembly of equipment.

G. Comprehensive parts and materials maintenance and repair list for each equipment element indicating the manufacturer and the manufacturer's identification number. Include name, address, and telephone number of local sales and service office for major equipment items.

H. Schedules of recommended spare parts to be stocked, including part number, inventory quantity, and ordering information.

I. Performance rating and nameplate data for each major system component.

J. Procedures for starting, operating, adjusting, calibrating, testing, and shutting down system equipment.

K. Emergency operating instructions and trouble-shooting guide.

L. Schedule of routine maintenance requirements and procedures, and preventative maintenance instructions required to ensure satisfactory performance and equipment longevity.

M. Maintenance instructions for extended out-of-service periods.

N. Field-verified power and control wiring schematics. Submit the approved schematics in each manual. After initial start-up and operation, correct these schematics to reflect any required field changes and submit the required copies for inclusion in the manuals.

O. Preliminary copies of the O&M manuals shall be submitted to the Engineer before arrival of the equipment to the site in accordance with Section 01830, Operations and Maintenance Manuals. The Contractor shall not be compensated for the pumping equipment until the Engineer receives the preliminary O&M manuals. Copies of the final O&M manuals shall incorporate the Engineer's comments and be submitted with copies of the approved shop drawings and test reports in accordance with Section 01830, Operations and Maintenance Manuals.

P. Installation Certificate: Submit a certificate from the manufacturer or from the manufacturer's qualified, factory-authorized representative for each pump furnished and installed and specified in this Section, stating that the installed equipment has been installed, inspected, and adjusted as required in accordance with the manufacturer's written installation procedures and operating instructions and is ready for acceptance by the Engineer.

PART 2 PRODUCTS

2.01 MANUFACTURER OF PUMPING SYSTEM, INCLUDING CONTROL PANELS AND COMPONENTS

A. Interstitial pumping system, including sensors and control panels will be designed and supplied by EPG Companies Inc., Maple Grove, MN and/or approved equal.

B. Other suppliers seeking to furnish products must obtain 10 days prior approval and demonstrate that they are able to furnish products equal to EPG Companies.

1. This includes UL Approval; Major components shall be made of 304 stainless steel construction, E-Glide™ seal rings and bearings, motor lead of "CP" waterproof and chemically resistant jacket.
2. UL approved control panel must be factory tested with pumps and operating sensors.

C. Materials and equipment shall conform to the referenced publications or as specified and indicated and shall be the products of manufacturers regularly engaged in the manufacture of such products.

2.02 SUMMARY OF PUMPS

The pumps shall be the following or Engineer-approved equal:

A. Leachate Collection Submersible Risers Pumps

1. Pumped Liquid Characteristics

a.	Liquid	Class I Landfill Leachate
b.	Temperature Range	18 to 30ºC
c.	pH range	6 to 8.5
d.	Solids Content	Some abrasive grit and fine sand

2. Pump Characteristics

a.	Number of pumps:	5 Total – one install per riser and one uninstalled spare
b.	Primary Design Condition (each)	35 gpm @ 49.5 feet TDH
c.	Secondary Design Condition (each)	80 gpm @ 25 feet TDH
d.	Shut-Off Head	57.5 feet
e.	Solids Handling Size	1/8 inch
f.	Configuration	Sled or wheel mounted
g.	Discharge Size	2-inch NPT
h.	Motor Horsepower	1.0 HP
i.	Electrical Service:	460V, 60 Hz, three phase

3. Acceptable Manufacturers

a. EPG WSDPT SurePump Wheeled Sump Drainer, Series 11, Model 11-2. Four pumps shall be installed in the leachate collection risers,

one per riser. One pump shall be provided to the Engineer as a spare.

b. Engineer-approved equal.

B. Leak Detection Submersible Pumps:

1. Pumped Liquid Characteristics

a.	Liquid	Class I Landfill Leachate
b.	Temperature Range	18 to 30ºC
c.	pH range	6 to 8.5
d.	Solids Content	Some abrasive grit and fine sand

2. Pump Characteristics

a.	Number of pumps:	2 Total – one installed in each riser
b.	Primary Design Condition (each)	35 gpm @ 49.5 feet TDH
c.	Secondary Design Condition (each)	80 gpm @ 25 feet TDH
d.	Shut-Off Head	57.5 feet
e.	Solids Handling Size	1/8 inch
f.	Configuration	Sled or wheel mounted
g.	Discharge Size	2-inch NPT
h.	Motor Horsepower	1.0 HP
i.	Electrical Service:	460V, 60 Hz, three phase

3. Acceptable Manufacturers

a. EPG WSDPT SurePump Wheeled Sump Drainer, Series 11-2. Two pumps shall be installed in the leak detection risers, one per riser.

b. Engineer-approved equal.

2.03 SUBMERSIBLE PUMPS

A. The Contractor shall furnish and install complete pumping systems at the pump station.

1. Two Leachate Collection pumps, two lag Leachate Collection pumps, two Leak Detection pumps, one spare pump.

B. Each pumping system shall include level sensors (transducers), retrieval cables, breakout boxes, and control panel. Retrieval cables shall be of sufficient strength (a minimum of 3/16 inch diameter~~)~~, made of Type 316 stainless steel and of

sufficient length to secure pump at the top of the riser pipe while the pump is in operating position at the sump bottom. The Contractor shall confirm length. The submersible pressure transmitter level sensor shall have adequate range of operation with a 4-20MA output signal. The transmitter shall be constructed with a stainless steel body, stainless steel diaphragm, and Viton seals. The signal cable must be vented and chemical resistant. The transmitter circuit must be protected by intrinsically safe barriers by the Contractor.

C. The Contractor shall furnish junction boxes as shown on the drawings. Enclosures shall be NEMA 7 and suitable for hazardous locations. Furnish and provide a complete discharge piping assembly to connect the pump to the existing piping as shown on the plans.

D. Furnish EPG Model NW stainless steel discharge adapter with NPT fittings or Engineer-approved equal.

E. The submersible pumps shall be capable of handling raw leachate.

F. The pump must be capable of ingesting and passing at least 1/8 inch solids without damaging the pump or causing a reduction in pump flow/head performance. Solids include but are not limited to silt, sand, sediment, HDPE shavings and rock particles.

G. The pump shall include a motor cable entrance with an anti-wicking block created by a break in the power cable insulation to prevent liquid migration into the motor housing in the event that the power cable is damaged. Power cable shall be of sufficient length to connect to the junction box mounted at the top of the riser when the pump is in operating position at the sump bottom. The Contractor shall confirm length.

H. All materials coming in contact with leachate shall be Type 304 stainless steel, Teflon, Viton, or E-Glide.

I. The pump shall permit the unit to "pump down" to within 8 inches to 10 inches of the sump bottom without any loss of performance or damage to the pump.

J. External "priming" shall not be required.

K. The motor and any seals (including mechanical seals) shall not require the use of oil or grease for lubrication.

L. The pump shall be fabricated for use in a riser pipe application. The pumping unit shall be able to slide down the riser pipe and negotiate bends without hanging up

on seams or any riser pipe imperfections. The pumps shall be horizontal submersible pumps.

M. No built-in check valve inside the pump will be permitted. Check valves shall be located on the discharge hose assembly and easily accessible for maintenance. If a check valve is to be located at the pump discharge, the valve should be bored with a 3/16-inch bleed hole that will allow the discharge line to be emptied before removing the pump for maintenance.

N. Pump and motor assemblies shall be spark free and suitable for a Class I Division I environment.

O. Pump shall operate off 460V/3-phase/60-hz electric service.

P. All hose fittings shall be Type 316 stainless steel and shall be suitable for the application. All hose bands shall be hi-torque Type 316 stainless construction.

2.04 MOTOR

A. The motor and its integral protective controls shall be suitable for use in a Class I, Division 1, Group D area.

B. The motors shall have hermetically sealed windings.

C. The power cable shall be of sufficient length to connect to the electrical explosion-proof junction box at the top of the HDPE riser when the pump is in operating position at the sump bottom. No cable splices within the HDPE riser will be permitted. The Contractor shall confirm actual cable length required in the field before pump is delivered.

D. The motor shall not require the use of oil or grease for lubrication.

E. The motor shall have a Kingsbury type thrust bearing capable of handling the maximum thrust load of the pump.

F. The motor pressure equalizing diaphragm assembly shall be Viton.

2.05 CONTROL PANEL

A. The Leachate Pump Station Control Panel (PCP) shall be provided by the pump manufacturer.

B. The PCP shall provide local and automatic pump station control functions and monitor local statuses.

C. Pump cable shall be sized and furnished by the pump manufacturer in accordance with IPECA.

D. As a minimum, the PCP shall incorporate the following features:

1. The pump control panel enclosure shall be gasketed NEMA 4X stainless steel fitted with a 3 point lockable latch and dead front panel. The enclosure shall include a UV resistant Lexan viewing window to allow the operators to view the components mounted on the dead front without the need to open the cabinet. No controls shall be mounted on the face of the enclosure.
2. On-Board 12-button operator interface keypad and 4x20-character LCD display. Configuration parameters shall be adjustable via the 12-button operator interface keypad or required RS-232 service port.
3. The LCD display shall provide the elapsed runtime of each pump, the average runtime of each pump, and the time of day.
4. The pump control shall be configured for duplex operation for the Leachate Collection pumps and simplex operation for the Leachate Detection pump via the on-board keypad.
5. Three elapsed time meters and three time delay relays for 0 to 180 seconds.
6. Three on-board HOA switches (one for each pump). Local-manual-control provided by the HOA switches. Each HOA switch shall be fail-safe and operate in the OFF and HAND position without power applied to the PCP.
7. Integrated pump alternation. The pump alternation function will operate based on the number of pumps configured. Automatic alternation around non-operational pumps shall be provided.
8. Pumps/Starter/Breaker Fault alarms. These alarms shall be activated when a pump is called to run, but fails to run, or if the pump is turned off by the pump controller but continues to run.
9. Multiple level control input options. The PCP shall provide local automatic level control from the transducer. Redundancy of level inputs shall be supported.
10. On-board 480 VAC three-phase-power monitor and motor protection. The phase monitor shall be transformer-isolated and detect loss of phase, phase reversal, low phase and high phase faults. All phase monitor adjustments shall be adjustable from the phase monitor's operator keypad. The power-monitoring function shall provide inputs to the control system identifying operating currents outside preset levels and providing alarms.
11. Phase voltages from phase A to B, B to C, and from phase A to C shall be displayed locally.
12. Integrated Alarm Light output and Alarm Horn output, each capable of driving 120 VAC loads to 1/2 amp. An input shall be supplied for external

alarm silence button, which shall be used to silence the Alarm Horn. Interposing relays for the light and horn terminations shall be provided and installed by the PCP supplier.

13. All inputs and outputs shall be optically or magnetically isolated and surge suppressed.
14. A local RS-232 service port shall provide local access for a programming unit or portable computer to monitor and/or configure all the functions of the PCP.
15. The PCP shall be easily removed/replaced.
16. Supply voltage to the power supply shall be 120 VAC and shall be derived from the PCP via an onboard provided dry transformer.
17. The transient voltage surge suppresser (TVSS) shall be installed on the load side of the main circuit breaker in the PCP. The transient voltage surge suppresser shall be manufactured by Advance Protection Technologies, or approved equal, which is suitable for a 480V, three-phase, secondary power source.

E. As a minimum, the PCP local operator interface terminal shall indicate the following process control parameters.

1. Process Control Parameters

a. The following points shall be monitored at the PCP for each pump station:

(1) Leachate Collection Pump 1 Status.
(2) Leachate Collection Pump 1 Start Fault.
(3) Leachate Collection Pump 2 Status.
(4) Leachate Collection Pump 2 Start Fault.
(5) Leak Detection Pump 1 Status.
(6) Leak Detection Pump 1 Start Fault.
(7) Leachate Collection Pump 1 HOA in AUTO.
(8) Leachate Collection Pump 2 HOA in AUTO.
(9) Leak Detection Pump 1 HOA in AUTO.
(10) Leachate Collection 1 Well Level Transducer (4-20 mA).
(11) Leachate Collection 1 Well Level Transducer Fault.
(12) Leachate Collection 2 Well Level Transducer (4-20 mA).
(13) Leachate Collection 2 Well Level Transducer Fault.
(14) Leak Detection 1 Transducer (4-20 mA).
(15) Leak Detection 1 Transducer Fault.
(16) Leak Detection 1 Flow Meter Input (4-20mA).
(17) Leachate Collection 1 Flow Meter Input (4-20mA).
(18) Leachate Collection 2 Flow Meter Input (4-20mA).
(19) Phase Voltage Fault.

(20) Phase Sequence Fault.
(21) Phase AB Voltage.
(22) Phase AC Voltage.
(23) PCP Controller Fault.
(24) AC Power current outside of range or Fault for each of the pumps. An overall AC Power Fault shall also be provided.
(25) Alarm Horn Status.
(26) Alarm Light Status.
(27) RS-485 Serial Modbus Interface (for current monitoring) connected to phase monitor.

F. The pump controller shall automatically control each pump based on level settings when the associated pump's HOA is in the Auto position. Automatic control functions shall be disabled when the pump's HOA switch is in the "Off" or "Hand" position.

G. No-flow protective logic for all sump pumps.

1. Using coordination through the externally mounted flow transmitters, through the user interface, the Owner shall have the ability to set the "pump no-flow setting", the "pump no-flow delay time", and the "pump no- flow retry time".
2. If the pump is running and the measured flow rate does not exceed the "pump no-flow setting" within the "pump no flow delay time", the pump shall be stopped.
3. After stopping a pump for a no-flow condition, the controller shall wait for the "pump no-flow retry time" and then try running the pump again. If flow rate is detected, then automatic operation will continue. If flow is not detected, then the retry process described above shall continue. After the third failed retry process, a fault will be issued and an alarm sounded.
4. If the Owner sets the "pump no-flow setting" to zero, the no-flow protective logic shall be disabled. This will allow the Owner to continue running the pump in the event that the flowmeter is faulted.

H. Low-Current protective logic (as a proxy for no-flow) for all sump pumps.

1. Through the user interface, the Owner shall have the ability to set the "pump low-current setting", the "pump low-current delay time" and the "pump no flow retry time".
2. If the pump is running and the pump motor current does not exceed the "pump low-current setting" within the "pump low-current delay time", the pump shall be stopped.
3. After stopping a pump for a Low-Current condition, the controller will wait for the "pump low-current retry time" and then try to run the pump

again. If current is normal, automatic operation shall continue in accordance with the standard control sequence. If the current is still below the "pump low-current setting" then the retry process described above will continue. After the third failed retry process, a fault will be issued and an alarm sounded.

4. If the Owner sets the "pump low-current setting" to zero, the Low-Current protective logic will be disabled. This will allow the customer to continue running the pump in the event that the current transducer is faulted.

2.06 LEVEL TRANSDUCER

A. Submersible transducers with adequately sized cable shall be provided for the collection sump and the detection sump.

B. For each pump station, one level transducer shall be used for controlling each of the two Leachate Collection Pumps in two interconnected side slope riser sumps. The transducer attached to the lead pump shall normally be the active transducer. The active transducer shall alternate with the lead and lag pumps unless one of the transducers is out of service. A separate transducer shall be used for controlling one Leak Detection Pump in a separate side-slope riser wet well. The transducers shall be constructed of 300 series stainless steel and shall be mounted to the pump carriage. Transducers shall provide a 4 to 20 mA output signal and come equipped with built-in surge protection. Static accuracy shall be no less than 1.0%.

C. A properly sized sensor cable suitable for leachate service shall be provided in a length suitable for the application, field trimmed by the installing contractor. No cable splices will be permitted within the sump or riser for any reason. The vent tube required for these transducers shall terminate within the NEMA 7 junction box and shall include a desiccant reservoir.

D. A submersible pressure transducer system shall be provided. Air bubbler systems are not acceptable.

2.07 FLOW METERS AND TRANSMITTERS

A. Four magnetic flow meters (4-20mA) and four flow transmitters with totalizers used for station flow indication at the pump station shall be provided and installed by the Contractor. Two flow meters shall indicate the leachate collection flow and two flow meters shall indicate the leak detection flow at each pump station.

B. The flow transmitters shall have an LCD display, which shall provide the instantaneous flow of each pump, the derived flow of the station, the time of day, and the totalized flow. These displays shall be mounted independently from the flow meter assemblies and shall be within the PCP.

2.08 PUMP RETRIEVAL CABLE

A. The retrieval cable shall be supplied by the Contractor and should be a minimum of 3/8 inch diameter, made of stainless steel and of sufficient length to secure pump at the top of the sump when the pump is in operating position at the sump bottom. (Contractor shall confirm length.) All cable retaining hardware shall be made of Type 300 Series stainless steel.

B. Cable shall be attached to the top of the pump in a secure manner as to facilitate its removal from the riser pipe assembly.

2.09 SPARE PARTS

A. Parts Stocking Program: The pump supplier shall provide the Owner the following spare parts which should be retained on the landfill site for use as necessary:

1. Spare Power Cable equivalent in length to the installed pump power cables (Includes cable entrance and gland fittings).
2. Spare level transducer with cable equivalent in length to the installed cables.

PART 3 EXECUTION

3.01 INSTALLATION

A. All materials and equipment shall be installed as shown on the Drawings and as recommended by the manufacturer. All electrical work shall conform to NFPA 70 and the requirements of Division 16, Electrical.

3.02 INSPECTION AND TESTING

A. Field supervisor: The manufacturer will furnish a suitably qualified technician to inspect the completed installation, make necessary adjustments and instruct operating personnel in the proper care and operation of the equipment, before the final acceptance of the pumping stations. No distributor, representative, or agent acting on behalf of the manufacturer shall be approved to complete start up services. This task must be reviewed and completed by a direct employee of the manufacturer.

B. Field Test: When the pumping facility is complete and ready for operation, then the station shall be inspected and tested for compliance to the contract documents. Test of equipment shall be made by the Contractor in the presence of the

Engineer, electrical sub-Contractor, and equipment manufacturer. The equipment tests shall include, but will not be limited to the following:

1. Pumps and motors: Performance of the pumps shall meet the specified criteria when field tested.
2. Electrical: Readings shall be made of the voltage and amperage draw and recorded on the manufacturers start up form. This form should be kept by the manufacturer, Contractor, and Engineer for future reference.
3. Controls: Control primary elements shall be tested to determine satisfactory performance for starting and stopping at the proper liquid levels. Pump sequence and alarm functions will also be tested.
4. Equipment: Equipment shall be operated to determine that the pump is located in the correct position in the riser assembly. A check will be conducted to ensure that there is no overloading of the pump or any overheating in any of the controls. A check will be conducted for any abnormal vibration that may be evident in the discharge plumbing. Pump will be raised and reset to ensure correct placement in riser pipe.
5. Inspection: An inspection of all mechanical and electrical equipment, controls, piping, valves, fittings, brackets, mountings, seals, conduit, painting, and component features shall be made while the station is being tested to determine performance and compliance with design requirements and the specification.
6. Structure: The stations shall be inspected for performance, structural soundness and water tightness.
7. Repairs, adjustments, and replacement: The Contractor shall make any and all necessary repairs, adjustments and replace any component parts until performance has been demonstrated to the satisfaction of the Consultant. The Contractor shall bear the cost of any repair, adjustment and replacement.
8. The pumps, control panels, flow meters, and breakout boxes shall be supplied by the same supplier. Coordination of manufacturer representatives for the inspection and startup services shall be provided by the supplier.
9. The Contractor shall provide qualified manufacturer's representative(s) for a minimum of one 8-hour day to provide complete instruction of the Owner's personnel in the operation and maintenance of all systems provided in this Section.

END OF SECTION

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13421
FLOW METERS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall perform all work necessary to furnish, install, commission, test, document, and start up the instrumentation. The Contractor shall provide all materials, labor, equipment, incidentals, and services required for a complete and operational system.

1.02 RELATED WORK

A. The provisions of all other sections of the Specifications are fully applicable to this Section as if incorporated in this Section.

B. The Contractor shall be responsible for coordinating work with the Owner and Subcontractors.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance.

1.04 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM).
B. American National Standards Institute (ANSI).
C. National Electrical Manufacturers Association (NEMA).
D. International Society of Automation (ISA).
E. Underwriter’s Laboratories, Inc. (UL).

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

B. All work, equipment, and materials supplied shall be warranted against defective design, materials, and workmanship for 1 year. The warranty period shall begin at the time of project completion and acceptance by the Owner.

C. The warranty shall cover replacement equipment and/or repair, including labor, travel time and miscellaneous expenses, at no cost to the Owner for the full warranty period.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. Deliver materials and equipment with the manufacturer's tags and labels and UL labels intact. Deliver packaged material in the manufacturer's original, unopened containers bearing the manufacturer's name, brand, and UL label.

C. Throughout this Contract the Contractor shall provide suitable protection for materials and equipment against loss or damage and the effects of weather and the construction environment. The Contractor shall be responsible for the condition of materials and equipment until the acceptance of equipment by the Owner.

D. Before installation, store material and equipment indoors in a dry, clean location. Handle and store to avoid damage. Heat storage areas that contain items subject to corrosion under damp conditions.

E. Turn off power to panels and equipment and close and cover control panels and equipment during any dusty construction to prevent degrading the operation or service life.

F. Follow the manufacturer's installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between the manufacturer's instructions and these Contract Documents, follow the Engineer's decision at no additional cost to the Owner. Keep a copy of the manufacturer's installation instructions on the job site and available for review at all times.

G. Keep the premises free of waste material or rubbish. Before final inspection and testing and upon completion of the work, remove materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment.

H. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, and consistency of the original finish.

1.07 RECORD DRAWINGS

A. Record Drawings shall be submitted in accordance with Section 01785, Record Documents, and this Section.

1.08 OPERATION AND MAINTENANCE (O&M) MANUAL

A. O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

B. Before final acceptance of this project, the Contractor shall submit an O&M Manual to the Engineer for all components provided under this Section. The manual shall comply with the following:

1. The literature shall have sufficiently detailed descriptions and figures to facilitate the operation, removal, installation, adjustment, calibration, and maintenance of each component to the printed circuit board level.
2. The manual shall include an updated set of the manufacturer's literature, data sheets, loop descriptions of operations, drawings corrected in accordance with shop drawing review comments and Record Drawing modifications and components parts list.
3. Instructions and parts lists shall have been prepared for the specific equipment furnished.
4. List of suppliers and/or service shops that can provide parts and accessories and equipment repair for the components provided under this Section. The list shall include a contact name, telephone number, and address.

1.09 MANUFACTURER'S LITERATURE

A. The Contractor shall provide descriptive literature for all equipment provided under this Section. The literature shall include major components, electrical devices, panel materials, panel components, panel paints and colors, mechanical devices, equipment tags, tubing, valves, fittings, fasteners, and appurtenances. This descriptive literature shall include catalog information, external wiring information, dimensional data, and mounting requirements.

B. Provide data (specification) sheets for all equipment and components. Provide a separate data sheet for each major component. The data sheets shall show the "component name," tag numbers, quantities, specific catalog/ordering numbers, specific features, and special options.

C. Provide a components parts list with exact and complete (including options and accessories) manufacturer's part number. Group the list by the component name used in these Specifications. Group each component type by tag number used in these Specifications. Components without tag numbers shall be grouped by the manufacturer's part number.

D. Provide a list of recommended spares, spare parts, and expendables with tag number and part number.

E. Provide storage requirements for all components provided under this Section.

1.10 CERTIFICATION/DOCUMENTATION

A. The instrument system supplier(s) shall verify the calibration and operation of all control, instrumentation, and telemetry components and shall present written certification of the operation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The manufacturer(s) and/or supplier(s) shall have regularly engaged in the manufacture of major components and/or assembly or instrumentation and control systems of the type and scope required for this project for a minimum of 5 years.

B. It is recognized that one manufacturer may not make all the equipment required and specified under this Section. The Contractor shall be responsible for ensuring that the various manufacturers and equipment suppliers' products are coordinated and are compatible so that the equipment performs the specified functions. The Contractor shall ensure that they are fully aware and understand the requirements of the system.

2.02 GENERAL EQUIPMENT REQUIREMENTS

A. All components and items of equipment that are necessary, whether indicated or not, to affect the required functions and performance shall be provided. In general and unless otherwise noted, corrosion-resistant materials such as Type 316 stainless steel shall be used. Working pressures, spans, and other ratings shall be selected to best fit the application. All like equipment shall be by the same manufacturer.

B. Whenever any material or product is indicated by patent or proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used to establish a standard of quality to expand the description of the

material or product desired. Materials and products equal to the named material or product may be provided unless specifically noted otherwise.

C. All equipment furnished under this Section shall be new and unused and shall be the standard product of a manufacturer having a minimum of 5 years successful experience in the manufacture of the equipment. Wherever possible, equipment items having the same or similar rated capacity or function shall be identical. Equipment shall be of the manufacturer's latest proven design.

D. Electrical Transient Protection: All instrumentation shall be equipped with suitable surge-arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines by lightning discharges or by nearby electrical devices.

1. Voltage surge and transient protectors for both power and analog field circuits shall be provided on the field end and destination end of the circuits. All instrument 120-volt power and signal circuits shall be protected by EDCO SLAC Series suppressor.
2. The devices shall be connected to the system ground. The total resistance of the ground circuit from the device to the driven ground rod shall not exceed 0.1 ohm.

E. Signal Characteristics

1. Analog signals shall be 4-20 mA DC and shall conform to the compatibility requirements of ISA Standard S50.1. Unless otherwise noted, circuits shall be Type 2 two-wire. Transmitters shall have a load-resistance capability conforming to Class L. Transmitters and receivers shall be fully isolated.
2. Discrete signals are two-state logic signals of two types. Control signals shall use 120-VAC sources. Alarm signals that interface directly with an annunciator shall use less than 30-VDC sources. All alarm signals shall be "normally open, close to alarm" isolated contacts rated for 5 amperes at 120 VAC and 2 amperes at 30 VDC.

F. Environmental Conditions

1. Unconditioned air: 20 °F to 105 °F, 10% to 100% humidity, subject to wash down or rain, corrosive (assume marine salts and H_2S as a minimum), and nonhazardous. Enclosures shall be NEMA 4X.
2. Other conditions as noted or approved.

G. Nameplates, Name Tags, and Service Legends: All field- and panel-mounted components provided under this Section shall be provided with permanently mounted name tags bearing the entire ISA tag number of the component.

1. Panel-mounted tags shall be engraved plastic. Field-mounted tags shall be stamped 16-gauge Type 316 stainless steel with 3/16-inch-high characters.
2. Nameplates shall be inscribed to identify the component listed and mounted near a panel-face-mounted instrument.
3. Service legends shall be integrally mounted on a panel-mounted instrument. Unless otherwise noted, service legends shall be engraved with the functional explanation.
4. Nameplates and service legends shall be engraved, rigid, laminated plastic plates attached to enclosure with stainless steel screws maintaining NEMA rating of enclosure. Unless otherwise noted, plate color shall be black with 3/16-inch-high white lettering. Panel nameplates shall have 1/2-inch-high lettering.

H. Power Supplies: Provide DC power supplies as required to power instruments requiring external DC power.

1. Power supplies shall convert 120-VAC power to DC power of the appropriate voltage(s) with sufficient voltage regulation and ripple control to ensure that the instruments being supplied can operate within their required tolerances.

2. Output overvoltage and overcurrent protective devices shall be provided with the power supply to protect the instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.

3. Each power supply shall be provided with a NEMA 1 enclosure for mounting within other enclosures. Power supplies shall be mounted so that dissipated heat does not adversely affect other components.

    a. Wiring: All electrical wiring and wiring identification shall be in accordance with the applicable requirements of Section 16401, Low-Voltage Electrical Work—General Requirements.

2.03 INSTRUMENTATION

A. Flow Meter

1. Flow Element-Magnetic Meter

a. Tags:

ISA Designation	Line Size (Inches)	Service
FT-1A-1	6	Leachate

b. Flow element shall be of the electromagnetic type using the pulsed DC-type coil excitation principle with high preamp input impedance. The flow measuring system, consisting of flow element, transmitter, and appurtenances, shall have an overall accuracy of 1% of rate with a 10:1 turndown for all flows resulting from pipe velocities of 1 to 33 feet per second. The system shall operate on 120-volt (10%), 60-Hz power. The unit shall have a zero-stability feature, thereby eliminating the need to stop flow to check zero alignment.

c. The flow element shall be of watertight, NEMA 4 construction, unless otherwise noted. The meter shall consist of a Type 316 stainless-steel meter tube, 150-pound ANSI carbon steel raised face flanges, Teflon liner, and Type 316 stainless-steel electrodes, unless otherwise noted. Electrodes shall be either flush or bullet-nose type. Meters 4 inches and smaller with Teflon liners shall be wafer-style design. Suitable covers shall be provided for flow element ends to protect the tube liner during shipment. The unit shall be furnished with grounding rings or shall be provided with built-in grounding electrodes.

d. The integral flow transmitter shall be indicating, both flow rate and totalized flow, with integral indicators and totalizers furnished. The indicators display shall face north. The transmitter output shall be a 4 to 20mA DC signal in linear proportion to flow and shall drive loads with impedances in the range of 0 to 800 ohms without load adjustments for a 24V DC supply. Output span and zero shall be manually adjustable. Both transmitter and primary element shall be powered from the same 120-volt, 60-Hz source.

e. Sufficient special cable(s) shall be provided for interconnection between the flow element and the transmitter. Cable(s) shall

facilitate both signal and power for the flow element (120-volt, 60-Hz power will be made available at the transmitter).

f. For each size of flow tube, provide one spool piece with identical laying length and flanges. Provide lifting rings on each spool piece to facilitate the replacement of a flow tube by the spool piece.

g. Provide an aluminum sunshield and transient surge protection for the incoming 120VAC and DC signals as manufactured by EDCO. Transient surge protection shall be mounted in a NEMA 4X stainless steel enclosure.

h. The flow meters shall be Siemens Mag 5100 or Engineer approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall lay out the work and be responsible for necessary lines, levels, elevations, and measurements. Installations shall comply with the applicable requirements of Section 16401, Low-Voltage Electrical Work—General Requirements. The Drawings indicate the extent and general arrangement of the components. The Contractor shall familiarize himself with work of other trades engaged in the construction. Exact routing of raceways, piping, and locations of equipment may be governed by structural conditions and obstructions. The Contractor shall coordinate the details of equipment shop drawings for connections to equipment furnished by others. This is not to be construed to permit redesigning systems.

3.02 INSTALLATION

A. The Contractor shall comply with referenced standards, National Electrical Code (NEC), National Electrical Safety Code, local codes, and rules and regulations of local agencies having jurisdiction. The size of conductors, circuit breakers, motor controllers, and protective devices indicated or specified shall meet all requirements of the NEC.

3.03 INSTALLER QUALIFICATIONS

A. The installer shall be acceptable to the manufacturer and/or supplier of the instrumentation and control systems. The installer shall have a minimum of 5 years of experience installing instrumentation and control systems of a similar type and scope.

3.04 WORKMANSHIP

A. General

1. Install materials and equipment in a workmanlike manner using craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance.
2. Coordinate the work with the Owner, the Engineer, and the work of other trades to avoid conflicts, errors, delays, and unnecessary interference.

3.05 TESTING

A. General: All elements of the instrumentation shall be tested in accordance with Section 11000, General Equipment Requirements, to demonstrate that the total system satisfies all of the requirements of this Specification.

1. All testing materials and equipment shall be provided by the Contractor. Where it is not practical to test with real process variables, the Contractor shall provide a suitable means of simulation. These simulation techniques shall be acceptable to the Engineer.
2. The Contractor shall have an updated set of Drawings and Specifications, a master copy of approved test procedures, and the master copy of current test failures and solutions to test failures.
3. Testing will not to be considered complete until all portions of the test have been approved by the Engineer. Ifs a test or a portion of a test fails to the point where it needs to be rescheduled, the additional testing cost shall be borne by the Contractor.

B. Factory Testing: The components shall be tested with simulated inputs and outputs at the factory. Factory tests shall generally conform to the applicable sections of ISA RP55.1.

3.06 TRAINING

A. Training shall be in accordance with Section 11000, General Equipment Requirements.

END OF SECTION

DIVISION 15

MECHANICAL

SECTION 15055
PIPING SYSTEMS—GENERAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Specification describes responsibilities and requirements for Piping Systems including the following:

1. Labor, materials, tools, equipment, and services to be furnished in accordance with the provisions of the Contract Documents. The materials to be used for the piping systems are shown in the Drawings and the Specifications.
2. Coordination of work with other trades.
3. Furnishing and installing all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, although such work is not specifically indicated.
4. Furnishing Record Drawings and documents for piping systems.

1.02 SUBMITTALS

The Contractor shall submit the following in accordance with Section 01330, Submittals and Acceptance:

A. If the Contractor deviates from the piping layout as shown on the Contract Drawings, the Contractor shall submit scaled piping drawings showing locations and dimensions to and from fittings, valves, equipment, structures, and related appurtenances. Provide scaled drawings to a minimum scale of 1 inch equals 10 feet. Provide details to minimum scale of 1/8 inch equals 1 foot. Elevations shall correspond to reference vertical elevation datum shown or provided for this project.

B. Copies of any manufacturer's written directions regarding material handling, delivery, storage, and installation.

C. Record piping drawings shall meet the requirements of Section 01785, Record Documents. During the work, the Contractor shall maintain accurate, up-to-date Record Drawings of piping systems installed in the project, including pre-existing piping discovered, relocated, or at locations other than as originally shown on the Drawings. When the work is completed and accepted by the Engineer, the Contractor shall submit Record Drawings in accordance with Section 01785,

Record Documents. The Contractor shall identify complete location, elevations, and description of piping systems.

D. Submit copies of forms documenting required field pressure testing work and results.

E. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.

F. Submit manufacturer's data sheet for gaskets supplied showing dimensions and bolting recommendations.

G. Support Systems

1. Drawings of each piping system locating each support, guide, and anchor.
2. Identify support, guide, and anchor type by catalog number and shop/ contract drawing detail number.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society of Mechanical Engineers (ASME)

1. ASME B1.1—Unified Inch Screw Threads (UN and UNR Thread Forms).
2. ASME B1.20.1—Pipe Threads, General Purpose (Inch).
3. ASME B16.21—Nonmetallic Flat Gaskets for Pipe Flanges.
4. ASME B18.2.1—Square, Hex, Heavy Hex, and Askew Head Bolts, and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
5. ASME B18.2.2—Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
6. ASME B31.1—Power Piping.
7. ASME B31.3—Process Piping.
8. ASME BPVC—Boiler and Pressure Vessel Code.

B. American Society for Testing and Materials (ASTM)

1. ASTM A183—Specification for Carbon Steel Track Bolts and Nuts.

2. ASTM A193/A193M—Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
3. ASTM A194/A194M—Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
4. ASTM A307—Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
5. ASTM D1330—Standard Specification for Rubber Sheet Gaskets.
6. ASTM F467—Standard Specification for Nonferrous Nuts for General Use.

C. American Water Works Association (AWWA)

1. AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

D. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)

1. MSS SP-58—Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.

E. NSF International (NSF)

1. NSF 61—Drinking Water System Components – Health Effects.

1.04 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. The Contractor shall protect the pipe from kinks, cuts, end damage, and other defects when transporting all piping. Binding and tie-down methods shall not damage or deflect the pipes in any way. Pipe damaged during shipment shall be rejected.

C. Pipe shall be stored on level ground, preferably turf or sand, free of sharp objects that could damage the pipe. Stacking of any pipe shall be limited to a height that will not cause excessive deformation of the lower layers of pipe under anticipated temperature conditions. When necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths to not allow deformation of the pipe at the point of contact with the sleeper or between

supports. Pipe shall not be removed from storage until bedding or sub-grade work is complete and ready to receive the pipe.

D. The joined pipe shall be handled in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipe. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped. Sections of the pipes with cuts and gouges shall be removed and the ends of the pipe rejoined. In accordance with the pipe manufacturer's written instructions, the Contractor shall repair all pipe with damaged linings and pipe exterior coatings that have been damaged before the pipe is installed.

E. The Contractor shall cover all pipe stored on the site with canvas or other opaque material to protect it from sunlight. Provide air circulation under the covering.

F. The Contractor shall inspect all pipe, fittings, and other accessories upon delivery and during the work. Any defective or damaged materials found during field inspection or during tests shall be removed from the site and replaced by, and at the expense of, the Contractor.

G. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Fittings shall be drained and stored in a manner that will protect them from damage.

H. Gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-delivered-to-site and first-to-be-installed rotation basis. Mechanical-joint glands, bolts, and washers shall be handled and stored in a manner that will ensure proper use with respect to types and sizes.

1.05 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

1.06 DEFINITIONS OF BURIED, EXPOSED, AND SUBMERGED PIPING

A. Buried piping is piping buried in soil, beneath a structure and/or encased in concrete. Where an exterior pipe coating is specified to be factory- or field-applied, the Contractor shall provide the coating up to the penetration of a structure. Piping encased in concrete does not require an exterior coating other than what is factory furnished.

B. Exposed piping is piping in any of the following conditions or locations:

1. Above ground.

C. Submerged piping is considered to be all piping within side slope riser pipes.

1.07 SYSTEM DESIGN REQUIREMENTS

A. General

1. The Specifications and Drawings are not all inclusive of explicit piping details.
2. Pressure ratings and materials specified represent minimum acceptable standards for piping systems.
3. Piping Systems: Suitable for the services specified and intended.

B. Support Systems

1. The absence of pipe supports and details on the Drawings shall not relieve the Contractor of responsibility for sizing and providing supports for this project.

2. Select and design within the specified spans and component requirements.

3. Comply with requirements of MSS SP-58.

4. Criteria for structural design and selection of pipe support system components:

a. Dead loads imposed by the weight of the pipes filled with water, within specified spans and component requirements, plus any insulation.
b. Safety factor: Minimum of 5.

5. Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor the support, to withstand the shear and pullout loads imposed by loading and spacing on each particular support.

a. Supports are shown only where specific types and locations are required; additional pipe supports may be required and are to be provided and installed by the Contractor at no additional cost to the Owner.

C. Adapters

1. No attempt has been made to show all adapters, spool pieces, reducers, bushings, or other fittings required to accommodate the connection of pipes, fittings, and valves of various joint design and sizes throughout the project. The Contractor is completely responsible for providing, at his expense, all adapters, reducers, sleeves, spool pieces, and other fittings and appurtenances necessary for connection of pipe (for the same pipe material of or a transition of pipe materials), valves, fittings, and appurtenances throughout the project, which shall be constructed of appropriate materials, coated and lined to match the materials, coatings, and linings specified for the connected components. All adapters, reducers, sleeves, spool pieces, and other fittings shall be coated and lined in accordance with the specifications for each individual pipe system.

PART 2 PRODUCTS

2.01 PIPING SYSTEM GENERAL REQUIREMENTS SCHEDULE

A. Unless noted otherwise in the Drawings, piping system materials, fittings, and appurtenances are subject to requirements of the individual Specifications for the piping systems.

2.02 PIPING SCHEDULE

A. Unless otherwise noted in the Drawings, piping system materials, fittings, and appurtenances are subject to the requirements of the individual Specifications for the piping systems.

2.03 THREAD FORMING FOR STAINLESS STEEL BOLTS

A. Form threads for stainless steel bolts by rolling, not by cutting or grinding.

2.04 BOLTS AND NUTS FOR FLANGES FOR DUCTILE IRON PIPE FLANGES (NOT USED)

2.05 BOLTS AND NUTS FOR HDPE PIPE FLANGES

A. Bolts, washers, and nuts for pipe installed outdoors, above and below ground, and in vaults and structures shall be as specified in Section 15146, High-Density Polyethylene (HDPE) Pipe.

2.06 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

A. Anti-seize thread lubricant shall be applied to the thread portion of all (above grade and below grade) stainless steel bolts (stainless steel tie rods, etc.) during assembly. Anti-seize lubricant shall be chloride free and shall be nongalling NSF approved. Anti-seize thread lubricant shall be Jet-Lube "Nikal," John Crane "Thred Gard Nickel," Never-Seez "Pure Nickel Special," or Permatex "Nickel Anti-Seize."

2.07 FLANGE GASKETS FOR DUCTILE IRON AND HDPE PIPE

A. Flange gaskets shall be in accordance with Section 15146, High-Density Polyethylene (HDPE) Pipe.

2.08 DETECTABLE PIPELINE MARKING TAPE

A. All 1-1/2-inch and larger buried non-metallic piping shall be laid with underground detectable caution tape, 2-inch tape for a maximum of 12-inch depth and 6-inch tape for a maximum of 24-inch depth.

PART 3 EXECUTION

3.01 PREPARATION

A. Field Alignment

1. The piping shown on the Contract Drawings is generally indicative of the work, with symbols and notations provided for clarity. However, the Contract Drawings are not an exact representation of all conditions involved; therefore, install piping to suit actual field conditions and measurements as approved by the Engineer. No extra compensation will be made for work due to differences between indicated and actual dimensions.
2. The Contractor shall install all adapters, fittings, flanged connections, closures, restrained joints, etc. not specified but necessary for a complete installation acceptable to the Engineer.
3. The Contract Drawings do not indicate all adapters, fittings, spool pieces, supports, and other items required to accommodate the installing and connecting of pipe, fittings, valves, and equipment of various joint designs and sizes. Provide such required items of appropriate designs, materials, coatings, and linings.
4. An extensive network of underground piping, conduit, direct-buried conductors, and related structures of various sizes, materials, alignments, age, and function exist within the project site. Conclusive information

concerning these facilities is not available. Consequently, the design of new piping indicated on the Contract Drawings is approximate. Adjust alignment, fitting, valve, and joint locations as required and as approved by the Engineer to accommodate and protect existing facilities and provide the intended functionality of new piping.

3.02 FIELD LAYOUT AND MODIFICATIONS

A. Unless directed otherwise, the Contractor shall be responsible for setting construction layout stakes and/or offsets required to complete the designated work. The Contractor shall ensure that those stakes and/or offsets are protected and any re-staking required for any reason including work stoppage shall be included in the bid price and no additional compensation to the Contractor will be made.

B. The Engineer has the right to make any modifications the Engineer deems necessary due to field conditions, conflicts with other utilities, or to protect other properties.

3.03 PIPE PRODUCTS INSPECTION

A. The Contractor shall obtain from the pipe manufacturer a certificate of inspection to the effect that the pipe, fittings, gaskets, glands, bolts, and nuts supplied for this Contract have been inspected at the plant and that they meet the requirements of these Specifications. The Contractor shall submit these certificates to the Engineer before installing the pipe materials. The Contractor shall visually inspect all pipe and fittings at delivery and before they are lowered into the trench to be installed. Pipe or fittings that do not conform to these Specifications or have been damaged in any manner will be rejected and the Contractor must remove them immediately. The entire product installation may be rejected when, in the opinion of the Engineer, the methods or quality assurance and uniformity of manufacturer fail to secure acceptable and uniform pipe products or where the materials used produce inferior pipe products.

3.04 REMOVAL OF EXISTING PIPE AND FITTINGS

A. Pipe specifically identified on the Drawings to be removed or replaced from service shall be physically taken out of the ground. The limits of pipe to be removed shall be specifically called for in the plans or shall be approved in writing by the Engineer. Any other removal not specifically called for shall be approved in writing and shall be considered incidental to construction of other items in the contract and the Contractor will not receive compensation for such work.

B. When removing pipe, the Contractor shall excavate a trench wide enough to dislodge the pipe from the surrounding soil and long enough to be able to handle the pipe without causing any damage to nearby utilities, structures, or adjacent property.

C. The removed pipe, fitting, and appurtenances will become the Contractor's property and the Contractor shall be responsible for proper disposal and any required permits for disposal.

D. Regarding pipe remaining in the ground subsequent to removal of connected pipe or pipe fittings, the remaining buried pipes, openings, and fittings shall be plugged or capped as approved by the Engineer.

E. Pipe that will be abandoned in place shall be plugged or capped as approved by the Engineer.

3.05 BURIED PIPING AND PIPE FITTINGS

A. Trenching and backfilling for all pipe and fittings shall also be in accordance with Section 02305, Earthwork for Utilities.

B. Installation

1. Inspect all piping for defects and remove all lumps or excess coatings before installation. The inside of the mechanical joint and outside of plain-end pipe shall be cleaned before joining pipe. Caution shall be taken to prevent damage to the pipe during lowering into the trench. Remove all foreign matter that has entered the pipe during storage and installation. The Contractor shall cover the pipe ends during installation to prevent debris from entering the pipe. No debris, tools, clothing, or other material shall be placed in the pipe.
2. After being placed in the trench, the pipe shall be brought to the proper line and grade by compacting the approved backfill material under it, except at open ends or otherwise as may be required prior to testing. Joint deflection shall not exceed 75% of the manufacturer's limit.
3. The Contractor shall install temporary water-tight plugs on the pipe ends during the time that the pipe is in the trench but no work is in progress. If there is water in the trench upon beginning work, this plug shall remain in place until the trench has been pumped dry, unless otherwise approved by the Engineer..
4. Buried carbon steel bolts and nuts shall be coated in accordance with System No. 24 as specified in Section 09900, Painting and Coating..
5. Coat threaded portions of stainless steel bolts and nuts with lubricant before assembly.

6. Restrained plugs or caps shall be inserted into all buried dead end pipes, tees, or crosses. Provide blind flanges for all flanged exposed piping. Restrained plugs and caps installed for pressure testing shall be fully secured and blocked to withstand the test pressure.

3.06 FLANGED JOINTS FOR EXPOSED PIPE AND FITTINGS

A. When bolting flanged joints, the Contractor shall avoid restraint on the opposite end of the pipe or fitting, which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually and at a uniform rate to ensure uniform compression of the gasket, in accordance with pipe and fitting manufacturer's recommendations.

B. Coat threaded portions of stainless steel bolts and nuts with lubricant before assembly.

3.07 PIPING CONNECTIONS TO PUMPS AND OTHER EQUIPMENT

A. When connecting to pumps and equipment, the Contractor shall ensure that piping stresses are not transmitted to the pump and equipment. All connecting pipe shall be permanently supported and aligned so that accurate matching of bolt holes and uniform contact over the entire surface of pump flanges are obtained before any bolts are installed in the flanges or pipe is threaded into pump and equipment. In addition, pump connection piping shall be free to move parallel to its longitudinal center line while the bolts are being tightened.

1. Pumps and equipment shall be leveled, aligned, and wedged into a position that will fit the connecting pipe, but shall not be grouted until the initial fitting and alignment of the pump and equipment may be shifted on its foundation if necessary to properly install the connecting pipe. Each pump and piece of equipment shall, however, be grouted before final bolting of the connecting piping.
2. After final alignment and bolting, the pump and equipment connections shall be tested for applied piping stresses by loosening the flange bolts which, if the piping is properly installed, should result in no movement of the piping relative to the pump or opening of the pump connection joints. If any movement is observed, the piping shall be loosened and re-aligned as required and then the flanges bolted back together. The flange bolts then shall be loosened, and the process repeated until no movement is observed.
3. All carbon steel bolts and nuts shall be coated with the same exterior coating applied to the piping system.

3.08 ANCHORING AND RESTRAINING

A. Thrust blocks shall be used in new lines and shall be limited to areas in which a new fitting has been installed in an existing line and field restraining joints are not feasible or when directed by the Engineer.

3.09 FLUSHING, CLEANING, TESTING AND INSPECTION OF PIPING

A. See Section 15144, Pressure Testing of Piping, for the requirements of pipe flushing, cleaning, pressure testing, and inspection requirements.

3.10 PIPE COLOR CODING

A. The Contractor shall coordinate with the Engineer to generate a list of acceptable pipe colors for exposed piping systems. Where color-coding is achieved by painting exterior surfaces of the piping systems, painting shall be provided in accordance with Section 09900, Painting and Coating.

END OF SECTION

SECTION 15060
PIPE SUPPORTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes requirements for materials and installation of pipe supports, including accessory items such as anchor bolts and screws, and neoprene isolation pads.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Provide line drawings of each piping system to the scale shown on the Drawings, locating each support. Identify each type of support by the manufacturer's catalog number or figure.

B. Provide installation drawings and manufacturer's catalog information on each type of support used. Clearly indicate the actual pipe outside diameter (not just nominal pipe size) that is used for the supports.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. For standards that have been withdrawn, the last version of the document before it was withdrawn. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM A36/A36M—Standard Specification for Carbon Structural Steel.
2. ASTM A47/A47M—Standard Specification for Ferritic Malleable Iron Castings.
3. ASTM A48/A48M—Standard Specification for Gray Iron Castings.
4. ASTM A153/A153M—Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A194/A194M—Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

6. ASTM A276/A276M—Standard Specification for Stainless Steel Bars and Shapes.
7. ASTM A307—Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
8. ASTM A575—Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
9. ASTM A576—Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
10. ASTM A635/A635M—Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
11. ASTM A1011/A1011M—Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
12. ASTM D256—Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
13. ASTM E84—Standard Test Method for Surface Burning Characteristics of Building Materials.
14. ASTM F593—Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
15. ASTM F594—Standard Specification for Stainless Steel Nuts.

B. American Society of Mechanical Engineers (ASME)

1. ASME B31.1—Power Piping.

C. Manufacturer's Standardization Society (MSS)

1. MSS SP-58—Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.
2. MSS SP-69—Pipe Hangers and Supports – Selection and Application.

1.04 QUALITY ASSURANCE

A. All supports, and appurtenances shall conform to the latest applicable requirements of ASME B31.1, except as supplemented or modified by the requirements of this Section.

B. All supports, and appurtenances shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions. The minimum working factor of safety for all supporting equipment, with the exception of springs, shall be five times the

ultimate tensile strength of the material, assuming 10 feet of water-filled pipe being supported.

C. All pipe and appurtenances connected to equipment shall be supported so as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the Contractor shall submit certification stating that such requirements have been complied with.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. All supports shall be crated, delivered, and uncrated to protect against any damage.

C. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.

D. Finished iron or steel surfaces not galvanized or painted shall be properly protected to prevent rust and corrosion.

1.06 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

PART 2 PRODUCTS

2.01 GENERAL

A. Not all pipe supports required are shown on the Drawings. The Contractor shall provide pipe supports for every piping system installed. Support piping by pipe support where it connects to pumps or other mechanical equipment.

B. The Contractor shall ensure that pipe support components shall withstand the dead loads imposed by the weight of the pipes, fittings, and valves (all filled with water) plus valve actuators and any insulation and shall have a minimum safety factor of 5 based on the material's ultimate strength.

C. All of the equipment specified in this Section is intended to support the various types of pipe and piping systems. The details shown on the Drawings are intended to indicate the generally desired methods of support under normal conditions. The Contractor shall develop final details and any details associated with special conditions not already covered to meet the system conditions specified in the respective Division 15 Pipe Sections.

D. All pipe shall be supported as required to prevent significant stresses in the pipe material, valves, fittings, and other pipe appurtenances and to support and secure the pipe in the intended position and alignment. All supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact

E. Supports shall be spaced in accordance with ASME B31.1 except that the maximum unsupported span shall not exceed 10 feet unless otherwise specified in this Section.

F. Where flexible couplings are required at equipment, the end opposite to the piece of equipment, tank, etc., shall be rigidly supported.

G. All pipe and appurtenances connected to the equipment shall be supported so as to prevent any strain from being imposed on the equipment or piping system.

H. All rods, clamps, inserts, anchor bolts, brackets, and components for exterior pipe supports shall be Type 316 stainless steel.

I. Supports shall be sufficiently close together so that the sag of the pipe is within limits that will permit drainage and avoid excessive bending stresses from concentrated loads between supports.

J. Pipe supports shall be provided as follows:

1. Cast-iron and ductile-iron piping shall be supported at a maximum support spacing of 10 feet with a minimum of one support per pipe section at the joints.
2. Individually supported HDPE pipes shall be supported as recommended by the manufacturer except that support-spacing shall not exceed 3 feet. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split-type couplings, and sleeve-type couplings and to minimize all pipe forces on pump housings. Pump housings shall not be used to support connecting pipes.
3. Effects of thermal expansion and contraction of the pipe shall be accounted for in the pipe support selection and installation.

K. Any required pipe support for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes and concrete and anchor hardware similar to items previously specified in this Section and shall be subject to the approval of the Engineer.

2.02 SUPPORT SYSTEMS

A. Pipe supports shall be as manufactured by Anvil, Unistrut, Cooper B-Line, Aikinstrut, Superstrut, or equal.

B. Pipe supports shall comply with MSS SP-58 for the standard types referenced on the Drawings. The Contractor shall construct special supports if detailed in the Drawings.

C. Pipe supports shall be hot-dipped galvanized according to ASTM A153 carbon steel (ASTM A36, A575, or A576). Bases, rollers, and anchors shall be steel as described above or may be cast iron (ASTM A48). Pipe clamps shall be Type 316 stainless steel as described above.

D. Offset pipe clamp.

E. Anvil Figure 103, Cooper B-Line B3148, or equal. Material shall be Type 316 stainless steel unless otherwise noted.

2.03 MISCELLANEOUS PIPE SUPPORTS

A. Pipe Anchor Chair: Anvil Figure 198 or equal.
B. One Hole Clamp: Anvil Figure 126 or equal.
C. Roller Chair: Anvil Figure 175 or equal.

2.04 NEOPRENE ISOLATING SLEEVES FOR METAL PIPE 6 INCHES AND SMALLER

A. Unistrut P2600, B-Line "Vibrocushion," or equal.

2.05 ANCHOR BOLTS AND SCREWS

A. Anchor bolts and screws for attaching pipe supports to walls, and slabs shall be Type 316 stainless steel, ASTM A276/A276M or F593. Nuts shall be Type 316 stainless steel, ASTM A194/A194M, Grade 8M, or ASTM F594, Type 316 stainless steel.

PART 3 EXECUTION

3.01 PIPE SUPPORT SPACING FOR SUPPORTS ON TOP OF SLABS OR GRADE

A. The Contractor shall install pipe supports on horizontal runs at the spacing shown or detailed on the Drawings. Provide supports of the type shown or detailed on the Drawings.

3.02 INSTALLING PIPE SUPPORTS

The Contractor shall do the following:

A. Provide separate supports at each valve. Provide one support around each end of the valve body or on the adjacent connecting pipe within one pipe diameter of the valve end. Provide additional supports to relieve eccentric loadings imposed by offset valve actuators.

B. Provide separate supports at each pipe elbow, tee, or fitting. Provide separate supports on both sides of each nonrigid joint or flexible pipe coupling.

C. Install leveling bolts beneath support baseplates. Provide 3/4-inch-thick grout pad beneath each base.

D. Install piping without springing, forcing, or stressing the pipe or any connecting valves, pumps, and other equipment to which the pipe is connected.

3.03 INSTALLING STEEL AND FRP CHANNEL FRAMES

A. The Contractor shall use 1-5/8-inch-high channel frames, unless 3-1/4 inches is needed, to provide clearance from walls. Use multiple back-to-back channels if additional clearance is needed.

3.04 INSTALLING NEOPRENE ISOLATING SLEEVES

A. The Contractor shall install a sleeve around each metal pipe 6 inches and smaller at the point of bearing or contact with the pipe support.

3.05 PAINTING AND COATING

The Contractor shall do the following regarding painting and coating:

A. Grind the welds of fabricated steel pipe supports smooth, prepare surface by sandblasting, and apply coating system.

B. Paint the supports as directed by the Engineer.

END OF SECTION

SECTION 15110
MANUAL, CHECK, AND PROCESS VALVES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves as shown in the Drawings and as specified in this Section. All valves shall be complete with all necessary manual actuators, valve boxes, extension stems, and floor stands, which are required for proper valve operation and completion of the work.

1. All valves shall be of the sizes shown in the Drawings. All equipment of the same type shall be from one manufacturer, unless authorized in writing by the Engineer.

2. The valves shall include but not be limited to the following:

a. Air Valves.
b. Ball Valves.
c. Check Valves.
d. Plug Valves.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Product technical submittal data shall contain the following information and data:

1. Acknowledgment that products submitted meet requirements of standards referenced.

2. Manufacturer’s installation instructions.

3. Manufacturer’s operation and maintenance manuals.

4. Data of valves, actuators, and accessories:

a. Pressure and temperature rating.
b. Materials of construction, with ASTM reference and grade.
c. Linings and coatings.

d. Dimensions and weight.
e. Flow coefficient.
f. Actuators and accessories details.
g. Manufacturer's product brochure, cut-sheets, and parts diagrams.

B. Dimensions and orientation of valve actuators as installed on the valves. Show location of internal stops for gear actuators. State differential pressure and fluid velocity used to size actuators. For worm-gear actuators, state the radius of the gear sector in contact with the worm and state the handwheel diameter.

C. The following test reports: Performance Tests; Leakage Tests; Hydrostatic Tests; and Proof-of-Design Tests as applicable or required.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing of Materials (ASTM)

1. ASTM A36/A36M—Standard Specification for Carbon Structural Steel.
2. ASTM A47/A47M—Standard Specification for Ferritic Malleable Iron Castings.
3. ASTM A48/A48M—Standard Specification for Gray Iron Castings.
4. ASTM A105/A105M—Standard Specification for Carbon Steel Forgings for Piping Applications.
5. ASTM A108—Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
6. ASTM A126—Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
7. ASTM A148/A148M—Standard Specification for Steel Castings, High Strength, for Structural Purposes.
8. ASTM A181/A181M—Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
9. ASTM A182/A182M—Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
10. ASTM A193/A193M—Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.

11. ASTM A194/A194M—Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
12. ASTM A216/A216M—Standard Specification for Steel Castings, Carbon, Suitable for Fusion-Welding, for High-Temperature Service.
13. ASTM A240/A240M—Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
14. ASTM A269/A269M—Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
15. ASTM A276/A276M—Standard Specification for Stainless Steel Bars and Shapes.
16. ASTM A313/A313M—Standard Specification for Stainless Steel Spring Wire.
17. ASTM A322—Standard Specification for Steel Bars, Alloy, Standard Grades.
18. ASTM A351—Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
19. ASTM A395/A395M—Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
20. ASTM A436—Standard Specification for Austenitic Gray Iron Castings.
21. ASTM A439/A439M—Standard Specification for Austenitic Ductile Iron Castings.
22. ASTM A449—Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
23. ASTM A479/A479M—Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
24. ASTM A494/A494M—Standard Specification for Castings, Nickel and Nickel Alloy.
25. ASTM A516/A516M—Standard Specification for Pressure Vessel Plates, Carbon-Steel, for Moderate- and Lower-Temperature Service.
26. ASTM A536—Standard Specification for Ductile Iron Castings.
27. ASTM A564/A564M—Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
28. ASTM A582/A582M—Standard Specification for Free-Machining Stainless Steel Bars.
29. ASTM A666—Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
30. ASTM A743/A743M—Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
31. ASTM A744/A744M—Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service.

32. ASTM A890/A890M—Standard Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion-Resistant, Duplex (Austenitic/Ferritic) for General Application.
33. ASTM B16/B16M—Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
34. ASTM B21/B21M—Standard Specification for Naval Brass Rod, Bar, and Shapes.
35. ASTM B61—Standard Specification for Steam or Valve Bronze Castings.
36. ASTM B62—Standard Specification for Composition Bronze or Ounce Metal Castings.
37. ASTM B98/B98M—Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
38. ASTM B99/B99M—Standard Specification for Copper-Silicon Alloy Wire for General Applications.
39. ASTM B127—Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
40. ASTM B148—Standard Specification for Aluminum-Bronze Sand Castings.
41. ASTM B150/B150M—Standard Specification for Aluminum Bronze Rod, Bar, and Shapes.
42. ASTM B164—Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
43. ASTM B169/B169M—Standard Specification for Aluminum Bronze Sheet, Strip, and Rolled Bar.
44. ASTM B193—Standard Test Method for Resistivity of Electrical Conductor Materials.
45. ASTM B371/B371M—Standard Specification for Copper-Zinc-Silicon Alloy Rod.
46. ASTM B427—Standard Specification for Gear Bronze Alloy Castings.
47. ASTM B443—Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip.
48. ASTM B446—Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar.
49. ASTM B462—Standard Specification for Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N10362, UNS N06686, UNS N08020, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service.
50. ASTM B463—Standard Specification for UNS N08020 Alloy Plate, Sheet, and Strip.

51. ASTM B472—Standard Specification for Nickel Alloy Billets and Bars for Reforging.
52. ASTM B584—Standard Specification for Copper Alloy Sand Castings for General Applications.
53. ASTM B763/B763M—Standard Specification for Copper Alloy Sand Castings for Valve Applications.
54. ASTM D1248—Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
55. ASTM D1784—Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
56. ASTM D1785—Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
57. ASTM F441/F441M—Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
58. ASTM F467—Standard Specification for Non-Ferrous Nuts for General Use.
59. ASTM F468—Standard Specification for Non-Ferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use.

B. American Society of Mechanical Engineers (ASME)

1. ASME B1.20.1—Pipe Threads, General Purpose (Inch).
2. ASME B1.20.7—Hose Coupling Screw Threads (Inch).
3. ASME B16.1—Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
4. ASME B16.5—Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standard.
5. ASME B16.10—Face-to-Face and End-to-End Dimensions of Valves.
6. ASME B16.11—Forged Fittings, Socket-Welding and Threaded.
7. ASME B16.18—Cast Copper Alloy Solder Joint Pressure Fittings.
8. ASME B16.24—Cast Copper Alloy Pipe Flanges and Flanged Fittings Classes 150, 300, 400, 600, 900, 1500, and 2500.
9. ASME B16.34—Valves – Flanged, Threaded, and Welding End.
10. ASME B16.42—Ductile Iron Pipe Flanges and Flanged Fittings Classes 150 and 300.
11. ASME Section VIII, Pressure Relief Devices.

C. American Society of Safety Engineers (ASSE)

1. ASSE 1011—Performance Requirements for Hose Connection Vacuum Breakers.

D. American Water Works Association (AWWA)

1. AWWA C110/A21.10—Ductile-Iron and Gray-Iron Fittings.
2. AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C115/A21.15—Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
4. AWWA C207—Steel Pipe Flanges for Waterworks Service, Sizes 4-Inch through 144-Inch (100 mm through 3,600 mm).
5. AWWA C500—Metal-Seated Gate Valves for Water Supply Service.
6. AWWA C508—Swing-Check Valves for Waterworks Service, 2-Inch (50 mm) through 24-Inch (600 mm).
7. AWWA C509—Resilient-Seated Gate Valves for Water-Supply Service.
8. AWWA C512—Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
9. AWWA C550—Protective Interior Coatings for Valves and Hydrants.
10. AWWA C800—Underground Service Line Valves and Fittings.

E. Fluid Controls Institute (FCI)

1. FCI 70-2—Control Valve Seat Leakage.

F. Manufacturers Standardization Society (MSS)

1. MSS SP-61—Pressure Testing of Valves.
2. MSS SP-108—Resilient-Seated Cast Iron Eccentric Plug Valves.

G. NSF International (NSF)

1. NSF 61—Drinking Water System Components – Health Effects.

1.04 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. All valves, unless otherwise directed, shall be loaded and unloaded by lifting, and under no circumstances shall valves be dropped, skidded, or rolled. Valves shall not be stacked or placed under pipe, fittings, or other valves in such a manner that damage could result.

C. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surface or interior linings and valve components. If

any part of the coating, lining, or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer before attempting to install such valves.

D. Only new valves will be allowed for installation and shall be stored in a manner to prevent damage and be kept free of dirt, mud, or other debris.

1.05 QUALIFICATIONS

A. All of the valves shall be products of well-established firms which are fully experienced, reputable, have been selling this product for a minimum of 10 years, and are qualified in the manufacture of the particular product furnished. The valves shall be designed, constructed, and installed in accordance with the requirements and procedures of applicable AWWA standards and shall comply with these Specifications as applicable.

1.06 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

1.07 VALVE TYPE CLASSIFICATIONS

A. Air Valves (Type 100 series)

1. Type 100: Air-Release Valves for Leachate Services.

B. Ball Valves (Type 200 series)

1. Type 200: Threaded Bronze Ball Valves, 2 Inches and Smaller.
2. Type 210: Double-Union PVC Ball Valves, 3 Inches and Smaller.

C. Check Valves (Type 400 series)

1. Type 420: Cast-Iron Swing Check Valves with Outside Lever and Weight, 4 Inches and Larger.

D. Plug Valves (Type 900 series)

1. Type 902: Eccentric Plug Valves, 4 Inches through 12 Inches.

PART 2 PRODUCTS

2.01 GENERAL

A. All valves shall be complete with all necessary geared actuators, handwheels, levers, valve bonnets, valve boxes, extension stems, operating nuts, and T-handle wrenches, which are required for proper valve operating and completing of the work included under this Section. Renewable parts including discs, packing, and seats shall be of types specified in this Section and acceptable by valve manufacturer for the intended service. All units shall have the name of the manufacturer and the size of the valve cast on the body or bonnet or shown on a permanently attached stainless-steel plate in raised embossed letters.

B. Valves and valve operators shall be factory prepared and primed and field finish coated in accordance with Section 09900, Painting and Coating.

2.02 VALVE ACTUATORS

A. The valve actuator shall be an integral part of a valve. The valve actuator shall be provided, installed, and adjusted by the valve manufacturer. Actuator mounting arrangements shall facilitate operation and maintenance and shall be determined by the valve manufacturer unless indicated otherwise on the Drawings or directed by the Engineer.

B. All valves shall open counter-clockwise as viewed from the top. Unless otherwise required by the Engineer, the direction of rotation of the wheel or wrench nut to open each valve shall be to the left (counter-clockwise). Each valve body or actuator shall have the word "Open" cast on it and an arrow indicating the direction to open.

C. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be AISI Type 304 stainless steel. Unless noted otherwise, valves shall be equipped with the following manual actuators:

1. Exposed Valves 2 to 6 inches: handwheel actuators.
2. Buried Valves 6 inches and smaller: 2-inch-square operating nuts (with valve bonnets, valve boxes, and extension stems as required) and T-handle wrench.

D. For buried service, provide watertight shaft seals and watertight valve and actuator cover gaskets. Provide totally enclosed actuators designed for buried or submerged service.

E. All buried valves shall have non-rising stems. All buried valves 3 feet below grade or deeper as measured at the valve centerline shall be furnished with an operator stem extension to extend the operating nut within 6 inches from the top of the valve box cover.

2.03 VALVE END CONNECTIONS

A. Provide valve end connections conforming to connected piping and as shown in the Drawings.

B. Comply with the following standards:

1. Threaded: ASME B1.20.1.
2. Flanged: ASME B16.1 Class 125 unless other noted or AWWA C207.
3. Mechanical (gland) Type: AWWA C111/A21.11.

C. Nuts, Bolts, and Washers: Wetted or internal to be bronze or stainless-steel. Exposed to be zinc or cadmium-plated.

D. Epoxy Interior Coating: Provide epoxy coating for all interiors of ferrous valve body surfaces in accordance with AWWA C550. Coatings shall be NSF-approved for valves in all potable water piping services. Coatings shall not be required for stainless-steel valve interiors.

2.04 VALVE BOXES

A. All buried valves 2-inch size and larger shall be equipped with a standard cast-iron roadway valve box. Valve boxes shall be of the slip or sliding type with a round lid marked "Leachate". The box shall be designed to prevent transfer of the surface loads directly to the valve or piping. Valve boxes must have a minimum adjustable range of 12 inches and a minimum inner diameter of 6 inches. All valve boxes and lids shall be produced from grey cast-iron conforming to the latest revision of specification for grey iron castings, ASTM A48/A48M, Class 20A-25A. All castings shall be true and free of holes and shall be cleaned in accordance with good foundry practice, chipped and ground as needed to remove fins and rough places on castings. Valve boxes have to be rated to sustain FDOT H-20 loadings and have a minimum depth of 8 inches. The valve box lid shall fit flush in the top of the box without forcing and shall not rock, tip, or rattle.

B. Provide debris cap.

C. Valve boxes shall be as manufactured by Tyler Pipe, Geneco, Star Pipe Products, or equal.

2.05 EXTENSION STEMS (NOT USED)

2.06 BOLTS, NUTS, AND GASKETS FOR FLANGED VALVES

A. Bolts, nuts, and gaskets for flanged valves shall be as described in Section 15055, Piping Systems—General.

2.07 PAINTING AND COATING

A. Coat metal valves located aboveground or in vaults and as specified in Section 09900, Painting and Coating, System No. 10. Apply the specified prime and finish coat at the place of manufacture. The finish coat shall match the color of the adjacent piping. Coat handwheels the same as the valves.

B. Coat buried metal valves at the place of manufacture as specified in Section 09900, Painting and Coating, System No. 21.

C. Line the interior metal parts of metal valves 4 inches and larger, excluding seating areas and bronze and stainless-steel pieces, as specified in Section 09900, Painting and Coating, System No. 7. Apply lining at the place of manufacture.

D. Test the valve interior linings and exterior coatings at the factory with a low-voltage (22.5 to 80 volts, with approximately 80,000-ohm resistance) holiday detector, using a sponge saturated with a 0.5% sodium chloride solution. The lining shall be holiday free.

E. Measure the thickness of the valve interior linings as specified in Section 09900, Painting and Coating. Repair areas having insufficient film thickness as specified in Section 09900, Painting and Coating.

2.08 AIR RELEASE VALVES (TYPE 100 SERIES)

A. General Description

1. All valves shall meet or exceed all applicable provisions of the latest revision of AWWA C512. Design pressure is 150 psig. Valves shall be operable for water temperatures of above freezing to 125°F.
2. All valves shall consist of a float or a float assembly. Valves shall be identified properly in plates attached permanently on the valve body. The body and cover shall be cast-iron ASTM A126, Class B, or ASTM A48/A48M, Class 35. Valves 3 inches and smaller shall have threaded ends. Valves 4 inches and larger shall have flanged ends. Threaded ends shall comply with ASME B1.20.1. Flanges shall comply with ASME B16.1, Class 125. All flanges shall be flat faced.

3. The float shall be Type 304 or 316 Stainless-Steel. For valves with inlet sizes less than 4 inches, the float shall be able to withstand a collapse pressure of 1,000 psig. For inlet sizes 4 inches and larger, the float shall be capable of withstanding collapse pressures of 750 psig. Trim shall be Type 304 or 316 Stainless-Steel. The valve seat shall be of EPDM or other rubber materials applicable to leachate. The valve seat shall be easily removed and replaced in the field.
4. Drain/test ports on all valves with inlet size 1 inch or larger shall have two 1/2-inch NPT minimum plugged ports, one near the bottom of the valve body and the other near the top of the valve. The plug shall be of bronze, ASTM B584, Alloy C83600.

B. Type 100—Air Release Valves for Leachate Services

1. Type 100 air-release valves for leachate services shall be inlet size 2 inch. Valves shall be ARI D-040 "Barak," or equal.

2.09 BALL VALVES (TYPE 200 SERIES)

A. Type 200—Threaded Bronze Ball Valves, 2 Inches and Smaller

1. Ball valves 2 inches and smaller shall have bronze (ASTM B62 or ASTM B584, Alloy C83600 or C84400) body and plug ball retainer. Ball and stem shall be Type 316 stainless-steel. Valves shall have screwed ends (ASME B1.20.1), non-blowout stems, reinforced PTFE seats, and have plastic-coated lever operators. Valves shall have a pressure rating of at least 600 psi WOG at a temperature of 150ºF. Valves shall be Stockham T-285 Series, Nibco T-585-70 Series, Apollo 70-100 Series.

B. Type 210—Double-Union PVC Ball Valves, 3 Inches and Smaller

1. Unless noted otherwise, ball valves installed in PVC piping systems 3 inches and smaller shall be constructed from polyvinyl chloride (PVC) ASTM D1784, rated to 150 psi minimum from 30º to 120ºF, double-union design with two-way blocking capability, socket end connection except where threaded or flanged-end valves are specifically shown in the Drawings, double EPDM O-ring seals and EPDM backing cushions, PTFE seals, ABS handle, NSF 61 certified. Valves shall be as manufactured by Asahi/America Inc., Quarter-Bloc Ball Valve Series, or approved equal.

2.10 CHECK VALVES (TYPE 400 SERIES)

A. Type 420—Cast-Iron Swing Check Valves with Outside Lever and Weight, 4 Inches and larger

1. Check valves shall be swing-check type with outside lever and weight and shall permit free flow of sewage forward and provide a positive check against backflow. Check valves shall be designed for a minimum working pressure of 150 psi. The manufacturer's name, initials, or trademark and also the size of the valve, working pressure, and direction of flow shall be directly cast on the body. Swing check valves shall exceed the minimum requirements of AWWA C508 with a heavy-duty body of cast-iron conforming to ASTM A126 Class B with integral flanges, faced and drilled in accordance with ASME B16.1 Class 125. Bolts, nuts, washers, etc., shall be Type 316 stainless-steel. The valve body shall be the full waterway type, designed to provide a net flow not less than the nominal inlet pipe size when swung open no more than 25º. The valve shall have a replaceable stainless-steel body seat and a cast-iron disc faced with a renewable resilient seat ring of rubber and held in place by stainless-steel screws. The disk arm shall be ductile-iron or steel, suspended from and keyed to a stainless-steel shaft, which is completely above the waterway and supported at each end by heavy bronze bushings. The shaft shall rotate freely without the need for external lubrication. The shaft shall be sealed where it passes through the body by means of a stuffing box and adjustable packing. Simple O-ring shaft seals are not acceptable. The valve interior shall be painted with epoxy coating by the valve manufacturer in accordance with AWWA C550. The check valve shall be GA Industries, Inc., Figure 220 Lever and Weight or approved equal.

2.11 PLUG VALVES (TYPE 900 SERIES)

A. Rubber compounds shall have less than 2% volume increase when tested in accordance with ASTM D471 after being immersed in distilled water at a temperature of 73.4°F ±2°F for 70 hours.

B. Type 902—Eccentric Plug Valves, 4 Inches through 12 Inches

1. Eccentric plug valves 4 inches through 12 inches shall be non-lubricated type. Minimum pressure rating shall be 175 psi. Bodies shall be cast-iron in accordance with ASTM A126, Class B. Ends shall be flanged, Class 125 in accordance with ASME B16.1. Plugs shall be stainless-steel, cast-iron (ASTM A126, Class B), or ductile-iron (ASTM A536, Grade 65-45-12) with Buna-N facing. Valve body seats shall be Type 304 or 316 stainless-steel or have a raised welded-in overlay at least 1/8-inch

thick of not less than 90% nickel. Body cap screws and bolts and nuts shall be Type 316 stainless-steel. Packing shall be butadiene-filled Teflon or approved equal.

2. Manual valves exposed aboveground shall have handwheel operators with the packing gland and shall include a friction collar and memory stop. Buried valves shall have 2-inch square nuts. All eccentric plug valves shall be Clow F-5412 flanged, Val-Matic, or approved equal.

PART 3 EXECUTION

3.01 JOINTS

A. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

B. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

C. Install lug-type valves with separate hex head machine bolts at each bolt hole and each flange (two bolts per valve bolt hole).

3.02 INSTALLING EXPOSED VALVES

A. Unless otherwise indicated in the Drawings, install valves in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the floor with their operating stems vertical.

B. Install valves on vertical runs of pipe that are next to walls with their stems horizontal, away from the wall. Valves on vertical runs of pipe that are not located next to walls shall be installed with their stems horizontal, oriented to facilitate valve operation.

3.03 INSTALLING BURIED VALVES

A. Connect the valve, coat the flanges, apply tape wrapping or polyethylene encasement and place and compact the backfill to the height of the valve stem.

B. Place block pads under the extension pipe to maintain the valve box vertical during backfilling and repaving and to prevent the extension pipe from contacting the valve bonnet.

C. Mount the upper slip pipe of the extension in midposition and secure with backfill around the extension pipe. Pour the concrete ring allowing a depression so the valve box cap will be flush with the pavement surface.

D. Install debris cap as close as possible under the cast-iron cover without interfering with the cover operation. Trim flexible skirt to provide a smooth contact with the interior or the extension pipe.

3.04 FIELD COATING BURIED VALVES

A. Coat flanges of buried valves and the flanges of the adjacent piping and the bolts and nuts of flanges and mechanical joints, as specified in Section 09900, Painting and Coating, System No. 24.

B. All buried ductile iron fittings, and valves shall have the appropriate finish applied and be bagged before backfilling. Polyethylene bagging for buried ductile iron fittings, and valves shall be 8 mils thickness minimum polyethylene, manufactured in accordance with ASTM D1238, Type I, Class C, Grade E1.

3.05 VALVE LEAKAGE AND FIELD TESTING

A. Test valves for leakage at the same time that the connecting pipelines are tested. See Section 15144, Pressure Testing of Piping, for pressure testing requirements. Protect or isolate any parts of valves, actuators, or control and instrumentation systems whose pressure rating is less than the pressure test. Valves shall show zero leakage. Repair or replace any leaking valves and retest.

B. Operate manual valves through three full cycles of opening and closing. Valves shall operate from full open to full close without sticking or binding. Do not backfill buried valves until after verifying that valves operate from full open to full closed. If valves stick or bind or do not operate from full open to full closed, repair or replace the valve and repeat the tests.

END OF SECTION

SECTION 15125

PIPING APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all piping appurtenances as shown on the Drawings and as specified in this Section.

B. All piping appurtenances shall be of the size shown on the Drawings. All equipment of the same type shall be from one manufacturer, unless authorized in writing by the Engineer.

C. All piping appurtenances shall have the name of the manufacturer and the working pressure for which they are designed cast in raised letters upon the body.

D. The piping appurtenances shall include, but not be limited to, the following:

1. Annular Diaphragm Seal and Pressure Gauge Assembly.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Product technical submittal data shall contain the following information and data:

1. Acknowledgment that products submitted meet requirements of standards referenced.

2. Manufacturer’s installation instructions.

3. Appurtenances:

   a. Pressure and temperature rating.

   b. Materials of construction.

   c. Linings.

   d. Dimensions and weight.

   e. Accessories.

   f. Manufacturer’s product brochures, cut-sheets, and parts diagrams.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Iron and Steel Institute (AISI)

   1. AISI Type 304L—Stainless Steel.

   2. AISI Type 316—Stainless Steel, Annealed Sheet.

B. American Society for Testing and Materials (ASTM)

   1. ASTM A536—Standard Specification for Ductile Iron Castings.

   2. ASTM C285—Standard Test Methods for Sieve Analysis of Wet-Milled and Dry-Milled Porcelain Enamel.

C. American Society of Mechanical Engineers (ASME)

1. ASME B16.5—Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standards.

D. American Water Works Association (AWWA)

1. AWWA C105/A21.5—Polyethylene Encasement for Ductile-Iron Pipe Systems.
2. AWWA C153/A21.53—Ductile-Iron Compact Fittings.
3. AWWA C207—Steel Pipe Flanges for Waterworks Service, Sizes 4-Inch through 144-Inch (100 mm through 3,600 mm).
4. AWWA C210—Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
5. AWWA C213—Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
6. AWWA C500—Metal-Seated Gate Valves for Water Supply Service.
7. AWWA C502—Dry-Barrel Fire Hydrants.
8. AWWA C700—Standard for Cold-Water Meters—Displacement Type, Metal Alloy Main Case.
9. AWWA C800—Underground Service Line Valves and Fittings.

E. National Sanitation Foundation (NSF)

1. NSF 61—Drinking Water System Components – Health Effects.

1.04 DELIVERY, HANDLING, AND STORAGE

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

B. All piping appurtenances, unless otherwise directed, shall be loaded and unloaded by lifting, and under no circumstances shall any piping appurtenances be dropped, skidded, or rolled.

C. Slings, hooks, or tongs used for lifting shall be padded to prevent damage to exterior surface or interior linings of piping appurtenances. If any part of the coating, lining, or components is damaged, the Contractor shall make repairs or replacement at his expense and in a manner satisfactory to the Engineer before attempting to install such piping appurtenances.

D. Only new piping appurtenances will be allowed for installation and shall be stored to prevent damage and be kept free of dirt, mud, or other debris.

1.05 QUALIFICATIONS

A. All of the piping appurtenances shall be products of well-established firms that are fully experienced, reputable, have been selling this product for a minimum of 10 years, and qualified in the manufacture of the particular product furnished. The piping appurtenances shall be designed, constructed, and installed in accordance with the requirements and procedures of applicable AWWA standards and shall comply with these Specifications as applicable.

PART 2 PRODUCTS

2.01 ANNULAR DIAPHRAGM SEAL AND PRESSURE GAUGE ASSEMBLY

A. Annular diaphragm seal and pressure gauge assemblies shall be provided at locations listed in this Section or as shown on the Drawings. All annular diaphragm-seal pressure gauge assemblies shall include an ethylene-glycol factory liquid-filled pressure-gauge and an annular seal assembly factory calibrated and ready for field installation. The annular seal assembly shall consist of a Buna-N diaphragm annual seal sleeve, carbon steel body, and ASME B16.5 Class 150 full-faced flanges (through bolted configuration). Pressure gauges shall be constructed with a stainless steel case with pressure ranges listed below. Annular diaphragm seal and pressure-gauge assemblies shall be as manufactured by the Red Valve Company, Incorporated, Series 48, or approved equal.

B. The Contractor shall furnish and install annular seal and pressure-gauge assemblies with pressure gauge ranges as follows and/or shown on the Drawings:

Location	Number of Assemblies	Pressure Gauge Range (psi)
Pump Station Collection Pipe	4	30
Pump Station Detection Pipe	2	30

2.02 TOOLS

A. If required for normal operation and maintenance, special tools shall be supplied with the equipment. Two T-handle wrenches, to operate standard 2-inch nuts on buried valves, and buried valve actuators shall be provided as part of the work.

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall install all piping appurtenances as shown on the Drawings.

B. All piping appurtenances shall be installed in the location shown, unless approved otherwise, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer.

C. Install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and shall be responsible for the proper location of these piping appurtenances during the construction of the structures.

3.02 SHOP PAINTING

A. Exterior surfaces of ferrous valves and piping appurtenances shall be painted in accordance with Section 09900, Painting and Coating, unless noted or specified otherwise.

3.03 INSPECTION AND TESTING

A. Completed valves and piping appurtenances shall be subjected to hydrostatic pressure test as described in Section 15055, Piping Systems—General, and the detail pipe sections of these Specifications. All leaks in valves and piping appurtenances shall be repaired and lines retested as approved by the Engineer. Before testing, the valves and pipelines shall be supported and thrust restrained for forces in excess of the test pressure to prevent movement during tests.

END OF SECTION

SECTION 15144
PRESSURE TESTING OF PIPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the hydrostatic, pneumatic, and leakage testing of pressure piping including leachate force mains and pump stations.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. Six copies of the test records to the Engineer upon completion of the testing.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Water Works Association (AWWA)

1. AWWA C600—Installation of Ductile Iron Mains and Their Appurtenances.
2. AWWA C605—Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.

1.04 TEST PRESSURES

A. At a minimum the Contractor shall perform pressure and leakage test at 1.5 times the maximum system pressure or 100 pounds per square inch (psi), whichever is greater (based on the elevation or the lowest point of the section under test and corrected for gauge location).

1.05 TESTING RECORDS

A. The Contractor shall provide records of each piping installation during the testing. These records shall include the following information:

1. Date and times of test.
2. Identification of process, pipeline, or pipeline section tested or retested.
3. Identification of pipeline material.
4. Identification of pipe specification.
5. Test fluid.
6. Test duration.

B. Test pressure at low point in process, pipeline, or pipeline section.

C. Remarks: Leaks identified (type and location), types of repairs, or corrections made.

D. Certification by Contractor that the leakage rate measured conformed to the Specifications.

1.06 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

PART 2 PRODUCTS

2.01 VENTS AND DRAINS FOR ABOVEGROUND PIPING

A. The Contractor shall install vents on the high points of aboveground piping, whether shown in the Drawings or not. Provide a valve at each vent or drain point. Valves shall be 3/4 inch for piping 3 inches. Valves shall be ball or gate valves unless otherwise shown on the Drawings. Valves shall be rated for the pressure of the adjacent piping and shall be suitable for use with the adjacent pipe material.

2.02 MANUAL AIR-RELEASE VALVES FOR BURIED PIPING

A. The Contractor shall provide temporary manual air-release valves at test bulkheads for pipeline test. Construct the pipe outlet in the same manner as for a permanent air valve and, after use, seal with a blind flange, pipe cap, or plug and coat the same as the adjacent pipe.

2.03 TEST BULKHEADS

A. The Contractor shall design and fabricate test bulkheads in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of the code. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

2.04 TESTING FLUID

A. The line shall be slowly filled with water and the specified test pressure shall be maintained in the pipe for the entire test period by means of a pump furnished by the Contractor. Provide accurate means for measuring the quantity of water required to maintain this pressure. The amount of water required is a measure of the leakage.

B. The Contractor shall be responsible for all costs associated with suppling and disposing of the test water.

C. The Contractor shall provide back flow prevention control for temporary connections to existing water mains.

2.05 TESTING EQUIPMENT

A. The Contractor shall provide calibrated pressure gauges, pipes, bulkheads, and pumps to perform the hydrostatic testing. The Contractor shall provide any necessary assistance required for testing.

PART 3 EXECUTION

3.01 TESTING PREPARATION

A. Pipes shall be in place, backfilled, and anchored before beginning pressure testing.

B. The Contractor shall conduct pressure tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, anchors, expansion joints, valves, and meters.

C. For buried piping, the pipe may be partially backfilled and the joints left exposed for inspection during an initial leakage test. However, perform the final pressure test after completely backfilling and compacting the trench.

D. Provide any temporary piping needed to carry the test fluid to the piping that is to be tested. After the test has been completed and demonstrated to comply with the Specifications, disconnect and remove temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Plug taps or connections to the existing piping from which the test fluid was obtained.

E. Provide temporary drain lines needed to carry testing fluid away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing.

F. Before starting the test, the Contractor shall notify the Engineer.

3.02 LENGTH OF TEST SECTION FOR BURIED PIPING

A. The maximum length of test section for buried pipe of 12 inches or smaller in diameter is 1,000 feet. Provide intermediate test bulkheads where the pipeline length exceeds these limits.

3.03 INITIAL PIPELINE FILLING FOR HYDROSTATIC TESTING

A. The maximum rate of filling shall not cause the water velocity in the pipeline to exceed 1 foot per second (fps). Filling may be facilitated by removing automatic air valves and releasing air manually.

3.04 TESTING NEW PIPE WHICH CONNECTS TO EXISTING PIPE

A. Before testing new pipelines that are to be connected to existing pipelines, the Contractor shall isolate the new line from the existing line by test bulkheads, spectacle flanges, or blind flanges. After the new line has been successfully tested, remove test bulkheads or flanges and connect to the existing piping.

3.05 HYDROSTATIC TESTING OF ABOVEGROUND OR EXPOSED PIPING

A. Open vents at high points of the piping system to purge air while the pipe is being filled with water. Venting during system filling may also be provided by temporarily loosening flanges.

B. Maintain the test pressure for a minimum of 2 hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show zero leakage or weeping. Correct leaks and retest until zero leakage is obtained.

3.06 HYDROSTATIC TESTING OF BURIED PIPING

A. Where any section of the piping contains concrete thrust blocks or encasement, the Contractor shall not make the pressure test until at least 10 days after the concrete has been placed.

B. Apply and maintain the test pressure by a positive displacement hydraulic force pump.

C. Maintain the test pressure for the 2 hours by restoring the pressure whenever it decreases by 5 psi.

D. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to leakage in the piping system. The allowable leakage volume for HDPE Pipe is as specified in Article 3.05 of Section 15146, High-Density Polyethylene (HDPE) Pipe.

E. The leakage test shall be a separate test following the pressure test and shall not be less than 2 hours long. All leaks evident at the surface shall be repaired and leakage eliminated regardless of the total leakage as shown by test. Lines that fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced.

F. Submit plan for testing to the Engineer for review at least 10 days before starting the test.

G. Any leakage in welded pipes shall be repaired by appropriate welding techniques.

H. Repair and retest any pipes showing leakage rates greater than that allowed in the criteria above.

3.07 REPETITION OF TEST

A. If the actual leakage exceeds the allowable leakage, locate and correct the faulty work and repeat the test. Restore the work and all damage resulting from the leak and its repair. Eliminate visible leakage.

3.08 BULKHEAD AND TEST FACILITY REMOVAL

A. After a satisfactory test, the Contractor shall remove the testing fluid, remove test bulkheads and other test facilities, and restore the pipe coatings/linings.

END OF SECTION

SECTION 15146
HIGH-DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Description: The Contractor shall provide all materials and incidentals, including piping, molded and ductile iron fittings, flanged adapters, flanged joints, mechanical joint adapters, hardware, and appurtenances for the HDPE piping systems shown on the Drawings and the Drawing Process Flow Identification.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance, and Section 15055, Piping Systems—General.

A. In general, shop drawings and related manufacturer's product certification shall be made in accordance with the General and Special Conditions of the Contract for approval before the manufacturer constructs or fabricates the material. The following items, which require shop drawings, are brought to the Contractor's attention. The list may not include all items for which shop drawing submittals are required to meet the requirements of the project.

1. Detail drawings of all classes of pipe, joints, and fittings.
2. Detail Drawings of all joints, including manufacturer's certified factory and/or laboratory test reports to confirm thrust-restraint capacities and restraining mechanism application.
3. Existing piping connection details.
4. Adapters for connection to mechanical joint valves and ductile iron pipe fittings.

B. Certification and test reports for the materials, manufacturing, and testing of the types of pipe supplied shall be furnished by the HDPE pipe manufacturer for the manufacturer's own products in accordance with the latest standards of the industry as described in this Section.

C. Provide a statement in writing from the HDPE pipe manufacturer that the manufacturer is listed with the Plastic Pipe Institute as a qualified extruder for the polyethylene resin to be used in the manufacture of the pipe for this project.

D. All persons making heat fusion joints shall receive training in the manufacturer's recommended procedures. The Contractor shall maintain records of trained

personnel and certify that training was received not more than 12 months before construction began. Additionally, the Contractor shall have worked on one or more projects involving combined installation of at least 10,000 feet of HDPE butt-fusion-welded pipe and shall provide the Engineer with a written list of HDPE pipeline installation experience, including project location, date, Owner, and personnel assigned and installing on this project.

E. The pipe manufacturer shall certify in writing that the Contractor is qualified to join, lay, and pull the pipe or representative of the pipe manufacturer shall be onsite to oversee all pipe joining. All costs for the manufacturer's representative shall be paid for by the Contractor.

F. The Contractor shall provide qualifications of the proposed firm to be used to clean, inspect, and videotape HDPE piping for record purposes. The Contractor shall submit a video record on DVD when the system is complete. The DVD shall be clearly labeled with the video inspection date, pipe starting and ending point, name, address, and phone number of firm performing the videotaping. Each section of pipe that is video inspected shall have a complete dialogue dubbed onto the video recording that at a minimum describes the length of pipe videotaped, the location of pipe videotaped, all welds, any deflections, and other features of interest.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM A307—Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
2. ASTM D3261—Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
3. ASTM D3350—Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
4. ASTM D4976—Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
5. ASTM F714—Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

B. American Water Works Association (AWWA)

1. AWWA C151/A21.51—Ductile Iron Pipe, Centrifugally Cast, for Water.
2. AWWA C901—Polyethylene (PE) Pressure Pipe and Tubing, 1/2-inch (13 mm) through 3-Inch (76 mm), for Water Service.
3. AWWA C906—Polyethylene (PE) Pressure Pipe and Fittings, 4-Inch through 65-Inch (100 mm Through 1,650 mm), for Waterworks.

C. International Organization for Standardization (ISO)

1. ISO 9001—Quality Management Systems – Requirements.

1.04 QUALITY ASSURANCE

A. The pipe and fitting manufacturer(s) shall have an established quality-control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier and verified by the manufacturer's quality control.

1.05 TESTING REQUIREMENTS

A. See Section 15144, Pressure Testing of Piping.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. General

1. All HDPE shall be DriscoPlex PE 4710 HDPE; or approved equal.
2. All HDPE pipe shall have an Iron Pipe Size (IPS) outside diameter unless otherwise specified or shown in the Drawings.
3. All HDPE piping system components shall be the products of one manufacturer.
4. Pipe and fittings shall be manufactured by an ISO 9001-certified manufacturer.

B. HDPE Pipe

1. HDPE pipe 4 inches in diameter and larger shall conform to material standard ASTM D3350 445574C cell classification rated as PE4710 by the Plastics Pipe Institute. Minimum pressure rating shall be in accordance with Piping Schedule Drawing or as specified in this Section. Minimum

pressure rating shall be 100 psi SDR 11 (Standard Dimension Ratio) for pipe sizes greater than 4 inches in diameter. For pipe sizes 3 inches and smaller in diameter, the minimum pressure rating shall be 200 psi SDR 9.

2. The polyethylene compound shall be suitably protected against degradation by ultraviolet light.
3. The maximum allowable hoop stress shall be 1,600 psi at 73.4ºF.
4. The pipe manufacturer shall be listed with the Plastic Pipe Institute as meeting the requirements of the resin manufacturer to manufacture pipe from the resin used.

C. Perforated HDPE Pipe for Leachate Collection and Leak Detection Systems

1. Perforated HDPE pipe shall conform to the requirements specified for HDPE pipe.
2. Perforations shall be drilled into the pipe at the pipe extrusion plant or fabrication shop. Any burrs remaining after drilling shall be removed. Perforations shall be drilled and deburred before the pipe is delivered to the job site. Job site perforation or perforation by the Contractor shall not be permitted.
3. Number of perforations: Pipe perforations shall be 3/8-inch diameter (±1/16 inch) with locations and spacings as indicated on the Drawings.

D. Fittings

1. The pipe manufacturer shall mold or fabricate the polyethylene fittings. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe.

    a. Molded Fittings: Molded fittings shall be manufactured in accordance with ASTM D3261 and shall be so marked. Each production lot of molded fittings shall be subjected to the test required under ASTM D3261. The manufacturer shall submit samples from each molded fitting production lot to x-ray inspection for voids and shall certify that voids were not found.

        (1) Polyethylene Flange Adapters: Flange adapter shall be made with sufficient throughbore length to be clamped in a butt fusion joining machine without the use of a subend holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to restrain the gasket against blow-out. Flange adapters shall be fitted with ductile-iron backup rings pressure rated equal

to or greater than the mating pipe. The Contractor shall provide flat ring-type EPDM gaskets with gasket thickness and hardness as recommended by the pipe manufacturer for use with HDPE flanged joints. Provide carbon steel hardware (bolts, nuts, washers, etc.) conforming to ASTM A307, Grade B for use with the flange adapters assemblies in accordance with the pipe manufacturer's recommendations. Gaskets shall be made from material suitable for exposure to the liquid within the pipe.

b. Fabricated Fittings: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full-service pressure rating of the mating pipe. Pressure de-rated fittings are not acceptable. Directional fittings 16 inches IPS and larger, such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.

2. D.I./HDPE Mechanical Joint Adapters.

a. The manufacturer of the HDPE pipe shall supply all D.I./HDPE mechanical joint adapters and accessories required to connect plain-end HDPE piping to mechanical joint fittings, valves, and appurtenances.

b. The D.I./HDPE mechanical joint adapter shall consist of:

(1) A molded or fabricated HDPE mechanical joint transition fitting.
(2) A Buna-N gasket for a D.I. mechanical joint.
(3) A ductile iron mechanical joint backup drive ring.
(4) Cor-Ten mechanical joint tee bolts.
(5) A stainless-steel sleeve stiffener molded or fabricated within the MJ end of the HDPE mechanical joint adapter fitting.

c. The D.I./HDPE mechanical joint adapter shall be connected to the HDPE pipe by a heat-fused joint on one end and connected to a ductile iron pipe valve, fitting, or appurtenance with the internally stiffened mechanical joint end.

d. The tee bolts and backup drive ring shall act as a joint restraint for connections to mechanical joints.

e. The HDPE mechanical joint adapter fitting shall be molded or fabricated by the manufacturer of the HDPE pipe. All molded fittings shall be fully pressure rated to match the SDR pipe pressure rating. Fabricated fittings shall be rated for internal pressure service equivalent to the full pressure rating of the mated IPS pipe.

f. If rework compounds are required, only those generated in the manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.

g. Solvent epoxy cementing and mechanical joining with bolt on wrap-around clamps shall not be used.

3. Ductile-iron fittings connected to SDR 17 HDPE pipe (4 inches and larger) shall be as specified in Section 15155, Ductile Iron Pipe and Fittings.

E. HDPE Pipe Jointing Method

1. HDPE pipe shall be jointed by butt fusion in accordance with the pipe manufacturer's directions and only for pipe within one SDR ratio of each other.
2. For SDR ratios that are two or more apart (i.e., SDR 21 to SDR 11), the joint shall be made using a restrained joints. Same-diameter pipe may be joined by using HDPE flange adapters and backup rings bolted to each other.
3. All HDPE pipe joined by butt fusion shall be made from the same class and type of raw material made by the same raw material supplier.
4. *Butt fusion* means the butt joining of the pipe by heat fusion aligned faces of the pipe ends (butts) in a suitable apparatus and joining under controlled pressure and alignment.
5. The external bead resulting from the butt-fusion process shall be visible and examined for complete butt-fusion 360º around the pipe exterior.
6. Short spools of pipe between valves and fittings shall be ductile iron pipe, with all joints restrained for sizes 4 inches and larger. For 2-inch, the spool shall be Schedule 40 Type 304 stainless steel piping or Schedule 80 PVC piping with IP threads stainless steel or PVC fittings and all joints restrained.
7. Where approved by the Engineer, the HDPE pipe and fittings may be fused with Electrofusion Couplings, as manufactured by Central Plastics Company, or approved equal. Technical information must be provided to

demonstrate that the fused coupling will not compromise the structural integrity of the HDPE pipe.

2.02 LOCATOR WIRE

A. All HDPE piping outside the edge of the landfill bottom-liner system shall be installed with detectable pipeline marking tape for location purposes as specified in Section 15055, Piping Systems—General.

PART 3 EXECUTION

3.01 GENERAL

A. All polyethylene pipe shall be cut, fabricated, joined, and installed in strict conformance with the pipe manufacturer's recommendations. Joining, laying, and pulling of polyethylene pipe shall be accomplished by personnel experienced in working with HDPE pipe.

3.02 LAYING PIPE

A. Joints

1. All HDPE to HDPE pipe joints shall be joined by heat fusion that produces homogeneous, sealed, leak-tight joints.
2. Restrained mechanical joint adapters shall be provided at tie-ins with valves, ductile iron fittings, and other pipe materials.

B. Butt Fusion Testing

1. The Contractor shall test the first fusion of each day.
2. In testing, the fusion shall be allowed to cool completely and then fusion test straps shall be cut out. The test shall be a minimum of 12 inches or 30 times the wall thickness in length with the fusion in the center and a minimum of 1 inch or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. The Contractor shall not begin until a fusion test has passed the bent strap test.

C. Pipe Deflection

1. When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane or where long radius curves are permitted, the amount of deflection shall not exceed 75% of that recommended by the manufacturer.

D. Pipe Cutting

1. Cutting HDPE butt fusion connections to HDPE pipe, valves, fittings, or closure pieces shall be done in a neat, workmanlike manner without damaging the pipe. Ends shall be cut square and perpendicular to the pipe axis.

3.03 PERFORATED HDPE PIPING INSTALLATION

A. All sections of perforated HDPE pipe shall be thoroughly cleaned and deburred after perforating and before welding or delivery to the job site to ensure all drill cuttings are removed from the pipe.

B. Pipe and fittings shall be joined using butt heat-fusion techniques in accordance with the pipe manufacturer's recommendations unless otherwise noted on the Drawings. Heat-fusion weld beads projecting into the interior of the piping on all solid wall and perforated gravity drain HDPE pipe shall be removed so that the internal weld is flush with the interior of the pipe. The joint must be completely cooled before bead removal. The internal bead shall be removed before making the next butt fusion.

C. Pipe shall be installed in gravel fill as specified in Section 02301, Earthwork for Landfill Construction.

D. Perforated pipe shall be installed in accordance with Drawing details and as specified for HDPE pipe.

E. Before final acceptance, completely flush and clean all parts of the system. Flushing water shall be disposed of properly. Flushing water shall not be discharged to the leachate storage tanks. The leachate collection and leak detection pumps shall not be used to handle water resulting from flushing operations. Remove all accumulated construction debris, rocks, sand, gravel, and other foreign material.

3.04 FLUSHING AND CLEANING

A. Flushing and cleaning shall be as specified in Section 15144, Pressure Testing of Piping.

3.05 TESTING AND LEAKAGE

A. Hydrostatic Tests—General

1. All testing shall comply with Section 15144, Pressure Testing of Piping, except as specified in this Section.

2. All field tests shall be made in the presence of the Owner or Engineer. Except as otherwise directed, all pipelines shall be tested. All piping to operate under liquid pressure shall be tested in sections of approved length, typically from valve to valve and in no case longer than 1,000 feet.

3. Hydrostatic testing shall consist of a combined pressure test and leakage test. The field test pressure shall be as indicated in Section 15144, Pressure Testing of Pipe. The pressure shall be applied by a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pipe connection, and all necessary apparatus shall be furnished by the Contractor and shall be subject to the satisfaction of the Engineer.

4. The maximum duration for any test, including initial pressurization, initial expansion, and time at test pressure, must not exceed 8 hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section and allow it to "relax" for at least 8 hours before bringing the test section up to test pressure again.

5. Monitored Make-Up Water Test: The test procedure consists of initial expansion and test phases.

   a. During the initial expansion phase, the test section is filled with water. Once the line is filled, make-up water is added at hourly intervals as required to maintain the test pressure for 3 hours.
   b. At the end of the initial expansion period, the addition of make-up water will cease. During the test phase the pipe will not have any water added to it for the following 2 hours. The 2 hours will be the actual leakage test. At the end of the 2-hour period, measured make-up water will be added to the pipe to return it to the original test pressure.
   c. If the amount of make-up water added is greater than calculated using the numbers listed below, the section being tested will be considered to have a leak. The leak shall be found and fixed at the Contractor's expense and that section of the line retested before continuing with subsequent leakage tests. Testing and repairs shall be repeated at the Contractor's expense until the amount of make-

up water is less than the amount calculated using the numbers listed below.

ALLOWABLE FOR EXPANSION UNDER TEST PRESSURE*
POLYETHYLENE PIPE

Nominal Pipe Size (in.)	Allowances for Expansion (US Gal/100 Feet of Pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
2	0.08	0.12	0.15
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.3	2.1
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
24	4.5	8.9	13.3
30	6.2	12.6	19.1
36	9.0	18.0	27.0
42	12.0	24.0	36.0
48	15.0	27.0	43.0

*These allowances only apply to the test phase and not to the initial expansion phase.

B. Jet Cleaning and Video Inspection

1. All HDPE gravity piping (solid wall and perforated) shall be jet cleaned and then video inspected before final inspection. The Contractor shall provide all equipment and labor for such cleaning and inspection. Any Subcontractor must be approved by the Owner before work can begin.
2. Video inspection shall be performed after cleaning and pressure testing (when pressure testing is required) the pipe. If cleaning and video inspection of each pipe run from its respective cleanout is not possible, the Contractor shall correct installation deficiencies to allow cleaning and video inspection of the entire length.
3. Digital video recordings shall be taken of all inspections. The Contractor shall prepare a DVD video record of the inspection for submission as detailed in Paragraph 1.02F. The DVD shall be accompanied by an inspection log in addition to a summary report.

END OF SECTION

SECTION 15155
DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall provide all materials and incidentals, including piping, fittings, flanged joints, mechanical joints, retainer glands, polyethylene bagging for buried ductile iron piping, fittings, valves, and appurtenances for the ductile iron piping systems required for the work shown on the Drawings and described in Section 15060, Pipe Supports.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. All ductile iron pipe and fittings to be installed under this Contract shall be inspected and tested at the foundry where the material for this project is manufactured. The Contractor shall submit sworn certificates of such tests and their results.

B. Shop Drawings, including layout drawings, shall be submitted as specified in Section 15055, Piping Systems—General.

C. The Contractor shall submit the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.

1.03 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM A193/A193M—Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

2. ASTM A194/A194M—Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
3. ASTM A307—Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
4. ASTM A536—Standard Specification for Ductile Iron Castings.
5. ASTM A563—Standard Specification for Carbon and Alloy Steel Nuts.
6. ASTM B117—Standard Practice for Operating Salt Spray (Fog) Apparatus.
7. ASTM C150/C150M—Standard Specification for Portland Cement.
8. ASTM C283—Standard Test Methods for Resistance of Porcelain Enameled Utensils to Boiling Acid.
9. ASTM D714—Standard Test Method for Evaluating Degree of Blistering of Paints.
10. ASTM D792—Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
11. ASTM D1238—Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
12. ASTM E96—Standard Test Methods for Water Vapor Transmission of Materials.
13. ASTM G95—Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method).

B. American Society of Mechanical Engineers (ASME)

1. ASME B1.1—Unified Inch Screw Threads (UN and UNR Thread Form).
2. ASME B16.1—Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
3. ASME B16.21—Nonmetallic Flat Gaskets for Pipe Flanges.

C. American Water Works Association (AWWA)

1. AWWA C104/A21.4—Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C110/A21.10—Ductile-Iron and Gray-Iron Fittings.
3. AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C115/A21.15—Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
5. AWWA C150/A21.50—Thickness Design of Ductile-Iron Pipe.
6. AWWA C151/A21.51—Ductile-Iron Pipe, Centrifugally Cast.
7. AWWA C153/A21.53—Ductile-Iron Compact Fittings.
8. AWWA C207—Steel Pipe Flanges for Waterworks Service, Sizes 4-Inch through 144-Inch (100 mm through 3,600 mm).

9. AWWA C600—Installation of Ductile-Iron Mains and their Appurtenances.
10. AWWA C651—Disinfecting Water Mains.

D. International Organization for Standardization (ISO)

1. ISO-9001—Quality Management Systems – Requirements.

E. NSF International (NSF)

1. NSF 61—Drinking Water System Components – Health Effects.

1.04 QUALITY ASSURANCE

A. Source Quality Control:

1. The ductile iron pipe manufacturer shall submit certification that the pipe and fitting products meet all tests required by AWWA C151/A21.51.
2. All materials shall be new and have a manufacturer's certificate verifying compliance to all tests and inspections as required in this Section. The weight, class, and casting period shall be shown on each piece of pipe. The manufacturer's "mark," the year produced, and the word "Ductile" or the letters "DI" shall be cast or stamped on all pipe.

1.05 TESTING REQUIREMENTS

A. See Section 15144, Pressure Testing of Piping, for testing requirements.

1.06 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

PART 2 PRODUCTS

2.01 GENERAL

A. All ductile iron piping shall be designed and manufactured in accordance with AWWA C150/A21.50 and AWWA C151/A21.51 for the following minimum operating conditions:

1. The minimum internal design pressure shall be 150 psi with a 100-psi surge allowance, with a safety factor of 2, for a total internal design pressure of 500 psi.

2. The external loads design criteria shall be for the minimum cover indicated on the Drawings at 120 lb per cubic feet soil weight and live load based on one AASHTO H-20 truck load. The thickness design of ductile iron pipe shall be in accordance with AWWA C150/A21.50.

3. Pressure Class: All ductile iron piping shall meet the following minimum working pressure classes:

a. 4 inches through 12 inches: 350 psi.

2.02 JOINTS

A. Ductile iron fittings shall be furnished with mechanical joints and flanged joint ends as shown on the Drawings and specified in this Section:

1. Mechanical Joints: All buried ductile iron fittings shall be furnished with mechanical joint ends unless noted otherwise. Mechanical joints shall conform to AWWA C111/A21.11. Glands shall be constructed of ductile iron.
2. Flanged Joints: Pipe for threaded flange fabrication shall be Special Thickness Class 53 in accordance with AWWA C110/A21.10, AWWA C111/A21.11, and AWWA C115/A21.15. Bolt circle and bolt holes shall match those of ASME B16.1 Class 125 flanges. The flanges shall be rated for a maximum working pressure of 250 psi. Threaded flanges shall be individually fitted and machine tightened on the pipe ends. Flange facing shall be smooth or with shallow serrations in accordance with AWWA C115/A21.15.

2.03 FITTINGS

A. General: Ductile iron pipe fittings shall be the compact type meeting the requirements of AWWA C110/A21.10 and AWWA C153/A21.53 where

applicable. Fittings shall be manufactured in accordance with AWWA C110/A21.10. Where taps are shown on fittings, tapping bosses shall be provided. At a minimum, fittings shall have the same pressure rating as the connecting pipe.

1. Flanged Joint: AWWA C110/21.10 and ASME B16.1, faced and drilled 125-pound ANSI standard.

2. Mechanical Joint: AWWA C110/A21.10

    a. Provide mechanical joint fittings for all buried fittings as shown in the Drawings, unless noted otherwise.
    b. Provide specified gaskets.

2.04 LINING AND COATING

A. The Contractor shall provide ceramic epoxy-lined ductile-iron piping, valves, and fittings. The Contractor shall perform all field measurements confirming the accuracy of the piping sizes and lengths shown on the Drawings. The Contractor shall notify the Engineer immediately before deviating from or altering the lining of ductile-iron piping.

B. Ceramic Epoxy Lined Pipe, Valves, and Fittings: The Contractor shall notify the Engineer immediately before cutting epoxy-lined ductile iron pipe in the field. The Contractor shall repair the cut end in accordance with the pipe manufacturer's written procedures.

1. General: The lining shall be an amine-cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The lining material shall be Protecto 401 Ceramic Epoxy as manufactured by Induron Protective Coatings, Inc. The lining shall be applied by a competent pipe lining specialty firm with a successful history of applying linings to the interior of ductile iron pipe and fittings.

2. Lining Materials: Lining material shall meet the following requirements and properties:

    a. A permeability rating of 0.00 when tested according to Method A of ASTM E96, Procedure A with a test duration of 30 days.

b. The following test shall be run on coupons from lined ductile pipe:

Test Parameter	ASTM Test Method	Typical Value
Salt Spray	B117	0.0 undercutting after 2 years
Cathodic disbondment 1.5 volts @ 77º F	G95	No more than 0.5 mm undercutting after 30 days
Immersion	D714	No effect after 2 years for 20% sulfuric acid, 140ºF 25% sodium hydroxide, 160ºF distilled water
Immersion	D714	0.0 undercutting after 2 years for 120ºF tap water

3. Application: The lining applicator shall apply lining according to the requirements of the Protecto 401 Specification and application methods and procedures.

2.05 MANUFACTURERS

A. Acceptable ductile iron pipe manufacturers include US Pipe, American Ductile Pipe, Griffin Pipe, or approved equal.

2.06 BOLTS

A. General: The Contractor shall provide carbon steel, ASTM A307, Grade A hex head bolts and ASTM A563, Grade A hex head nuts. Threads shall be as specified in ASME B1.1 coarse thread series, Class 2A external and Class 2B internal. Nuts, bolts, and gaskets for flanged fittings and blind flanges shall be designed to withstand the design and test pressure ratings for the pipe.

2.07 GASKETS

A. Gaskets for mechanical joints shall be compatible with Class I landfill leachate pipe service. See Section 15055, Piping System—General, for gasket requirements.

B. Gaskets for flanged joints shall be EPDM and in accordance with AWWA C207 material shall be compatible with Class I landfill leachate. Gaskets shall be full-face type for 125-pound flanges.

2.08 RETAINER GLANDS

A. Retainer glands shall be provided for all buried ductile-iron mechanical joints, fitting, and ductile-iron pipe connections to buried valves. Retainer glands shall be designed for joint retaining through the use of a follower gland and set screw-anchoring devices that impart multiple wedging action against the pipe. The mechanical joint-restraint device shall be UL listed and shall have a working pressure of at least 250 psi with a minimum safety factor of 2.

1. Gland: Manufactured of ductile iron conforming to ASTM A536. Gland dimensions shall match AWWA C111/A21.11 and AWWA C153/A21.53.

2. Restraining Devices: Manufactured of ductile iron heat treated to a minimum hardness of 370 BHN. Restraining devices shall incorporate a set screw/twist-off nut bolt to ensure the proper actuating of the restraining device. The twist-off nut shall be designed to come off at the torque limit desired to anchor the restraining device in place on the pipe.

3. Joint Deflection: Retainer gland joint deflection shall be limited to manufacturer's recommended maximum deflection angle. Joint deflection shall be applied before the set screws are torqued.

4. Acceptable Manufacturers:

   a. EBAA Iron, Inc. – Megalug 1100 Series.
   b. Or approved equal.

2.09 EXTERNAL PIPE RESTRAINTS

A. Ductile iron pipe push-on (bell and spigot) joint restraint shall be provided by a restraining harness consisting of a restraint ring, connecting tie-rods, and split-ring assembly installed at all push-on joints. The restraint ring shall consist of wedging components made from 60-42-12 ductile iron conforming to ASTM A536 and wedges heat treated to minimum 370 BHN. Torque limiting twist-off nuts shall be provided on each wedge to ensure proper applied installation torque. The split ring shall be made from 60-42-12 ductile iron conforming to ASTM A536. The connecting rods shall be made of steel conforming to AWWA C111/A12.11. Sizes 4- to 16-inch-diameter restraining harnesses shall have 350-psi maximum working pressure rating and 18- to 36-inch-diameter restraining harnesses shall have 250-psi maximum working pressure rating. All harnesses shall be designed with a 2-to-1 safety factor applied to the maximum working pressure rating.

B. Acceptable Manufacturers

1. EBAA Iron, Inc. – Series 1700.
2. Or approved equal.

2.10 INTERNAL PIPE RESTRAINT (NOT USED)

2.11 POLYETHYLENE BAGGING

A. All buried ductile iron pipe, fittings, and valves shall have the appropriate finish applied and be bagged before backfilling. Polyethylene bagging for buried ductile iron pipe, fittings, and valves shall be 8 mils thickness minimum polyethylene, manufactured in accordance with ASTM D1238, Type I, Class C, Grade E1.

2.12 COLOR CODING OR MARKING (NOT USED)

PART 3 EXECUTION

3.01 HANDLING PIPE AND FITTINGS

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe, fitting, lining, and coating. Pipe and fittings shall not be dropped. All pipe and fittings shall be examined before installation, and no piece that the Engineer finds defective shall be installed. The Contractor shall repair any damage to the pipe and fittings coating and/or lining as directed by the Engineer. If the Engineer determines that the coating and/or lining cannot be repaired, the Contractor shall replace the damaged pipe and fittings at no additional compensation.

B. All pipe and fittings shall be subjected to a careful inspection immediately before installation.

C. If any defective pipe is discovered after it has been installed, the Contractor shall remove and replace it with a pipe in satisfactory condition at no additional expense to the Owner.

D. Ceramic epoxy pipe and fittings shall be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying.

3.02 PIPE INSTALLATION

A. The Contractor shall provide and use proper implements, tools, and facilities for the safe and convenient performance of the work. All pipe, fittings, valves, and appurtenances shall be lowered carefully into the trench and at above-grade

locations to prevent damage to the pipe, protective coating, lining, and polyethylene bagging. Under no circumstances shall pipeline materials be dropped off or dumped. A trench shall be dewatered before the pipe is installed.

B. The Contractor shall carefully examine all pipe fittings, valves, and other appurtenances for damage and other defects immediately before installation and before bagging buried ductile-iron pipe. The Contractor shall mark and hold defective materials for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

C. The Contractor shall remove all lumps, blisters, and excess coating from the socket and plain ends of push-on joint pipe for buried service. The outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid in trench.

D. The Contractor shall prevent foreign material from entering the pipe while the pipe is being placed in the trench. During installation, no debris, tools, clothing, or other materials shall be placed in the pipe.

E. As each length of buried pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

F. When pipe is not being laid, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. When practical, the plug shall remain in place until the trench is pumped completely dry. Care shall be taken to prevent pipe flotation should the trench fill with water.

G. Trench width at the top of pipe, bedding conditions, and backfill placement and compaction shall be such that design loadings on the pipe will not be exceeded.

H. Joint Assembly: Pipe joints shall be assembled in accordance with the manufacturer's instructions and the requirements of AWWA C600.

1. Flanged Joint: Before connecting flanged pipe, the Contractor shall thoroughly clean all faces of the flanges of all oil, grease, and foreign material. The gaskets shall be checked for proper fit and thoroughly cleaned. Care shall be taken to ensure proper sealing of the flange gasket. Bolts shall be tightened so that the pressure on the gasket is uniform. Torque-limiting wrenches shall be used to ensure uniform bearing insofar as possible. If joints leak when the hydrostatic test is applied, the gaskets shall be removed and reset and bolts retightened.
2. Push-On, Restrained Joint, or Mechanical Joint: The Contractor shall joint piping in accordance with the manufacturer's recommendations. Provide

all special tools and devices, such as special jacks, chokers, and similar items required for proper installation. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer, and no substitutes will be permitted under any circumstance.

I. Pipe Deflection: When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane or where long radius curves are permitted, the amount of deflection shall not exceed that shown in ANSI/AWWA C600 and that recommended by the retainer gland manufacturer for mechanical joint pipe and fittings.

J. Pipe Cutting: For inserting valves, fittings, or closure pieces pipe shall be cut in a neat, workmanlike manner without damaging the pipe or lining. Ductile cast iron may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheel saw, or oxyacetylene torch. Cut ends and rough edges shall be ground smooth, and for push-on joint connections the cut end shall be beveled.

3.03 ABOVE-GROUND PIPE INSTALLATION

A. The Contractor shall install pipe in horizontal or vertical planes, parallel or perpendicular to concrete pad edges unless otherwise shown. Support pipe and fittings to prevent strain on joints, valves, and equipment. Install flanged joints so that contact faces bear uniformly on the gasket. Tighten bolts in accordance with the pipe manufacturer's recommendations.

3.04 SURFACE PREPARATION AND PAINTING

A. All exposed pipe and fittings shall be painted as specified in Section 09900, Painting and Coating.

B. All buried steel (excluding stainless steel) bolts, nuts, washers, rods, harnesses, clamps, sleeves, and appurtenances shall be coated with System No. 24 as specified in Section 09900, Painting and Coating.

3.05 INSPECTION AND TESTING

A. See Section 15055, Piping Systems—General, and Section 15144, Pressure Testing of Piping.

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16401
LOW-VOLTAGE ELECTRICAL WORK—GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary for a complete corrosion-resistant working system, including all ancillary items that may be required for the equipment provided and not specifically identified herein, fees, charges, and permits necessary. Work of this Section includes electrical installation requirements for equipment of other sections. This Section is general and does not purport to show or identify all required components for a complete and working system. This Section may include specifications for materials and equipment not contained within the scope of this project.

B. The Contractor shall provide temporary and permanent electrical services of proper voltage and phase as required for the Project. All single-phase temporary receptacle outlets shall be provided with ground fault protection in accordance with NEC 590.6 and installed in accordance with NEC 406.8.

C. The Contractor shall coordinate the work of this Section with others involved in the construction of the project.

D. The Contractor shall coordinate with the local power company to schedule and arrange for connection of the proposed electrical systems to the electrical distribution system.

1.02 SUBMITTALS

The Contractor shall submit shop drawings in accordance with Section 01330, Submittals and Acceptance:

A. The Contractor shall submit a complete list of materials and equipment to be incorporated in the work to the Owner for review within 30 days after the Award of Contract.

B. The list shall include catalog numbers, cut sheets, diagrams, and other descriptive data required to demonstrate conformance with the Specifications. Partial lists will not be acceptable.

C. The basis of acceptance shall be the manufacturer's published ratings for the equipment. The manufacturer shall be regularly engaged in the manufacture of products specified.

D. Shop drawings shall be submitted for the following items of equipment:

1. Wiring Devices.
2. Panelboards.
3. Safety Switches.
4. Circuit Breakers.
5. Motors.
6. Motor Starters.
7. Outdoor Electrical Equipment Housing.
8. Relays.
9. Control Devices.
10. Transformers.
11. Lighting Fixtures.
12. Concrete Posts/Poles.
13. Surge Protection Device.

E. Contents of the shop drawings shall include the following:

1. Details of construction, outline and assembly drawings.
2. Dimensions.
3. Materials.
4. Finish.
5. Ratings.
6. Accessories.
7. Trim.
8. Engineering data.
9. Ladder-type schematic control diagrams and wiring diagrams.
10. Calculations for harmonic current and voltage distortion.
11. Test Equipment datasheets and proposed test procedures for testing the grounding system.

F. The Contractor shall submit the manufacturer's literature for the equipment listed in Paragraph 1.02.D above to the Owner for review, including the following:

1. Written description of equipment function, normal operating characteristics and limiting conditions.
2. Recommended assembly, installation, alignment, adjustment, and calibration instructions.
3. Operating instructions.
4. Guide to troubleshooting.

5. Maintenance instructions and timetables.
6. Parts List and an assembly drawing with the parts identified.

G. Surge protection device submittals shall include the following:

1. UL 1449 peak let-through voltage documentation.
2. Category C3 peak let-through voltage test results.

1.03 REFERENCES

Reference standards and recommended practices referred to in this Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American National Standards Institute (ANSI)

1. ANSI C12.20—Electricity Meters 0.1, 0.2, and 0.5 Accuracy Classes.
2. ANSI C80.1—Electrical Rigid Steel Conduit.

B. American Society for Testing and Materials (ASTM)

1. ASTM A36/A36M—Standard Specification for Carbon Structural Steel.
2. ASTM A48/A48M—Standard Specification for Gray Iron Castings.
3. ASTM A153/A153M—Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM B8—Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

C. American Bearing Manufacturers Association (ABMA)

1. ABMA Std 20—Radial Bearings of Ball, Cylindrical Roller, and Spherical Roller Types, Metric Design.

D. Federal Specifications and Standards (FSS)

1. FSS A-A-50552—Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible.
2. FSS A-A-50553B—Fittings for Conduit, Metal (Thick-Wall (Rigid) and Thin-Wall (EMT) Type).
3. FSS A-A-50563B—Conduit Outlet Boxes, Bodies and Entrance Caps, Electrical: Cast Metal.
4. FSS A-A-55809B—Insulation Tape, Electrical, 600V, Polyvinyl Chloride, Pressure-Sensitive Adhesive.

5. FSS A-A-55810A—Conduit, Metal, Flexible.
6. FSS A-A-59213A—Splice Connectors.
7. FSS A-A-59544A—Cable and Wire, Electrical (Power, Fixed Installation).
8. FSS W-C-375E—Circuit Breakers, Molded Case: Branch Circuit and Service.
9. FSS W-C-596H—Connector, Electrical Power (General Specification).
10. FSS W-P-115C—Panel, Power Distribution.
11. FSS W-S-896G—Switches, Toggle (Toggle and Lock), Flush-Mounted (General Specification).

E. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 112—Standard Test Procedure for Polyphase Induction Motors and Generators.
2. IEEE 117—Standard Test Procedure for Thermal Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery.
3. IEEE 519—Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
4. IEEE C2—National Electrical Safety Code (NESC).
5. IEEE C62.41.1—Guide on the Surges Environmental in Low-Voltage (1,000 V and Less) AC Power Circuits.
6. IEEE C62.45—Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1,000 V and Less) AC Power Circuits.

F. National Electrical Manufacturers Association (NEMA)

1. NEMA ICS 1—Industrial Control and Systems: General Requirements.
2. NEMA ICS 6—Industrial Control and Systems: Enclosures.
3. NEMA MG 1—Motors and Generators.
4. NEMA PB 1—Panelboards.
5. NEMA ST 20—Dry Type Transformers for General Applications.
6. NEMA TC 2—Electric Polyvinyl Chloride (PVC) Conduit.
7. NEMA TC 3—Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
8. NEMA WD 1—General Color Requirements for Wiring Devices.

G. National Fire Protection Association (NFPA)

1. NFPA 70—National Electrical Code (NEC).
2. NFPA 101—Life Safety Code.

H. Underwriters Laboratories, Inc. (UL)

1. UL 6A—Electrical Rigid Metal Conduit – Aluminum.
2. UL 50—Enclosures for Electrical Equipment, Non-Environmental Considerations.
3. UL 67—Standard for Panelboards.
4. UL 83—Thermoplastic-Insulated Wires and Cables.
5. UL 360—Standard for Liquid-Tight Flexible Metal Conduit.
6. UL 467—Grounding and Bonding Equipment.
7. UL 489—Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
8. UL 498—Standard for Attachment Plugs and Receptacles.
9. UL 508—Standard for Industrial Control Equipment.
10. UL 510—Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
11. UL 514A—Metallic Outlet Boxes.
12. UL 514B—Conduit, Tubing, and Cable Fittings.
13. UL 514C—Standard for Nonmetallic Outlet Boxes, Flush-Devices Boxes, and Covers.
14. UL 651—Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.
15. UL 797—Electrical Metallic Tubing - Steel.
16. UL 1029—Standard for High-Intensity-Discharge Lamp Ballasts.
17. UL 1449—Standard for Surge Protective Devices.
18. UL 1660—Liquid-Tight Flexible Nonmetallic Conduit.

I. Intertek

1. ETL-PVC-001—Independent third party testing standard to signify compliance to coating adhesion performance.

1.04 QUALITY ASSURANCE

A. PVC-coated metal conduit must comply with UL 6A for safety and ETL PVC-001 for performance.

1.05 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Section 01780, Warranties and Bonds.

B. All equipment and materials supplied shall be warranted against defective design, materials, and workmanship for a minimum of 1 year, or as specified in this Section, against normal use. The warranty period shall begin once the total project

is accepted by the Owner and shall cover replacement of equipment and/or repair, including labor, travel time, and miscellaneous expenses at no cost to the Owner for the full warranty period.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01650, Delivery, Storage, and Handling, for storage and protection of the items specified in this Section.

B. The Contractor shall deliver materials with manufacturer's tags and labels and UL labels intact. Packaged material shall be delivered in the manufacturer's original, unopened containers bearing the manufacturer's name, brand, and UL label. Materials and equipment shall be stored in a dry, clean location. Handle and store so as to avoid damage. Items delivered in broken, damaged, rusted, or unlabeled condition shall be removed from the project site immediately and replaced with acceptable items. The Contractor shall provide suitable protection of materials and equipment from dust and moisture. The Contractor shall be responsible for the condition of materials and equipment until they are accepted by the Owner.

1.07 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. O&M Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Section 01830, Operations and Maintenance Manuals.

B. Before final acceptance of this project, an O&M Manual shall be submitted to the Owner. The manual shall include manufacturer's literature as outlined in Paragraph 1.02.F above, drawings corrected in accordance with shop drawing review comments and including all modifications, and lists of suppliers and/or service shops that can provide parts and accessories and equipment repair for the items of equipment listed in Paragraph 1.02.D above. The lists shall include a contact name, telephone number, and address.

C. A test report detailing the results of the grounding system test shall be provided with the O&M Manual.

1.08 CODES, INSPECTIONS, AND FEES

A. The Contractor shall obtain all necessary permits and inspections required for the work of this Section and pay all charges incidental to this work. The Contractor shall deliver to the Owner all certificates of inspection issued by authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All material and equipment shall be new and listed or labeled for use within the United States by a Nationally Recognized Testing Laboratory (NRTL). Equipment shall be provided with a specific listing, such as UL, when indicated in this Section or in other portions of the Contract Documents. Only products by manufacturers regularly engaged in the production of specified units will be acceptable.

B. Where two or more units which perform the same function or are of the same class of equipment or materials are required, provide all units from a single manufacturer.

C. Provide materials and equipment of suitable composition to perform satisfactorily when exposed to corrosive conditions of the project site.

1. Provide breather and drain fittings in all raceways and enclosures where necessary to prevent condensation or trapping of moisture.
2. Provide heaters in all control panels to prevent condensation.

2.02 CONDUIT

A. Rigid Metal Conduit: Rigid metal conduit shall be aluminum and shall conform to UL 6A.

1. PVC-coated rigid steel conduit, elbows, and fittings shall be coated with a bonded polyvinylchloride which is permanently fused on at the factory.

    a. Must meet UL 6A safety standards and carry the ETL-PVC-001 verified label.
    b. Aboveground conduit system PVC coating shall have a minimum thickness of 40 mils. Couplings and condulets shall have overlapping pressure sealing sleeves.
    c. Below-ground conduit system PVC coating shall have a minimum thickness of 40 mils.
    d. Below-ground conduit system PVC coating for extreme corrosive conditions shall have a minimum thickness of 40 mils and shall have external and internal bonded coatings.

B. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be polyvinyl chloride compound and shall conform to NEMA TC-2 and UL 651. Conduit shall be sunlight resistant, rated for use with 90 °C conductors. Fittings shall be of the

same polyvinyl chloride compound and from the same manufacture as the conduit and shall conform to NEMA TC-3 and UL 514B. Conduit and fittings shall be joined by a solvent cement. The type of cement and the procedure for application shall be as recommended by the conduit manufacturer. The conduit shall be Carlon Plus 80, or equal.

C. Liquidtight Flexible Metal Conduit: Liquidtight flexible metal conduit shall be made with galvanized steel flexible conduit covered with an extruded PVC jacket. Fittings shall be compression type specifically designed for use with flexible conduit and shall form watertight connections. Box connectors shall have an "O" ring between the fitting body and the enclosure.

2.03 BOXES

A. General: Boxes shall be sized as recommended by the NEC or as shown on the Drawings.

1. Boxes shall be stainless steel, or cast metal, as specified or shown on the Drawings.
2. Cast metal boxes shall be of the type indicated on the Drawings.

B. Outlet Boxes: Outlet boxes shall be sheet steel, cast metal, or nonmetallic.

1. Sheet steel boxes shall be cadmium-coated or zinc-coated.
2. Cast metal boxes shall conform to FSS A-A-50563B.
3. Non-metallic boxes shall conform to UL 514C.
4. Fixture outlet boxes and junction boxes shall be 4-inch, octagonal.
5. Switch and receptacle outlet boxes shall be 2 inches wide by 4 inches high by 2 inches deep.
6. Junction box extensions and covers shall conform to UL 514A.
7. Boxes installed in wet locations or on exterior surfaces shall be cast metal with gasketed covers.

2.04 WIRING DEVICES

A. Toggle Switches: Toggle switches shall be specification grade and shall conform to FSS W-S-896G and shall be totally enclosed with bodies of molded compound and a mounting strap.

1. Handles shall be ivory.
2. Wiring terminals shall be screw-type, back- or side-wired.
3. Switches shall be rated, quiet type, 20 amperes, 277 volts.
4. Switches shall be suitable for control of tungsten filament lamp loads with "T" marking of UL.

5. No more than one switch is allowed in a single gang position of a switch box.

B. Receptacles: Receptacles shall be specification grade and shall conform to NEMA WD-1 and UL 498.

1. Single and duplex receptacles for general-purpose use shall be heavy-duty specification-grade, 20 amperes, 125 volts, three-wire grounding, NEMA configuration 5-20R.

2. Special purpose single receptacles shall be heavy-duty specification grade, 20 amperes, 250 volts, three-wire grounding, NEMA configuration 6-20R, unless indicated otherwise on the Drawings.

3. Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, three-wire grounding, NEMA configuration 5-20R.

a. Receptacles shall have a nominal sensitivity to ground leakage current of 4 to 6 milliamps and shall interrupt the current supply for any value of ground leakage current exceeding the trip level of 4 to 6 milliamps on the load side of the receptacle with a maximum tripping time of $1/30^{th}$ of a second.
b. Receptacles shall provide protection for any device connected to the circuit beyond the receptacle.
c. Receptacles shall have test and reset buttons accessible on the face of the receptacle.

4. Receptacles shall be suitable for mounting in a standard outlet box and shall have a high-impact nylon face.

5. Wiring terminals shall be screw-type, back- or side-wired.

6. Color of device face shall be ivory.

7. Receptacles shall be Leviton, Hubbell, Pass & Seymour or approved equal.

2.05 DEVICE PLATES

A. Cover Plates: Cover plates shall conform to UL 514A.

1. Furnish one-piece type to suit devices installed, with round or beveled edges.

2. Weatherproof switch cover plates shall be spring-loaded gasketed type with individual cover for each switch. Receptacle covers shall be weatherproof with or without the attachment plug cap inserted.
3. Waterproof receptacle cover plates shall have screw cap for each outlet. The plug shall have a matching screw attachment to maintain the rating when the plug is attached. The screw cap shall be permanently attached to the cover plate by a chain. A matching plug shall be provided for each cover plate.
4. Zinc-coated steel or cast-metal plates shall be used on unfinished walls.
5. Satin-finish stainless steel plates shall be used on finished walls.
6. The Contractor shall provide metal screws with countersunk heads and finish to match the finish of the plate.

2.06 WIRE AND CABLE

A. Conductors: All conductors shall be annealed soft drawn copper, conforming to ASTM B8, UL 83, and the latest requirements of the NEC. All conductors shall have THW or THWN type insulation, rated at 600 volts, unless specifically noted otherwise.

1. Other types of insulation may be used as permitted by the NEC. The Contractor shall be responsible for change in conduit size and conductor size to maintain the ampacity of the circuit.
2. Wire #8 AWG and larger shall be stranded concentric lay. Wire sizes #14, #12, and #10 AWG shall be stranded for control and motor power and solid for light and receptacle circuits.
3. Conductors shall be as manufactured by General Cable Corp., BICC Cables Corp., ESSEX International, Inc., Southwire Company, Pirelli Cable Corp., or equal.
4. Conductors installed between Adjustable Speed Drives (ASD) and motors shall be shielded ASD cables for conductor sizes AWG 4/0 and below. ASD cables shall be rated for up to 1000V and have cross-linked polyethylene (XLPE) Type XHHW-2 insulation on current-carrying conductors. ASD cables with current-carrying conductors of size No 2 and smaller shall have an insulated grounding conductor. Larger cables may have insulated or bare grounding conductors. ASD cables shall have a braided or tape shield. The outer jacket shall be black sunlight and oil-resistant PVC. ASD cables shall be rated for 90°C in wet or dry locations and shall be suitable for direct burial. ASD cables shall be designed specifically for use in ASD applications. The Contractor shall install the ASD cables in accordance with the cable manufacturer's and the ASD manufacturer's recommendations. ASD cables shall be manufactured by Belden, or approved equal.

B. Conductor splices shall not be allowed on any conductor unless approved by the engineer and, if approved, shall conform to FSS A-A-59213A. Acceptable: Scotchcast Splicing Kit, 3M Company. Plastic tape shall conform to FSS A-A-55809B.

2.07 PANELBOARDS

A. Panelboards shall be Type 1, Class 1 circuit-breaker type, conforming to FSS W-P-115C, as indicated on the panelboard schedules and where shown on the Drawings. Panelboards shall be of a dead-front safety type, equipped with thermal-magnetic molded case, bolted-in circuit breakers. Bus structure and main lugs or the main breaker shall have current and voltage ratings as shown on the panelboard schedules. Such ratings shall be established by heat rise tests, with the maximum hot spot on any bus bar or connections not to exceed a 50°C rise above ambient. All current-carrying parts of the bus assembly shall be copper.

B. The panelboard bus assembly shall be enclosed in a steel cabinet for surface mounting or mounting within a motor control center. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA PB1 and UL 67 for electric panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Fronts shall include doors and shall have flush, brushed stainless steel cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps. Doors shall be mounted by concealed steel hinges. Fronts shall not be removable with the door in the locked position. Complete panelboard enclosure shall be of Code gauge, full-finished steel with rust-inhibiting primer and baked enamel finish.

C. A directory card shall provide a space for each circuit and shall designate the type of load (lights, receptacle, or equipment name). Entries on the directory card shall be typewritten.

D. Circuit breakers shall be arranged and numbered as shown on the panelboard schedule. Circuit numbering shall be such that, starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side. Connect adjacent breaker poles to Line 1 and Line 2, respectively, and maintain the same relationship of sequence.

E. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, breaker, neutral, and ground shall be UL listed as suitable for the type of conductor specified.

F. All panelboards shall be equipped with a copper neutral bus bar and separate copper equipment grounding bar.

G. Panelboard circuit breakers shall comply with FSS W-C-375E.

1. All molded-case circuit breakers shall be quick-make, quick-break, thermal-magnetic with trip indication and have common trip on all multi-pole breakers. Trip indication shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is tripped.
2. All breakers shall be calibrated for operation in an ambient temperature of 40°C.
3. The circuit breakers shall be labeled or imprinted on the case with frame size, trip size, voltage rating, UL approval, and shall be sealed at the factory.

H. The panelboards shall have a single integrated equipment fault current interrupting the rating as shown on the panelboard schedules. The rating shall be indicated on the equipment nameplate.

I. The panelboard assembly shall be designed such that any individual breaker can be removed without disturbing an adjacent unit, loosening or removing supplemental insulation supplied as a means of obtaining clearances, or affecting other requirements of UL.

J. Panelboards shall be listed by Underwriters Laboratories and bear the UL label and shall be rated for service entrance use where required. Panelboards shall be as manufactured by Square D, General Electric, Cutler-Hammer, or Siemens. Panelboard installed in motor control center shall be of the same manufacture as the motor control center.

2.08 SAFETY SWITCHES

A. Safety switches shall be NEMA heavy-duty type and UL listed. Switches shall be rated as indicated on the Drawings.

1. All switches shall have switch blades which are fully visible in the OFF position when the door is open. Switches shall have permanently attached arc suppressors, hinged or otherwise attached to permit easy access to line-side lugs without removal of the arc suppressor. Lugs shall be UL listed for copper and aluminum cables and front removable. All current-carrying parts shall be plated by electrolytic processes.
2. Switches shall have a quick-make and quick-break operating handle and mechanism which shall be an integral part of the box, not the cover. Padlocking provisions shall be provided for padlocking in the OFF

position only, with at least three padlocks. Switches shall have a dual-cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open.

B. Enclosures: Switches installed indoors shall be furnished in NEMA 1 general-purpose enclosure with knockouts, unless otherwise specified. Switches located outdoors shall be furnished in NEMA 3R or NEMA 4X stainless steel enclosures as indicated on the Drawings.

1. Covers on NEMA 1 enclosures shall be attached with butt-type pin hinges.
2. NEMA 3R switches through 200 amperes shall be provided with closing caps and/or interchangeable hubs as required. Rain-tight covers shall be securable in the open position.
3. NEMA 4X switches shall be furnished in stainless steel enclosures without knockouts. The means of sealing the cover shall be positive, with 30- through 200-ampere switches having quick release latches with pin type hinges and gaskets. Enclosures shall be of Code-gauge stainless steel.

C. The switch jaws shall be multi-spring type for positive grip of the switch blades. The fuse clips shall be spring-reinforced, positive-pressure type, or electrolytic copper.

D. Switches shall be as manufactured by Square D, General Electric, Cutler-Hammer, or Siemens. All switches shall be by the same manufacturer.

2.09 CIRCUIT BREAKERS

A. The Contractor shall provide molded-case thermal magnetic circuit breakers of the type, size, and electrical characteristics specified or indicated on the Drawings. Circuit breakers used as service entrance disconnects shall be suitable and rated as service entrance equipment.

B. Circuit breakers shall be of single-unit construction, and multi-pole circuit breakers shall have trip elements in each pole with common trip bar. Frame size 200 amperes or larger shall have adjustable magnetic instantaneous trip and shall have interchangeable thermal magnetic trip units.

C. Shunt trip shall be installed in circuit breakers where required by the Drawings or Specifications.

D. Circuit breaker interrupting ratings shall be equal to the available short circuit current at the point of installation with the minimum ratings as follows:

Frame Size	240 V	480 V
100 A	18,000	14,000
200 A	25,000	22,000
400 A	42,000	30,000
800 A	42,000	30,000
1,200 A	42,000	30,000

E. Provide NEMA Type 1 enclosures for general duty indoor use. Enclosures shall be NEMA 4X stainless steel for exterior locations unless indicated otherwise.

F. Circuit breakers shall be as manufactured by General Electric, Siemens, Square D, or Cutler-Hammer.

2.10 MOTORS

A. Motors shall be provided with the equipment driven by the motor, unless otherwise indicated or specified, and shall conform to the latest requirements of NEMA, IEEE, ANSI, NEC, and American Bearing Manufacturer's Association (ABMA) standards, where applicable.

1. Motors shall be of sufficient capacity to operate the driven equipment, under all load and operating conditions, without exceeding 100% of the motor's nameplate horsepower rating, excluding the service factor, and without exceeding the motor's rated temperature limits.
2. Motors shall be furnished with permanent, highly visible stainless steel nameplates. Nameplates shall include all motor ratings, accessories, and special features.

B. Motors may be single speed or variable speed as required for the application.

1. Motors for variable-speed applications shall be designed for operation at the rated maximum speed and at reduced speed throughout the variable-speed range without overloading. Motors for variable-speed operation shall be inverter duty rated and compatible with the associated variable-speed control equipment and operating conditions, including the effects of harmonic current and voltage distortion. Motors for variable-speed operation shall be equipped with a normally closed automatic reset winding thermostat in addition to all accessory equipment recommended by the variable-speed equipment manufacturer. Thermostat leads shall be brought to the motor connection box.

C. Motors shall be NEMA Design B, unless otherwise indicated or specified, and shall be suitable for continuous duty operation. Motor currents and torque shall be in accordance with NEMA MG1-12.34 and MG1-12.37.

1. Three-phase, single-speed, squirrel-cage induction motors less than 50 HP shall be rated 208-230/460 volt for use on 208-, 240-, or 480-volt, three-phase, 60-Hz systems.
2. Multi-speed motors and motors 50 HP and larger may be single voltage as required for the particular voltage.

D. Motors shall be provided with Class F non-hygroscopic insulation system using materials and an insulation system evaluated in accordance with IEEE 117 classification tests. Temperature rise shall be limited to a maximum of 80° C, by resistance, at a service factor of 1.0 in an ambient temperature of 40° C. Motors shall have multiple dips and bakes of varnish treatment for additional protection.

E. Motors larger than 5 HP shall be provided with locked-rotor current not exceeding NEMA Code letter "G."

F. Motors shall be furnished with a minimum service factor of 1.15.

G. Motors shall be suitable for full voltage across-the-line-type starting, unless otherwise specified or indicated on the Drawings.

H. Motors shall be equipped with ball, open, single-row, deep-groove Conrad-type bearings conforming to the ABMA Std 20. Drive end bearings may be cylindrical roller type for belted drives.

1. Bearing life shall be 17,500 hours minimum for belted applications and 100,000 hours minimum for flexible direct-coupled applications.
2. The bearing identification number shall be stamped on the motor nameplate.
3. The lubrication system shall consist of a capped grease fitting inlet, a relief plug 180 degrees from inlet, and a grease reservoir in bracket and cast inner cap.
4. Bearings shall be greased by the manufacturer with a premium moisture-resistant polyuria-thickened grease containing rust inhibitors and suitable for operation over a temperature range of -25° C to 120° C.

I. The motor enclosure, including frame with integrally cast feet and/or vertical P-base mounting, end brackets, bearing inner caps, fan guards, and conduit box and cover shall be ASTM Type A48/A48M, Class 25 cast iron or better.

1. Conduit boxes shall be provided with the number and size of conduit connections, as shown on the Drawings. The conduit box shall allow rotation to accommodate conduit connection. Provision for grounding shall be made using a mounted clamp-type lug in the conduit box.
2. Motors shall be equipped with lifting lugs. Motor enclosures shall be equipped with stainless-steel screens for all openings in accordance with NEMA MG 1 for guarded machines.
3. Vertical hollow-shaft motors shall be equipped with non-reverse ratchets to prevent backspin.
4. Motors shall be NEMA MG 1 open drip-proof, weather-protected Type I, totally enclosed fan-cooled, or explosion-proof as specified in other sections of the Specifications or indicated on the Drawings.

J. Submersible motors shall be explosion-proof and NRTL listed for Class 1, Division 1, Group C & D hazardous locations as defined by the NEC.

1. All electrical components shall be housed in an air-filled or oil-filled cast-iron, watertight enclosure which is sealed by the use of O-rings. Joints shall be rabbeted with extra-large overlaps.
2. Automatic reset, normally closed, thermal overloads shall be imbedded in the motor winding to provide overheating protection.
3. Moisture-detection probes shall be incorporated to detect moisture in either the seal or stator cavity by measuring resistivity between the probes. Float-type devices or single probe-to-ground moisture detectors are not acceptable.
4. Submersible motors shall have power and control conductors housed in multi-conductor cables of sufficient length to reach the control panel or junction box as indicated on the Drawings. Cable leads shall allow cable-to-motor connections to be accomplished in the field without soldering. Cable entrance to the motor shall be sealed.
5. Submersible motors shall be designed to allow either fully submerged or completely dry operation.

K. Polyphase motors shall be of an energy-efficient design having a minimum efficiency rating as listed in NEMA MG 1-12.55, Table 12-6C.

1. Motor efficiency shall be determined in accordance with NEMA MG 1-12.54.1 and IEEE 112, Method B.
2. Efficiency rating shall be labeled on the motor nameplate in compliance with NEMA MG 1-12.54.2.

L. Motors shall be capable of the following starts per hour, unless otherwise specified, without overheating or causing damage to the motor.

1. Submersible motors, 10 starts per hour.

2.11 MOTOR STARTERS

A. Manual Motor Starters: Manual motor starters shall be toggle, key, or pushbutton type and shall be equipped with melting alloy overload protection on each pole.

1. Fractional horsepower manual motor starters shall be Square D Class 2510 Type F (or equal) single-unit with handle guard/lock-off feature. The handle shall be toggle-type unless otherwise specified or indicated on the Drawings.

2. Integral horsepower manual motor starters shall be Square D Class 2510 Type M or T (or equal) rated 600 VAC/250 VDC, with lock-off feature and auxiliary contact. Auxiliary contact shall be normally open unless otherwise indicated. Control shall be pushbutton or toggle as indicated on the Drawings.

3. Manual motor starters shall be provided in surface-mounted enclosures unless otherwise indicated.

   a. Type F units mounted outdoors shall be in NEMA 4 cast-metal enclosures.
   b. Type M or T units mounted outdoors shall be in NEMA 4 stainless-steel or cast-metal enclosures.
   c. Manual motor starters in hazardous locations shall be Class 2510 NEMA 7 and 9, by Square D or equal.

B. Magnetic Motor Starters: Magnetic motor starters shall be rated in accordance with NEMA standards, sizes, and horsepower ratings. Starters shall be sized for the horsepower ratings as indicated on the Drawings or required by the driven equipment. Minimum sizes and type of starter shall be as indicated on the Drawings and shall have the following features:

1. Magnetic starters shall be equipped with double-break silver-alloy contacts. All contacts shall be replaceable without removing power wiring or removing the starter from the panel or enclosure.

2. Coils shall be of molded construction. All coils shall be replaceable from the front without removing the starter from the panel or enclosure.

3. Overload relays shall be the melting-alloy type with a replaceable control module. Thermal units shall be of one-piece construction and inter-changeable. The starter shall be inoperative if the thermal unit is removed. Three-phase starters shall have overload relays in all three phases. Reset button shall be accessible without opening the door or panel. Visible trip indication for overload phase indication shall be provided. The relay shall have a Form C contact, which operates when the overload relay trips; the contact shall be wired to terminal blocks for remote use. Solid-state overload (SSOL) relays shall be used for projects that include renovations or upgrades to existing facilities that use SSOL relays for motor protection. SSOL shall be Square D Micrologic or equal. Provide SSOL relays with the following features:

   a. Phase loss protection; trips within 3 seconds.

   b. Phase unbalance protection.

   c. Ground fault trip when selected.

   d. Selectable trip Class 5, 10, 20, or 30.

   e. Reset trip with selected Auto/Manual.

   f. Dip switch selectable with the following features:

      (1) Set Phase Unbalanced ON or OFF.
      (2) Set Phase Loss ON or OFF.
      (3) Set Reset to Manual or Automatic.
      (4) Set Ground Fault ON or OFF.

   g. Overload shall be self-powered with no need for external power source.

4. A phase-failure relay shall be provided for all motor starters and shall have solid-state sensing circuitry monitoring all three phases. The relay shall have isolated DPDT contacts and shall protect the motor against the loss of one of the three phases: voltage unbalance in excess of 10% rated voltage, phase reversal, and undervoltage. Undervoltage shall be adjustable to 75% of rated voltage. The relay shall be Square D Company Class 8430 or approved equal.

5. All motor starters shall have their own control power transformer for individual starter control voltage, except where installed in control panels

in which a common control power transformer may be incorporated. Control voltage shall be 120 VAC. Control power transformers shall be sized to include motor space heater load, starter or contactor coil, timers, relays, and other devices as indicated or specified. Primary inputs and the ungrounded secondary output of the control power transformer shall be fused.

6. Starters shall be suitable for adding at least four external electrical interlocks of any arrangement, normally open or normally closed. Starters shall be supplied with a minimum of two interlock contacts.

7. All magnetic starters shall be provided with terminal blocks for wiring devices external to the starter enclosure. The starter shall be supplied in a NEMA 1 enclosure unless otherwise indicated or specified.

8. The starter shall be capable of starting the motor the number of times per hour stated for motors or as required by the pumping sequence, without causing damage to the starter.

9. Panel-mounted elapsed-time meters shall have six register wheels indicating up to 99,999.9 hours, without a reset knob, and be rated at 115 VAC, 60-Hz. The panel manufacturer shall provide one meter for each motor installed and connect the meter so that the meter will record the time that the motor is energized.

10. Equip all magnetic controllers and/or starters, unless otherwise noted, with a three-position selector switch labeled “Hand-Off-Automatic” or as indicated. Switch in Hand position shall start motor.

11. Equip all magnetic controllers and/or starters with indicating lights as follows: green-power on, red-running.

12. A list of overload relay heater elements installed in each starter shall be included in the Operation and Maintenance Manual. The list shall identify the starter by name of equipment and show the type, size, and model number of the heater element.

C. Full-Voltage Non-reversing (FVNR) Starters: FVNR motor starters shall be designed for across-the-line full-voltage starting and stopping of squirrel-cage motors and shall be the combination type with motor circuit protector unless otherwise indicated.

1. The starters shall be rated 600 VAC, 60-Hz.

D. Full-Voltage Reversing (FVR) Starters: FVR motor starters shall be designed for across-the-line full-voltage starting and stopping of squirrel-cage motors and shall be the combination type with motor circuit protector unless otherwise indicated.

1. The starters shall be rated 600 VAC, 60-Hz.

E. Two-speed (TS) Starters: TS motor starters shall be designed for across-the-line starting and stopping of constant torque and variable torque two winding squirrel-cage motors and shall have a separate three-pole starter for each speed matched to the motor requirements. Starters shall be the combination type with motor circuit protector unless otherwise indicated.

1. The starters shall be rated 600 VAC, 60-Hz.
2. The starters shall be equipped with an accelerating relay/timer to start the motor on low speed before accelerating to high speed and requiring the off or stop position to be selected before shifting from high speed to low speed.

F. Combination Starters

1. All motor starters shall be combination type unless noted otherwise.
2. Combination starters shall be manufactured in accordance with the latest published NEMA Standards. Combination starters shall consist of circuit breaker, a fused disconnect, or a motor circuit protector, as indicated on the Drawings, and a magnetic motor starter as specified above. Combination starters shall have an interrupting rating sufficient for the short circuit current available at the line terminals with a minimum rating of 14,000 RMS symmetrical amperes at 480 volts. All combination starters shall be mounted in a NEMA 1, General Purpose enclosure, unless otherwise indicated on the Contract Drawings.
3. The operator and operator arm shall be permanently attached to the handle of the breaker with positive indication of switch position with door either open or closed. The door and switch shall be interlocked to prevent closing the switch when the door is open.
4. The door latch shall be tamper-proof with a coin-proof slot in the door handle latch. The door handle shall have double safety interlocking of the operator and door handle to prevent opening of the door when the breaker is in the “ON” position. An interlock bypass shall be provided to allow access to authorized personnel. All exposed parts shall be dead when the switch is in the “OFF” position.
5. Padlocking facilities shall be provided to positively lock the disconnect in either the “ON” or “OFF” position with from one to three padlocks with the door open or closed.

6. Combination starters shall be Allen-Bradley, Cutler-Hammer, Square D, or approved equal.

G. Control Devices

1. Pushbutton control, when indicated on the Drawings, shall be non-illuminated, momentary contact (unless otherwise indicated), oil-tight, pushbutton with no guard. Pushbutton controls shall be Square D Type "K" or approved equal.
2. Selector switch operators, when indicated on the Drawings, shall be two- or three-position, non-illuminated, oil-tight switches with normal return to all positions. Selector switch operators shall be Square D Type "K" or approved equal.
3. Pilot lights shall be 120-volt LED push-to-test type.
4. Control relays shall be double-pole, double throw sealed, plug-in type relays with din rail or panel mount base, rated for 10A current at 120 VAC, with internal LED pilot light to indicate relay coil is energized.
5. Provide time delay relays in all motor starters larger than 5 HP to provide a sequenced start-up of motors upon energization. Sequence shall start with largest motor, next largest, etc. The timer shall have a range of 5 to 180 seconds.

2.12 DRY-TYPE TRANSFORMERS

A. Dry-type transformers for power and lighting shall be self-cooled with ratings as indicated on the Drawings. Transformers 25 kVA and larger shall have a minimum of four 2-1/2% full-capacity primary taps, two above and two below the rated voltage. Transformers shall be UL listed.

B. The core shall be constructed of high-grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. The core lamination shall be clamped together with structural steel angles. The core and coil assembly shall be mounted to the enclosure by neoprene rubber vibration-absorbing mounts. The neoprene rubber mounts shall eliminate metal-to-metal contact between the enclosure and the core and coil assembly.

C. Insulating material shall be in accordance with NEMA ST-20 for a 220°C component recognized insulation system. A temperature rise above 40°C ambient shall be 150°C for transformers 15 kVA and above, and 115°C for transformers below 15 kVA, with maximum temperature of the top of the enclosure not exceeding a 50°C rise above a 40°C ambient.

D. Coils shall be continuous-wound construction and shall be impregnated with a non-hygroscopic thermosetting varnish.

E. Transformers shall be mounted in drip-proof and rodent-proof heavy-gauge steel enclosures, ventilated according to current manufacturing standards. Outdoor units shall be weatherproof.

F. Transformer enclosures shall be painted with a gray baked-enamel finish applied after the unit has been degreased, cleaned, phosphate, and primed. Enclosures may be designed for floor or wall mounting. Floor mounting units shall be mounted on a 3-1/2-inch raised concrete pad.

G. Transformers shall be as manufactured by Square D, General Electric, Cutler-Hammer/Westinghouse, Siemens, or approved equal.

2.13 LIGHTING FIXTURES AND COMPONENTS

A. Lighting fixtures similar and equal to the types indicated on the Drawings shall be furnished and installed complete with all ballasts, lamps, starters, lenses, accessory hardware, and associated equipment to provide a complete and working lighting system. Each fixture furnished shall be designed for the wattage and lamp type indicated on the Drawings and/or specified in this Section.

2.14 SURGE PROTECTION DEVICE

A. Primary surge protection device (SPD) shall be installed at the main service on the load side of the main breaker or automatic transfer switch as indicated on the Drawings.

1. Primary service SPD shall be listed in accordance with UL 1449-3RD Edition and shall be tested to Category C3 (20 kV, 10 kA, 8/20 µsec. Waveform) in accordance with IEEE C62.41.1 and IEEE C62.45. Suppressors shall meet or exceed the following criteria:

a. Single impulse current rating of 160,000 amperes per phase (8/20 µsec. waveform).

b. Pulse life rating of 1,000 occurrences with no clamping drift for Category C (8/20 µsec. waveform).

c. UL 1449 peak let-through voltage shall not exceed the following:

Voltage	L-N	N-G
120/208 or 120/240	500	500
277/480	800	800

d. The test for Category C3 peak let-through voltage IEEE C.62.41.1 (20 kV-1.2/50 µs) shall be conducted by an independent testing laboratory. Documentation of the test shall be submitted with the shop drawings.

e. Peak let-through voltage measured in UL and ANSI/IEEE testing shall include the effect of 6-inch leads connected to the complete unit.

f. Turn-on and turn-off times shall be less than 1.0 nanosecond.

B. Secondary surge protection device (SPD) shall be installed on the secondary side of step-down transformers or at the associated panelboards, at control panels, and at motor disconnects or junction boxes as indicated on the Drawings. Suppressors at panelboards shall be connected to a 30-amp multi-pole breaker. All other suppressors shall be fused.

1. Secondary SPD shall be listed in accordance with UL 1449-3RD Edition. Suppressors shall meet or exceed the following criteria:

a. Single impulse current rating of 80,000 amperes per phase (8/20 µsec. waveform).

b. Pulse life rating of 1,000 occurrences with no clamping drift for Category C (8/20 µsec. waveform).

c. UL 1449 peak let-through voltage shall not exceed the following:

Voltage	L-N	N-G
120/208 or 120/240	500	500
277/480	800	800

d. The test for Category C3 peak let-through voltage IEEE C.62.41.1 (20 kV-1.2/50 µs) shall be conducted by an independent testing laboratory. Documentation of the test shall be submitted with the shop drawings.

e. Peak let-through voltage measured in UL and ANSI/IEEE testing shall include the effect of 6-inch leads connected to the complete unit.

f. Turn-on and turn-off times shall be less than 1.0 nanosecond.

C. Minimum Requirements for Surge Suppressors

1. Provide suppression elements between each phase or leg and the system neutral and between the neutral conductor and ground.
2. Each module of modular type suppressors shall be externally fused. The status of each module shall be monitored on the front of the enclosure and on each module.
3. The suppressor failure mode shall be of a “fail-short” design.
4. Visible indication of proper connection and operation shall be provided.
5. Modular-type suppressors shall have an internal disconnect and current limiting fuses. Encapsulated suppressors shall have external fuse or circuit breaker protection.
6. Terminals shall be provided for all necessary power and ground connections and shall accommodate #10 to #1 AWG wire sizes.
7. Suppressors shall be of solid-state componentry and shall operate bidirectionally.
8. Suppressors shall have a warranty guarantee period of at least 5 years.

D. All surge protection devices shall be of the same manufacture and shall be installed in accordance with the manufacturer’s installation instructions. The mounting position shall be selected to provide the shortest lead possible between the suppressor and the point of connection.

E. Surge protection devices shall be as manufactured by Advanced Protection Technologies, Inc., PQ Protection, LEA or approved equal.

2.15 GROUNDING

A. Ground rods shall be copper-clad steel, 3/4-inch-x-10-foot sectional type, with couplings and driving studs for installation.

B. The conductor shall be bare, stranded copper, complying with ASTM B8, for main power ground and instrument ground, unless otherwise indicated. Grounding conductors run in conduit shall have green insulation.

C. Connection to the ground rod shall be made with exothermic welding kits by Cadweld or approved equal. “Acorn” type clamps are not acceptable. Ground connections to equipment frames, building steel, etc., shall be made with equipment grounding lugs or clamps intended for grounding purposes.

2.16 PLASTIC CAUTION TAPE

A. The Contractor shall provide a continuous non-metallic caution tape, 12 inches below finished grade, above each duct or conduit run. The tape shall be 6 inches

wide, imprinted to indicate underground electric utilities, as manufactured by Griffolyn, Terra-Tape, or equal.

2.17 PRECAST PRODUCTS

A. Concrete Handholes: Concrete handholes shall conform to the dimensions shown on the Drawings, shall be designed to AASHTO H-20 loading, and shall be constructed of 4,000-psi (minimum) reinforced concrete.

1. Handholes shall have full-size aluminum (T6061-T6) diamond plate pedestrian covers with reinforcing angles, rated for 300 pounds per square foot unless otherwise indicated. Covers shall be removable and shall be provided with lifting holes (four per cover). Covers larger than 4-foot-x-4-foot nominal shall be of sectional construction. Aluminum angles with flat bars shall be set into the inside of walls flush with the top to match covers.
2. Handholes shall be open bottom unless otherwise indicated or specified.
3. Handholes shall have pulling eyes cast in the wall opposite duct entry. The conduit shall be terminated in a handhole with end bells grouted in entrance windows with non-shrink grout.
4. Power and/or signal cables shall be supported on heavy-duty non-metallic cable racks with adjustable arms and be held in place with non-metallic tie wraps. Racks shall be maximum 3 feet apart with a minimum of one per wall of handhole. Racks shall be attached to handhole walls in accordance with the rack manufacturer's recommendation with a minimum of three anchors per rack. An anchor shall be located in holes immediately above each adjustable arm.
5. Handholes shall be installed on a 6-inch-thick bed of gravel. The gravel shall be compacted before casting or setting handholes. Handholes shall protrude 2 inches minimum above surrounding grade.

B. Concrete Pull Box: The pull box shall be constructed of reinforced concrete or polymer concrete and shall be Brooks Products, Inc., Quazite, or equal. Covers shall be provided with lifting slot, bolts, and "ELECTRIC" logo.

PART 3 EXECUTION

3.01 LAYOUT OF CONDUIT AND WIRING SYSTEMS

A. The Contractor shall lay out the work and shall be responsible for all necessary lines, levels, elevations, and measurements. The Drawings indicate the extent and general arrangement of the components. The Contractor shall become familiar with the work of other trades engaged in the construction. The exact routing of raceways and locations of equipment may be governed by structural conditions

and obstructions. The Contractor shall coordinate with the details of equipment shop drawings for power and control connections to equipment furnished by others. This is not to be construed as permitting redesigning systems.

B. Submit all requests for changes in the proposed layout due to structural features, equipment locations, and similar conditions to the Owner, with the following provisions:

1. Detail the reasons for the changes.
2. Submit requests within 30 days after award of Contract.
3. Make no changes without written approval of the Owner.

C. Examine areas scheduled to receive electrical equipment and material for conditions which will adversely affect the execution, permanence, or quality of the work. Determine field conditions by actual measurement. Do not proceed with installation until defects have been corrected.

3.02 INSTALLATION

A. General: Comply with NEC, NESC, local codes, and rules and regulations of local agencies having jurisdiction. Coordinate electrical installation of systems and packaged equipment items specified in other Sections of these Specifications.

1. Conductors, circuit breakers, motor controllers, and protective devices indicated or specified shall be sized to serve the electrical equipment furnished and shall meet all requirements of the NEC. Voltage drop shall be limited to 3%, including main service, feeder, and branch circuit.
2. Coordinate protective, control, and signaling devices.

B. Grounding and Bonding: The Contractor shall establish a grounding and bonding system that electrically connects metal structural materials, equipment enclosures, conduits, outlet boxes, cabinets, motor frames, fixtures, devices, transformer cases, switchgear enclosures, incoming service neutral conductor, and the earth. The common point of attachment for the grounding and bonding system shall be at the main service disconnect unless otherwise indicate in this Section or in the Drawings. The grounding and bonding system shall be properly bonded and sized in accordance with NEC. Solidly bond all non-current-conducting metal parts to the electrical installation grounding bus. A green insulated grounding conductor shall be carried with each circuit.

1. Provide common grounds throughout the system.
2. Provide a ground grid consisting of driven copper-clad steel ground rods connected by bare copper conductor at the service entrance and/or as

shown on the Drawings. Resistance to remote earth shall be 10 ohms or less before connection to the system.

C. Identification: Equipment such as but not limited to disconnect switches, motor starters, control panels, etc., shall be clearly marked.

1. Identify all devices operating at more than 250 VAC phase-to-phase or 125 VAC phase-to-ground with red enamel letters or numerals of appropriate height applied with a stencil.

2. Except as otherwise noted, all equipment shall be marked with engraved nameplates of laminated two-color phenolic plastic having white letters. Attach each nameplate with stainless steel screws. Align nameplates on equipment being marked in the center near the top.

3. Panelboards and control panels shall have designation in 1/2-inch-high letters and voltage in 1/4-inch-high letters centered above the door on exterior trim.

4. Mark equipment mounted remotely from the source of power (such as pumps and fans) with equipment number, source of power, and starter location. Where starters are remotely mounted, marking shall include equipment name, number, and location.

5. Conductors shall be identified at each termination, pull box, junction box, handhole, point of entry to or exit from wireways, panelboards, control panels, and other points of access. Tags or labels shall be securely affixed to the conductor in visible locations. Tags shall be durable plastic with the designation stamped on one side with suitable dies. Labels shall be permanent with legible black characters on white heat-shrink tubing or equivalent identification acceptable to the Owner.

    a. Power conductors shall be color-coded to identify phases, neutral and switch legs, using plastic, self-sealing tape. Tags or labels shall identify the switchboard, MCC, panel, etc., it is served from and the circuit number.
    b. The control conductor (including monitor and instrumentation conductors) shall be identified by color coding and tag or label as to wire number (corresponding to the manufacturer’s wiring diagram) and equipment name.
    c. Power wiring and control wiring shall be identified in all handholes with a waterproof permanent tag attached to the cable with plastic cable ties.

D. Equipment Connections: Provide complete system with all power and control connections required for proper operation.

E. Conduit

1. Rigid galvanized steel (RGS) conduit may be used as follows:

   a. Exposed in buildings.
   b. Exposed with PVC coating where indicated on the Drawings.
   c. Concealed in poured concrete.
   d. Below grade with PVC coating where indicated on the Drawings.

2. Rigid non-metallic (PVC) conduit may be used as follows:

   a. Concealed in walls and floors, Schedule 80.
   b. Below-grade direct burial, Schedule 80.

3. Burial depth of conduit shall be measured from the top of the conduit to the top surface of finished grade, pavement, concrete, or similar cover as follows:

   a. 36 inches (minimum) below unpaved areas,
   b. 36 inches (minimum) below stabilized subbase in paved areas.

4. For concretes slabs on grade and foundations, conduit burial depth shall be measured from the bottom of the concrete slab or foundation as follows:

   a. 12 inches (minimum) below concrete slabs on grade or foundations.

5. It shall be the responsibility of the Electrical Contractor to coordinate the location and depths of all electrical conduits to be installed under this Contract with other trades. Particular attention shall be given to all locations where conduits enter a structure or building from underground. Proper clearances from the top of the conduits to the bottom of slabs and foundations shall be maintained.

6. Where conduits rise through slabs on grade, curved portion of bends shall not be visible above the finished slab.

7. Conduit stub-up to above grade and conduit stub-up out of or from below floor slab shall be PVC-coated aluminum from and including the last 90º bend.

8. Stub-ups through concrete slabs for connection of future equipment or conduits runs shall be provided with couplings threaded inside for plugs and shall be set flush with the finished floor or slab. Install screwdriver-operated threaded flush plugs in couplings. Provide pull wire in all empty conduit runs.

9. Avoid bends and offsets, where possible. Make bends and offsets with an approved hickey or conduit-bending machine. Install plastic (PVC) coated conduit and fittings in accordance with the manufacturer's installation manual using tools designed for installing plastic (PVC) coated conduit and fittings. Touch up any and all damaged areas with manufacturer-recommended coating compound. Do not install crushed or deformed conduit. Use expansion fittings or other approved devices where conduit or tubing crosses expansion joints. Prevent dirt or trash from lodging in conduits, boxes, and fittings. Free clogged conduit of all obstructions or replace conduit.

10. Installers of PVC coated metal conduit shall be certified by the manufacturer and be able to present a valid, unexpired, certified installer card before starting installation.

11. Supports:

    a. Pipe straps, wall brackets, hangers, or ceiling trapeze.
    b. Use wood screws or screw-type nails for fastening to wood. Use toggle bolts for fastening to hollow masonry units. Use concrete inserts or expansion anchors for fastening to concrete. Use machine screws, welded threaded studs, or spring-tension clamps for fastening to steel work.
    c. Power-driven threaded studs may be used in lieu of expansion bolts or machine or wood screws where acceptable to the Owner.
    d. Use threaded C-clamps on rigid steel conduit only.
    e. Do not weld conduit or pipe straps to steel structures.
    f. Non-metallic conduit through 1-inch size shall use one-hole snap-strap clamps and 1-1/4-inch through 2-inch shall use two-hole snap-strap clamps, with maximum spacing between supports as outlined in the NEC based on 50°C conductor temperature. Clamps shall be manufactured from a nylon compound.

12. Expansion couplings shall be used in all straight lengths of non-metallic conduit in exposed applications. Maximum spacing between expansion couplings shall be 100 feet.

13. Connections: All conduits, where they enter sheet metal enclosures such as panelboards, pull boxes or outlet boxes, shall be secured in place by galvanized locknuts and bushings, one locknut inside of box with bushing on conduit end and one locknut outside of box for rigid conduit. The locknuts shall be tightened against the box without deforming the box.

    a. Conduit connections shall use fittings to maintain NEMA rating of enclosures.
    b. All bushings and conduit box connectors shall have the insulating material permanently fastened to the fittings.
    c. Grounding bushings shall be used in switchgear and motor control centers.
    d. Conduit connections exposed in wet locations shall be by watertight threaded hub. Metallic conduit box connections may use a two-piece hub with built-in recessed neoprene gasket such as Appleton Uni-Seal. Non-metallic conduit box connectors may use a neoprene flat washer or "O" ring placed over threads of the fitting between the shoulder of the fitting and the box.

F. Boxes

1. The Contractor shall provide outlet, pull, junction, or terminal boxes in wiring or conduit systems wherever required for pulling wires, making connections, and mounting devices or fixtures.

    a. Indicated locations are approximate only. Coordinate actual location with all work to be performed in the space or area and for the equipment to be served.
    b. Locate outlets so that fixtures and other items will be symmetrically located according to the space or area layout.
    c. Outdoor switch and receptacle outlets shall use non-metallic boxes and covers.

2. Outlet boxes in exposed work or wet locations shall be cast metal. Sheet metal boxes shall be concealed in walls or ceiling. Non-metallic boxes shall be used with non-metallic conduit.

3. Supports:

    a. In open overhead spaces, cast boxes threaded to rigid metallic conduit need not be separately supported unless used for fixture support.
    b. Use wood screws or screw-type nails for fastening to wood. Use toggle bolts for fastening to hollow masonry units. Use concrete

inserts or expansion anchors for fastening to concrete. Use machine screws or welded, threaded studs for fastening to steel work.

c. Power-driven threaded studs may be used in lieu of expansion bolts or machine or wood screws where acceptable to the Engineer and the Owner.

G. Wiring Devices: Receptacles installed outdoors shall be the ground-fault circuit-interrupter type.

H. Wiring

1. The Contractor shall provide a complete system of conductors as indicated.
2. Size shall be as required by the NEC and shall be #12 AWG minimum for power and lighting circuits and #14 AWG minimum for control and alarm circuits.
3. Crimp-on insulated wire terminals shall be used on stranded wire for terminations.
4. Splices shall be in accessible locations only and shall be insulated-pressure type for #10 AWG and smaller wires. For #8 AWG and larger, use solderless connectors covered with an insulation material equivalent to the conductor insulation.

I. Lighting Fixtures: All fixtures and supports shall be carefully laid out and equipped with suitable swivel hangers, canopies, and/or other auxiliaries as required to ensure that fixtures are plumb without bending or offsetting stems, rods, or supports and properly aligned both lengthwise and crosswise except that where obstructions or conflicts are encountered the fixtures shall be relocated as directed by the Engineer or the Owner and installed in such a manner as to provide a finished, neat, and workmanlike installation.

J. Appearance: All items shall be cleaned or touched up as necessary to ensure first-class condition.

3.03 FIELD TESTS AND OBSERVATION

A. General: Do not enclose or cover any work until it has been observed, tested, and accepted.

1. Provide all personnel, equipment, and instruments required for observation and testing.

2. Demonstrate that all circuits and devices are in operating condition. Tests shall include the following:

    a. Megger all motor windings before operation for insulation resistance and, if found low, dry out windings to secure acceptable insulation resistance.
    b. Check control center components, buses, starters, breakers, relays, alarms, interlocks, etc., and place in service in accordance with the manufacturer's instructions. Inspect and adjust electrical equipment before energization.
    c. Megger all power cables and wiring for insulation resistance and record.
    d. Check all motors for correct lubrication and lubricate, if required, in accordance with the manufacturer's instructions.
    e. Check direction of rotation of all motors and reverse, if necessary.

3. Assemble in binders and turn over to the Owner all instruction bulletins, lubrication schedules, operating instructions, pamphlets, parts lists, prints, etc., accompanying or attached to apparatus and equipment.

4. Notify the Engineer and the Owner 1 week before test date.

B. Ground Rod Test: Before any wire is connected to ground rods, test each rod for resistance to ground.

1. The testing instrument shall be a direct reading, single test, portable ground testing megger.
2. The test procedure shall be as recommended by the manufacturer of the test instrument used.
3. The make and model of the test instrument and a copy of the test procedure shall be submitted to the Owner before the test is conducted.
4. Do not conduct tests within 48 hours after rainfall or during foggy weather.
5. If ground resistance exceeds 10 ohms, additional grounds shall be driven.
6. The grounding test shall be witnessed by the Engineer or other representative of the Owner. A copy of the test results and method shall be included in the maintenance manual. Deliver one copy of the test results to the Engineer and the Owner within 1 week after the test.

3.04 ADJUST AND CLEAN

A. The Contractor shall remove excess and waste materials from the project site.

B. Remove defective work and replace with material that meets Specification requirements or repair to the satisfaction of the Owner.

C. Touch up scratches, abrasions, voids and other defects in factory- or shop-finished surfaces.

END OF SECTION

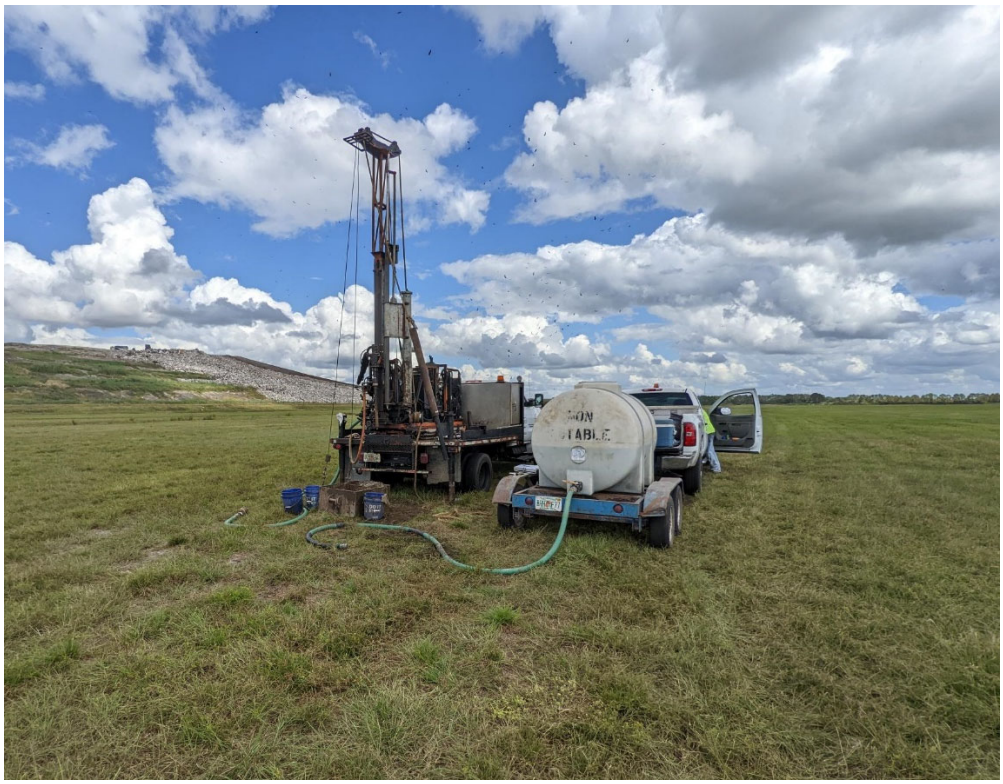
ATTACHMENT A

GEOTECHNICAL REPORT

Madrid CPWG

Preliminary Geotechnical Evaluation

Highlands County Class I LF Expansion, Sebring, Florida



Prepared for:

Jones Edmunds

Prepared by:

MADRID ENGINEERING GROUP, INC., dba MADRID CPWG
2030 State Road 60 East
Bartow, FL 33830
863-533-9007

Project No. 15226
December 2022

MADRID CPWG
2030 State Road 60 E
Bartow FL 33830-4268
Ph: (863) 533-9007
Fax: (863) 533-8997

December 12, 2022

Jones Edmunds
730 NE Waldo Road
Gainesville, FL 32641
Attn: Carol G. Sawyer

Re: Madrid Project No. 15226
Preliminary Geotechnical Evaluation Report
Highlands County Class I LF Expansion
Sebring, Florida

Dear Mrs. Sawyer:

Madrid Engineering Group, Inc., dba Madrid CPWG, (Madrid) is pleased to submit this Geotechnical Evaluation Report summarizing the results of our preliminary geotechnical subsurface exploration and engineering evaluation services completed for the above referenced project. The work was completed in general accordance with the authorized scope of work in our cost estimate proposal dated October 4, 2022 and provides general geotechnical recommendations regarding the proposed design and construction.

We appreciate the opportunity to be of service to you on this project and look forward to working with you on future projects. If you have any questions, please do not hesitate to contact us.

Sincerely,
Madrid Engineering Group, Inc. (EB 6509)

JOHN EDWARD DELASHAW LICENSE No. 48154 STATE OF FLORIDA PROFESSIONAL ENGINEER
12/12/22

John E Delashaw, P.E.
Principal
Florida P.E. No. 48154

Attachment: Geotechnical Engineering Report

EXECUTIVE SUMMARY

Project Description

Project Features Relative to This Report	
Landfill Expansion	Madrid was requested to obtain subsurface soil and groundwater information for a proposed Highlands County Class I Landfill Expansion and preliminary investigation for a potential borrow area at/near the expansion site. The expansion will be built in cells 5 and 7. These cells have a total area of approximately 36.6 acres.

Field Activities

- Nineteen (19) Standard Penetration Test (SPT) borings (SPT-1 through SPT-19) to depths of 70 and 75 feet below ground surface (bgs) within the proposed expansion (cells 5 and 7)
- Three (3) shallow (approximately 2 feet deep) test pits were completed adjacent to SPT borings within the proposed expansion (cells 5 and 7) to look for historical indicators of a SHWT. Shelby tube samples collected for laboratory permeability testing

Findings

Based on the results of the exploration completed at the site, the soil conditions include primarily poorly graded sand, slightly silty sand, slightly clayey sand, and clayed sand. Small deep layers of silt and clay were also encountered. Organic soils were not encountered. The water table was encountered within in range from 6 inches to 540 inches bgs. In several borings, the water table was not encountered within top 10 feet of the soil borings at this site during drilling. Based on soil survey report and our experience of past projects in the project vicinity, we estimate the seasonal high water table (SHWT) to be about 6 inches bgs.

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FIGURES

APPENDICES

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 General

Madrid Engineering Group, Inc., dba Madrid CPWG, (Madrid) is pleased to submit this report summarizing the results from our subsurface soil exploration, consistent with the instructions provided by Jones Edmunds for the proposed Highlands County Class I LF Expansion and preliminary investigation for a potential borrow area, located at 12700 Arbuckle Creek Road in Sebring, Florida.

Madrid understands the following regarding the specific features:

Table 1.1

Project Features Relative to This Report	
Landfill Expansion	Madrid was requested to obtain subsurface soil and groundwater information to a proposed Highlands County Class I Landfill Expansion and preliminary investigation for a potential borrow area at/near the expansion site. The expansion will be built in cells 5 and 7. These cells have a total area of approximately 36.6 acres.

The purpose of this exploration was to collect subsurface soil and groundwater information to provide an evaluation of the existing subsurface conditions at the boring locations and to identify constraints or limitations (to the extent possible) that the subsurface conditions may impose on the planned construction. A marked up aerial photograph of the site with approximate locations for borings was provided to Madrid and this was used to plan our field work.

The scope of work for this investigation included review of existing geological data, a field exploration and laboratory testing program, evaluation of soil testing results, evaluating site suitability and providing general geotechnical recommendations for stormwater drainage structures.

1.2 Site Location and Description

The subject site is generally located at 12700 Arbuckle Creek Road in Sebring, Florida as shown on **Figure 1**, **Site Location Map**. Specifically, the property is located in Section 22, Township 34 South, Range 30 East in Highlands County, Florida. The proposed site is an open grass field and consists of undeveloped land.

The site is generally flat and level with elevations obtained from Google Earth at the boring locations ranging between approximately 63 and 66 feet. GIS topographic

information is provided on **Figure 2, USGS Topographic Map**. Boring/test elevations provided in this report were estimated based on Google Earth data; no surveying was completed by Madrid.

1.3 Soil Survey Review

The Natural Resources Conservation Services (NRCS) Soil Survey reports provide a general description of the typical shallow soil strata (about 6 feet) encountered within each particular soil mapping unit and reports typical depth to seasonal high water levels. The NRCS defines seasonal high water as "a zone of saturation at the highest average depth during the wettest season that is at least six inches thick, persists for more than a few weeks, and is within six feet of the soil surface." **Figure 3, NRCS/USDA Soils Map** shows the locations of the soil types within the project limits. The only prevalent soil type is **Myakka fine sand** (map unit 10). The following is a description of the soil type listed in the soil survey manual, utilizing a soil number map unit system for easy identification on maps.

Myakka fine sand (map unit 10): *According to the NRCS, this nearly level poorly drained soil is in low, broad, flatwood areas in the county. The mapped areas are irregular in shape and range from 10 to 200 acres. The slopes are smooth and range from 0 to 2 percent. Typically, the subsurface layer is black fine sand about 4 inches thick. The subsurface layer, to a depth of about 24 inches, is light gray and light brownish gray sand. The subsoil to a depth of about 80 inches is black and dark brown sand. The available water capacity of this Myakka soil is very low. The permeability is moderate. The water table is at a depth of less than 12 inches during the summer rainy season. Generally, it is at a depth of 12 to 40 inches during the rest of the year. During extended dry periods the water table recedes to a depth of more than 40 inches. Also, this soil can have a perched water table because of the permeability of the subsoil..*

2.0 FIELD EXPLORATION

2.1 Test Pits and Undisturbed Sample Collection

Madrid completed three test pits (TP-1 through TP-3) at the site to a depth of approximately 2 feet below ground surface (bgs). The test pits were performed in order to look for historical indicators of seasonal high groundwater levels and to collect relatively undisturbed samples (Shelby tubes), one vertical and one horizontal at the base of each test pit, for laboratory permeability testing.

2.2 SPT Borings

From October 26, 2022, to November 9, 2022, Madrid explored subsurface conditions at the site by drilling nineteen (19) Standard Penetration Test (SPT) borings (eighteen to 70 feet and one to 75 feet below ground surface) with truck mounted drilling equipment and a safety hammer. A GPS hand unit (typical accuracy of +/- 10 feet) was utilized in the field for location purposes. Boring locations are shown at the bottom of the boring logs in **Appendix A**.

Disturbed samples from the SPT borings were obtained using a split-spoon sampler in general accordance with ASTM Specification D 1586, using a 1.4-inch I.D. split-spoon sampler driven with a 140-pound slide hammer (safety hammer) falling a distance of 30 inches. An engineering technician familiar with soil classification and field evaluations logged the borings in the field and placed samples in sealed containers and returned them to Madrid's laboratory for further classification. Upon completion, the boreholes were backfilled in general accordance with industry standards. The soil boring logs have been included with this report in **Appendix A**. Soil samples will be retained for a period of 3 months unless otherwise notified.

3.0 SUBSURFACE CONDITIONS AND LABORATORY TESTING

3.1 Subsurface Soil Conditions

In general, the SPT borings encountered mostly loose to very dense sands and slightly silty sands (SP-SM) in the shallow depth of exploration followed by a layer of slightly clayey sand (SM-SC) or clayey sand (SC), encountered between 37 to 57 feet bgs. Deep layers of silt and clay were encountered at the bottom of six (6) SPT borings, generally the last three (3) feet. Organic soils were not encountered.

No losses of drilling fluid circulation were reported in any of the SPT borings. The general soil profiles described above and as presented on the boring logs are based on our interpretation of subsurface conditions encountered at the boring locations only. Boundaries between soil layers are approximate and for illustration purposes only. Variations in soil conditions in both horizontal and vertical directions different from those presented are likely to exist between boring locations.

3.2 Groundwater Conditions and Seasonal High Ground Water

The project site is generally flat and level with elevations obtained from Google Earth at the boring locations ranging between approximately 63 and 66 feet. The water table was encountered within range from 6 inches to 540 inches bgs. In several borings, the water table was not encountered within top 10 feet of the soil borings at this site during drilling. Seasonal fluctuations in the groundwater level should be anticipated due

to variations in rainfall. The Soil Survey for Highland County, Florida describes the seasonal high water table (SHWT) for the map unit to be greater than 6 inches of the surface.

3.3 Laboratory Testing

Laboratory tests for natural water content (ASTM D2216), percent passing the No. 200 sieve (ASTM D1140), and constant head permeability testing (AASHTO T215), were performed on selected samples retrieved during the field exploration from the SPT borings to verify the visual and tactile soil classifications. Laboratory test reports are included in **Appendix B**.

Table 3.3a

Lab Summary	
<#200 Sieve	3.2% - 56.2%
% Moisture	10.5% - 68.0%
Organic Content	2.0% - 4.3%
Liquid Limit	34% - 55%
Plastic Limit	28% - 40%
Plasticity Index	3% - 15%

During the field visit, Madrid obtained three sets of relatively undisturbed soil samples for laboratory permeability analysis. These samples were collected within the excavated test pits (at TP-1 through TP-3), at the locations shown on **Figure 4**. Vertical samples were obtained from a depth of about 18 to 24 inches bgs, and horizontal samples were obtained at a depth of about 24 inches bgs. The results of the laboratory permeability testing and percent passing the No. 200 sieve are summarized in the table below. Detailed **Constant Head Permeability Reports** have been included with this report in **Appendix B**.

Table3.3b

Pond Boring #	Orientation	Average Permeability (in/hr)	Estimated SHWT Depth (in)
TP-1	Horizontal	45.9	6
	Vertical	1.2	
TP-2	Horizontal	6.9	6
	Vertical	2.6	
TP-3	Horizontal	8.8	6
	Vertical	12.3	

Note: these values are ultimate values (no safety factor) and the designer should select conservative design values based on this information and their experience with similar conditions.

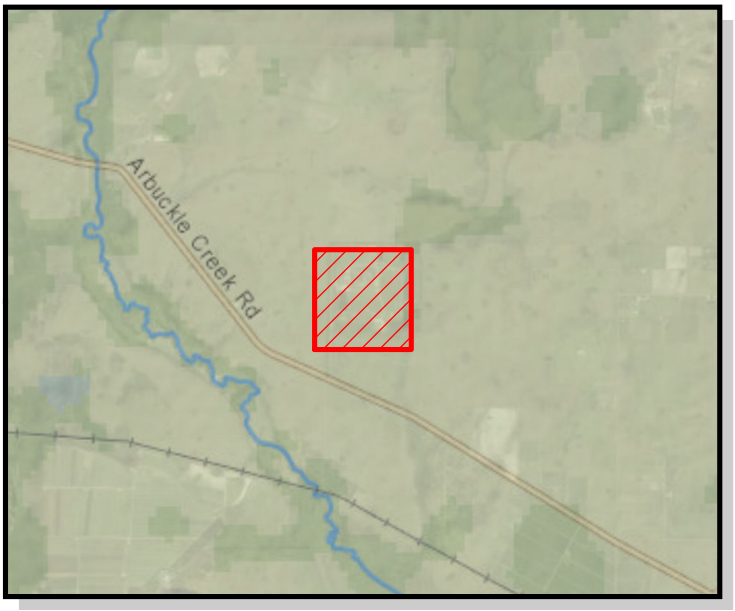
4.0 EVALUATION AND ANALYSIS OF FINDINGS

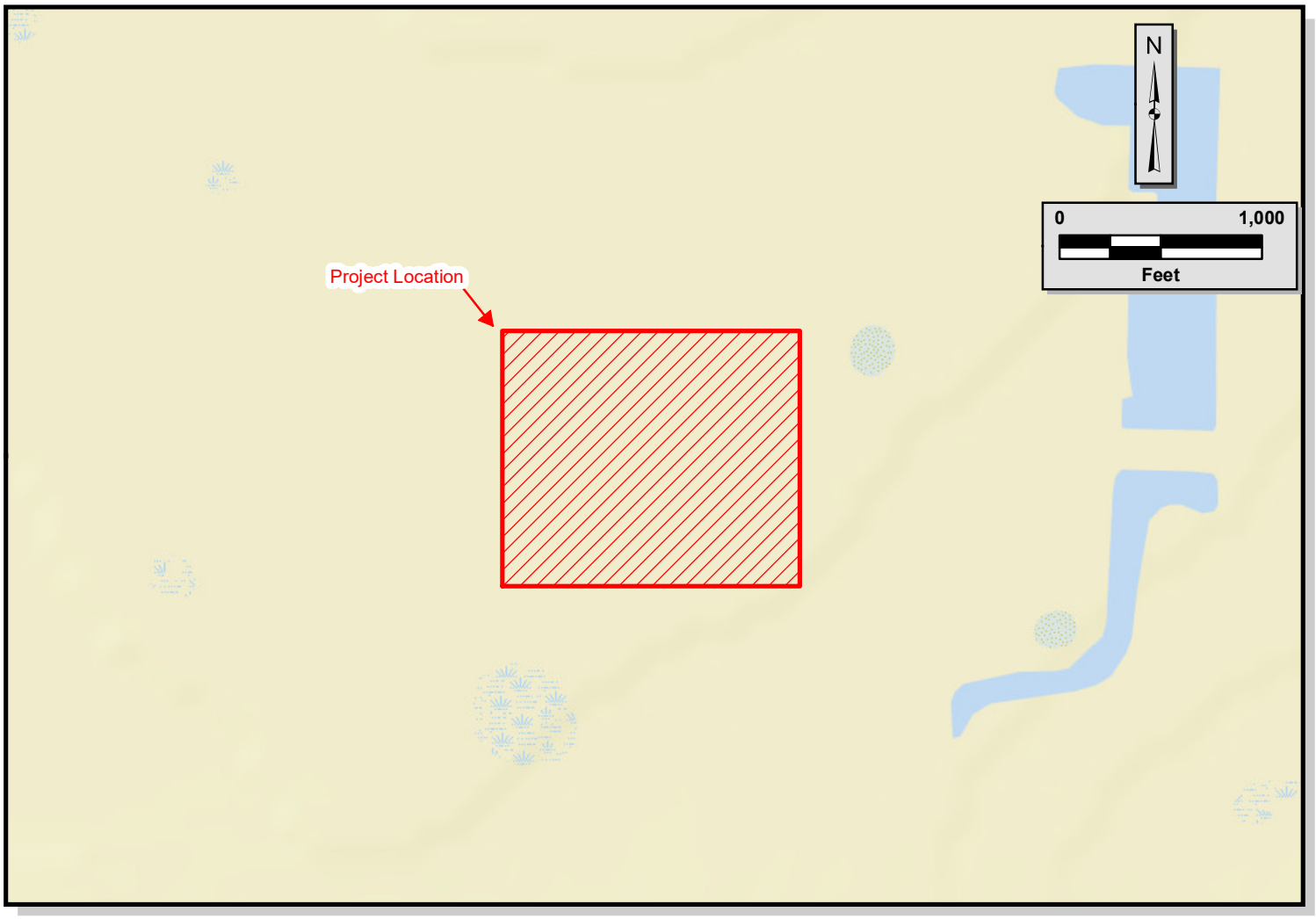
In general, the SPT borings encountered competent sandy profiles with varying fines content. Occasional deep layers of silt and clay were encountered at the bottom of some of the SPT borings. The soil profiles encountered are generally suitable for the proposed Class I landfill expansion area and did not identify problematic conditions that pose site development constraints. Shallow soils are well draining, will provide suitable bearing capacity and most of the settlement will occur immediately (during construction) as the soils at this site are primary sandy soils. Some long-term settlement under landfill loads will occur due to deep clay layers.

5.0 LIMITATIONS

This report has been prepared for Jones Edmunds for the proposed Highlands County Class I LF Expansion and preliminary investigation for a potential borrow area, located at 12700 Arbuckle Creek Road in Sebring, Florida. The information in this report is intended for the sole use of the addressees and their assigns/agents and may not be relied upon or used by any third party without expressed written consent. The evaluations and recommendations presented herein are based on Madrid's interpretation and understanding of site conditions and information provided by the Client. This report is not a specification document and is not intended for use as a part of the specifications. Varying degrees of non-uniformity of the horizontal and vertical soil conditions may exist at the site. This study is not intended to be an evaluation of

sinkhole risk. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface. The study reported herein has been conducted in accordance with the generally accepted standards, principles and practices in the geotechnical engineering profession. No other warranty, expressed or implied, is made. Madrid is not responsible for the independent conclusions, opinions, and/or recommendations made by others based on the field investigation and laboratory testing data presented in this report. Soil samples will be stored at our Bartow Office for a period of 3 months from the date of this report unless other arrangements are made.





Sources: GIS Information (ESRI)

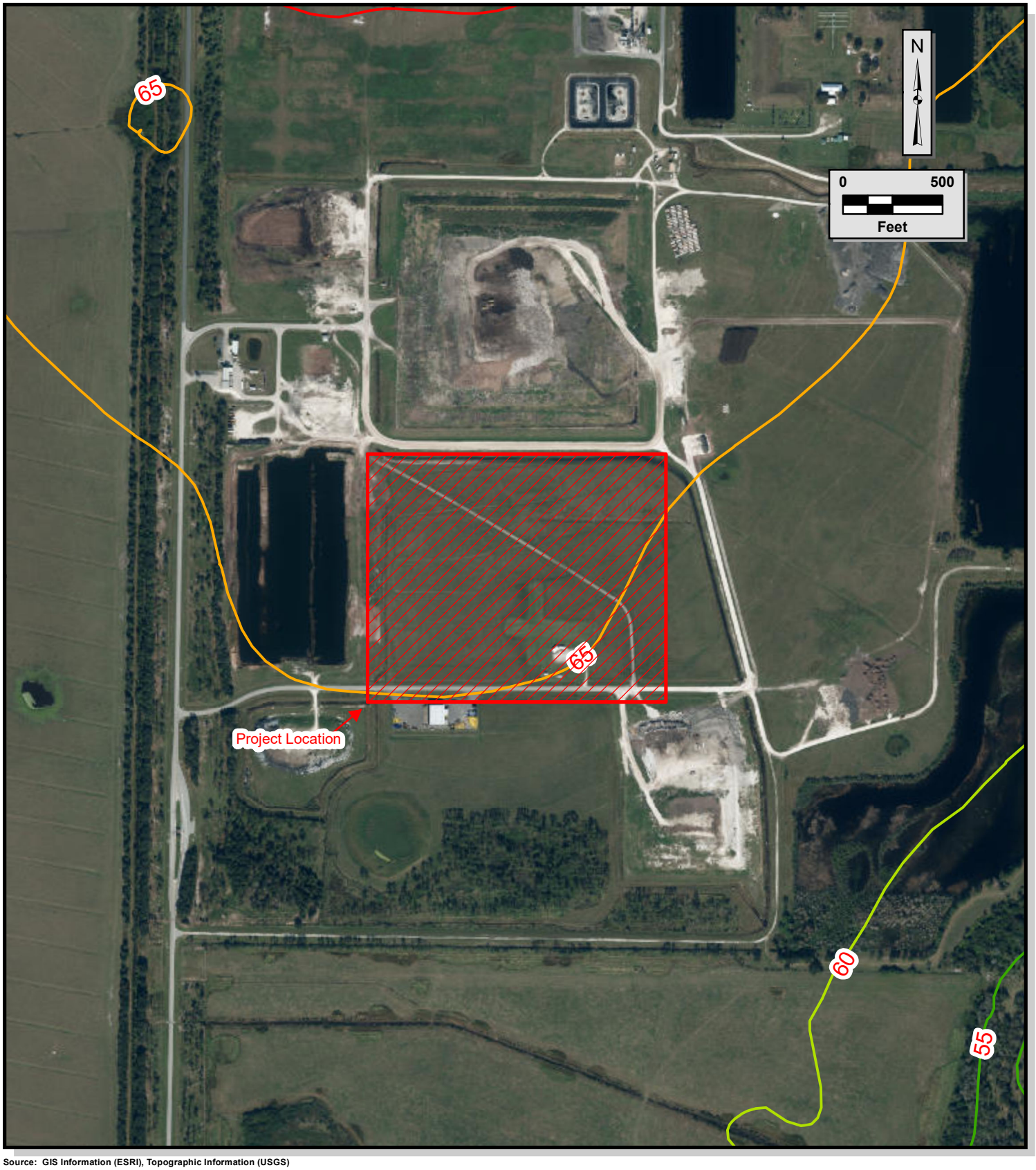
MADRID CPWG
2030 State Road 60 East
Bartow, Florida 33830
863 533-9007 Fax: 863 533-8997
EB-0006509

Jones Edmunds

FIGURE 1
Site Location Map
Highlands County Class I LF Expansion
Sebring, Florida

Project Number:
15226

Notes:	Drawn By: CJ	Checked By: DeS



Source: GIS Information (ESRI), Topographic Information (USGS)

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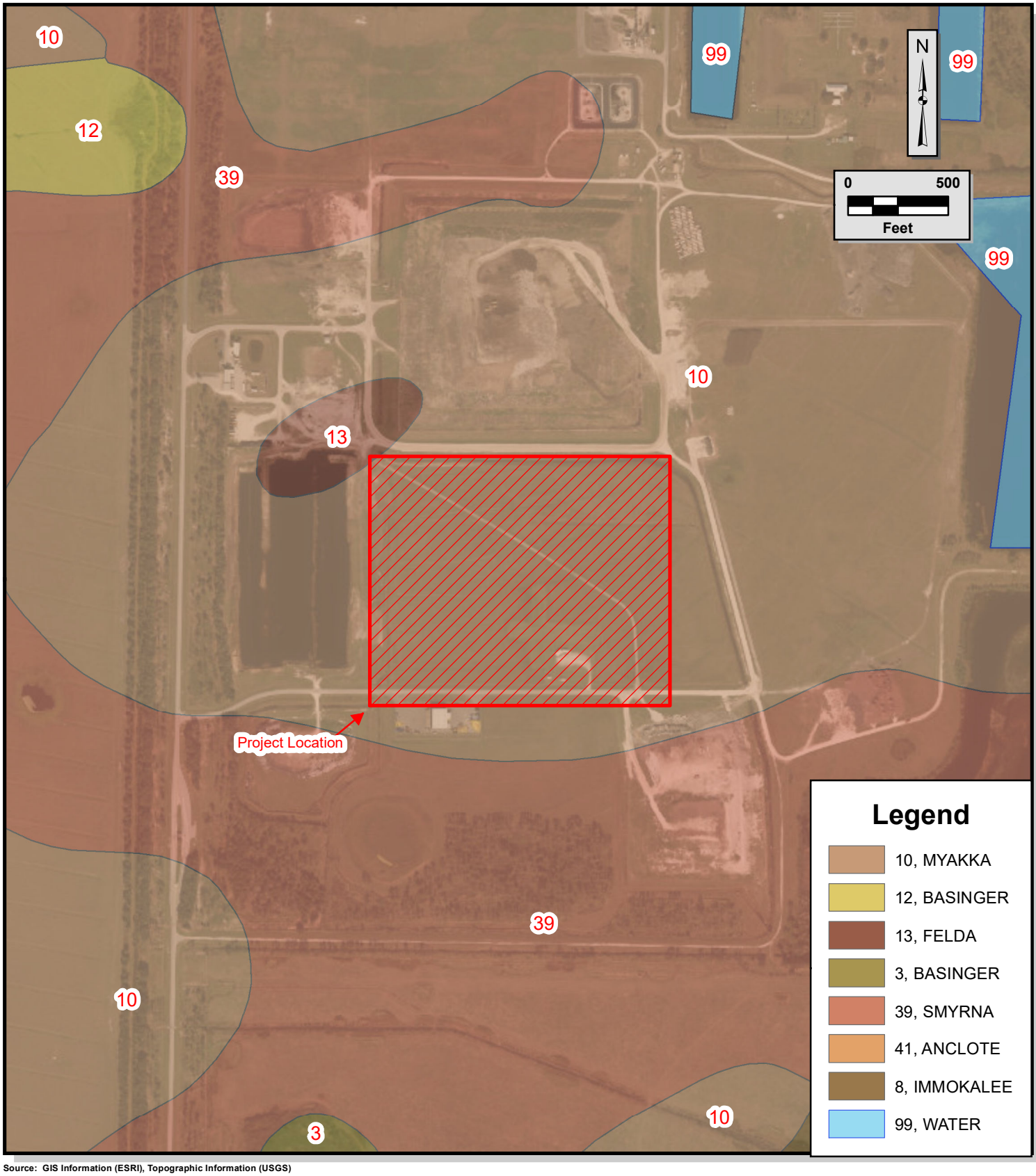
FIGURE 2
USGS Topographic Map
Highlands County Class I LF Expansion
Sebring, Florida

Project Number:
15226

Drawn By: CJ

Checked By: DeS



Source: GIS Information (ESRI), Topographic Information (USGS)

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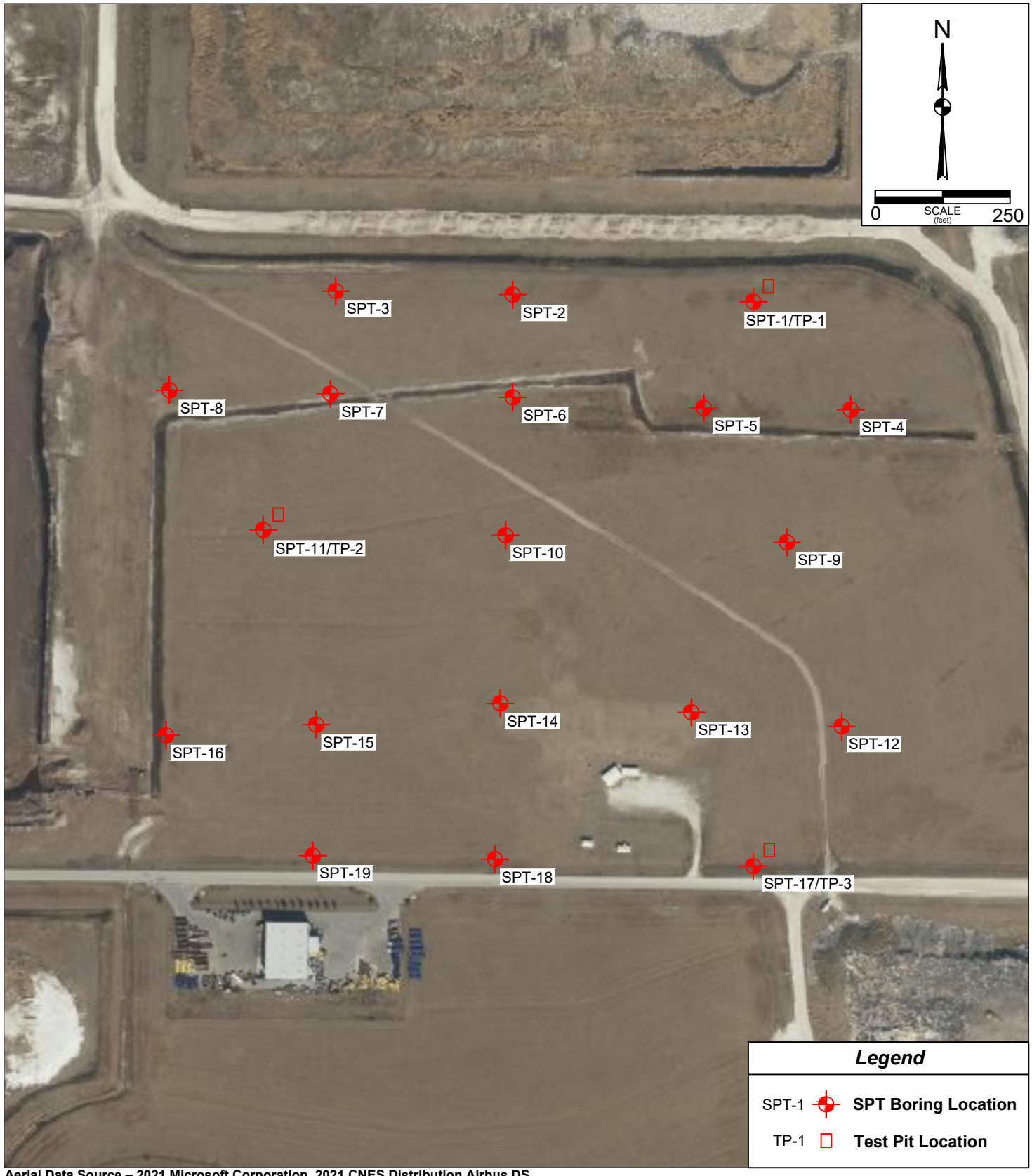
EB-0006509

Jones Edmunds

FIGURE 3
NRCS/USDA Soils Map
Highlands County Class I LF Expansion
Sebring, Florida

Drawn By: CJ	Checked By: DeS	Project Number: 15226



Aerial Data Source – 2021 Microsoft Corporation, 2021 CNES Distribution Airbus DS.

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Bartow, Florida 33830
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EB-0006509

Jones Edmunds

FIGURE 4
Boring Location Plan
Highlands County Class I LF Expansion
Sebring, Florida

Project Number:
15226

Notes: Base map provided by Client.	Drawn By: CJ	Checked By: DeS

Appendix A

BORING NO. SPT-01

DATE DRILLED 10/27/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
	Medium dense pale brown slightly silty sand (SP-SM)	4-11-11-12	22
	Medium dense dark gray	5-7-9-11	16
	<#200 = 7.2%		
	Medium dense dark grayish brown	4-6-6-9	12
		3-6-17-17	23
	Dense	10-17-23-27	40
12	Very dense yellowish brown sand (SP)	30-40-50/4	Refusal
		25-50/4	Refusal
		21-40-50/5	Refusal
		10-20-23	43
	Medium dense very dense brown	6-10-14	24
37	Loose very pale brown slightly clayey sand (SP-SC)	4-4-5	9
42	Loose gray clayey sand (SC)	2-4-4	8
		2-2-2	4
52	Medium dense gray slightly clayey sand (SP-SC)	1-4-9	13
	Loose	2-3-4	7
		2-3-4	7
67	Very stiff gray highly plastic silt (MH) LL = 55 PL = 40 PI = 15	4-7-9	16

Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70
Elev. (ft): 60, 55, 50, 45, 40, 35, 30, 25, 20, 15, 10, 5, 0, -5

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 27.507594°,-81.313245°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-02

DATE DRILLED 10/26/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense light gray slightly silty sand (SP-SM)	0	65	2-7-7-10	14
	Brownish yellow			6-10-9-12	19
4	Medium dense light gray sand (SP)	5	60	3-9-10-11	19
				5-6-7-9	13
8	Medium dense light gray slightly silty sand (SP-SM)	10	55	6-11-12-18	23
	Dense dark gray	15	50	13-22-28	50
	Very dense <#200 = 7.0%	20	45	35-50/5	Refusal
	Brown	25	40	50/6	Refusal
	Very dense yellowish brown	30	35	44-50/4	Refusal
		35	30	23-39-50/6	Refusal
37	Dense yellowish brown sand (SP)	40	25	14-21-26	47
	Very dense light gray	45	20	12-30-42	72
47	Medium dense very pale brown slightly clayey sand (SP-SC)	50	15	10-13-9	22
	Loose	55	10	1-4-1	5
	Gray	60	5	1-2-2	4
		65	0	2-2-2	4
		70	-5	2-2-4	6

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.507627°,-81.314622°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-03

DATE DRILLED 10/26/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense light gray sand (SP)	0	65	3-4-7-12	11
	Very pale brown			5-10-12-10	22
	Brown	5	60	5-7-8-8	15
	Loose light gray			4-4-6-6	10
	Medium dense dark gray <#200 = 4.2%	10	55	4-7-7-7	14
	Very dense	15	50	24-30-50/6	Refusal
	Brown	20	45	43-50/4	Refusal
	Very dense yellowish brown	25	40	50/5	Refusal
		30	35	24-47-50/5	Refusal
		35	30	21-38-43	81
		40	25	10-29-25	54
	Dense pale brown	45	20	10-20-18	38
	Medium dense very pale brown	50	15	7-8-9	17
52	Medium dense gray slightly clayey sand (SP-SC)	55	10	8-9-11	20
	Light gray	60	5	6-12-17	29
		65	0	4-7-11	18
		70		5-4-10	14

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.507642°,-81.315635°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-04

DATE DRILLED 10/26/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense light gray sand (SP)	0	65	2-4-7-5	11
2	Medium dense yellowish brown silty sand (SM)			3-7-7-8	14
4	Medium dense yellowish brown slightly silty sand (SP-SM)	5	60	8-14-8-9	22
				4-5-6-7	11
	Medium dense dark gray <#200 = 5.7% organic content = 4.3%	10	55	4-12-10-13	22
	Very dense	15	50	24-50/4	Refusal
	Dark brown	20	45	35-50/4	Refusal
	Brown	25	40	50/5	Refusal
27	Very dense brown slightly silty sand (SP-SM)	30	35	35-50/5	Refusal
32	Very dense brown sand (SP)	35	30	16-26-31	57
	Dense pale brown	40	25	13-20-24	44
42	Loose light gray clayey sand (SC) <#200 = 13.7%	45	20	2-3-4	7
47	Very loose gray sand (SP)	50	15	1-1-1	2
		55	10	2-2-1	3
57	Very loose gray slightly clayey sand (SP-SC)	60	5	1-1-2	3
	Loose	65	0	3-3-4	7
67	Firm gray silt (ML) LL = 42 PL = 36 PI = 6	70	-5	3-4-4	8

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.507044°,-81.312687°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-05

DATE DRILLED 10/28/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
0		0	60		
2	Loose light gray sand (SP)			3-3-7-7	10
	Medium dense gray slightly silty sand (SP-SM)	5	55	5-7-7-5	14
	Pale brown			5-6-7-7	13
6	Medium dense gray sand (SP)			5-6-7-6	13
8	Medium dense very dark gray slightly silty sand (SP-SM) <#200 = 5.1%	10	50	5-9-12-12	21
	Very dense dark gray	15	45	20-30-34	64
	Dark brown	20	40	34-50/4	Refusal
		25	35	50/4	Refusal
27	Very dense yellowish brown sand (SP)	30	30	45-50/1	Refusal
		35	25	24-46-50/4	Refusal
	Dense brown	40	20	13-29-19	48
42	Loose gray slightly clayey sand (SP-SC)	45	15	2-2-3	5
	Loose gray <#200 = 11.8%	50	10	1-2-2	4
		55	5	2-2-2	4
	Loose gray	60	0	2-3-4	7
	Medium dense	65	-5	3-6-7	13
67	Stiff gray silt (ML) LL = 43 PL = 35 PI = 8	70		3-6-9	15

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 27.507051°,-81.313527°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-06

DATE DRILLED 11/7/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 8' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
0		0	65		
2	Medium dense light gray sand (SP)			3-6-7-9	13
	Medium dense gray slightly silty sand (SP-SM)			7-10-8-14	18
	Grayish brown	5	60	4-8-9-9	17
				5-6-5-5	11
8	Medium dense brown sand (SP)			5-5-10-10	15
		10	55		
12	Very dense dark gray slightly silty sand (SP-SM) <#200 = 5.8% organic content = 3.7%			20-32-35	67
		15	50		
	No recovery - soil type shown is assumed			50/5	Refusal
		20	45		
22	Very dense dark yellowish brown sand (SP)			50/5	Refusal
		25	40		
				50/5	Refusal
		30	35		
	Yellowish brown			28-43-44	87
		35	30		
				14-33-50	83
		40	25		
42	Medium dense yellowish brown slightly silty sand (SP-SM)			14-19-15	34
		45	20		
47	Loose light gray slightly clayey sand (SP-SC)			4-4-4	8
		50	15		
52	Loose grayish olive clayey sand (SC)			1-2-2	4
		55	10		
	Medium dense			1-3-3	6
		60	5		
				4-5-9	14
		65	0		
				5-5-7	12
		70	-5		

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.507103°,-81.314621°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-07

DATE DRILLED 10/28/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Loose light gray sand (SP)	0	65	3-4-6-6	10
4	Medium dense dark grayish brown organic content = 3.8%	5	60	4-6-8-10	14
6	Medium dense brown slightly silty sand (SP-SM)			5-6-8-12	14
8	Medium dense pale brown sand (SP)	10	55	6-10-12-11	22
12	Medium dense dark gray silty sand (SM)			4-6-8-7	14
	Dense dark gray sand (SP) <#200 = 3.7%	15	50	11-19-24	43
	Very dense grayish brown	20	45	23-40-40	80
22	Very dense yellowish brown silty sand (SM)	25	40	40-50/5	Refusal
27	Very dense yellowish brown sand (SP)	30	35	50/4	Refusal
32	Very dense yellowish brown slightly silty sand (SP-SM)	35	30	30-50/4	Refusal
37	Very dense yellowish brown sand (SP)	40	25	16-31-43	74
42	Very dense light gray clayey sand (SC)	45	20	20-42-47	89
47	Medium dense very pale brown slightly clayey sand (SP-SC)	50	15	4-5-6	11
	Loose gray	55	10	3-4-5	9
		60	5	3-3-5	8
	Medium dense	65	0	3-4-12	16
		70	-5	2-9-16	25

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.507119°,-81.315664°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-08

DATE DRILLED 10/28/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense dark gray sand (SP)	0		6-5-7-6	12
	Loose			5-5-5-4	10
	Medium dense pale brown	5	60	4-5-6-8	11
6	<#200 = 4.2%				
	Medium dense gray sand (SP)			8-13-12-12	25
8	Loose dark gray silty sand (SM)	10	55	4-5-5-6	10
	Dense	15	50	13-20-26	46
	Very dense brown	20	45	29-44-50/5	Refusal
		25	40	32-46-49	95
27	Very dense yellowish brown slightly silty sand (SP-SM)	30	35	20-50/5	Refusal
32	Very dense yellowish brown sand (SP)	35	30	19-31-43	74
		40	25	11-26-43	69
		45	20	12-28-27	55
47	Medium dense very pale brown slightly clayewy sand (SP-SC)	50	15	10-9-5	14
	Very loose gray	55	10	1-1-2	3
	Loose	60	5	1-2-2	4
		65	0	1-2-4	6
	Very loose	70	-5	1-2-1	3
72	Firm gray silty sand (SM) <#200 = 41.9%	75	-10	1-3-4	7

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.507135°,-81.316585°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-09

DATE DRILLED 11/8/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 45' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Loose light gray sand (SP)	2-4-6-7	10
2	Medium dense dark grayish brown silty sand (SM)	4-6-7-10	13
4	Medium dense gray slightly silty sand (SP) <#200 = 4.0% Dark gray	8-9-10-10	19
		5-5-8-9	13
8	Medium dense dark gray silty sand (SM)	4-7-8-8	15
12	Very dense grayish brown slightly silty sand (SP-SM)	16-34-43	77
17	Very dense grayish brown sand (SP) <#200 = 4.0%	39-50/5	Refusal
22	Very dense dark brown slightly silty sand (SP-SM)	34-50/5	Refusal
27	Very dense brown sand (SP)	22-49-50/5	Refusal
		14-37-22	59
	Dense pale brown	8-15-19	34
42	Very loose gray clayey sand (SC)	3-2-1	3
47	Very loose grayish olive slightly clayey sand (SP-SC)	1-2-1	3
		2-1-1	2
	Loose	1-3-3	6
		2-3-4	7
67	Firm grayish olive silt (ML) <#200 = 53.5% LL = 37 PL = 30 PI = 7	2-3-5	8

Depth (ft) / Elev. (ft): 0 / 65, 5 / 60, 10 / 55, 15 / 50, 20 / 45, 25 / 40, 30 / 35, 35 / 30, 40 / 25, 45 / 20, 50 / 15, 55 / 10, 60 / 5, 65 / 0, 70 / -5

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 27.506366°,-81.313049°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-10

DATE DRILLED 11/1/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense light gray sand (SP)	0	65	4-5-6-7	11
	Pale brown			5-12-15-14	27
4	Dense gray silty sand (SM)	5	60	5-17-20-20	37
6	Medium dense dark gray slightly silty sand (SP-SM)			11-12-15-16	27
	Dense dark gray	10	55	6-14-27-20	41
	Very dense <#200 = 5.8%	15	50	28-46-50	96
	Very dense dark brown	20	45	50/5	Refusal
22	Very dense yellowish brown sand (SP)	25	40	35-50/4	Refusal
		30	35	46-50/2	Refusal
		35	30	19-50/5	Refusal
		40	25	19-40-50/4	Refusal
		45	20	18-50/5	Refusal
47	Loose pale brown slightly clayey sand (SP-SC)	50	15	3-4-6	10
	Gray	55	10	1-3-6	9
	Medium dense	60	5	2-9-8	17
		65	0	5-10-12	22
67	Medium dense gray clayey sand (SC)	70	-5	4-10-20	30

STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.506399°,-81.314659°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-11

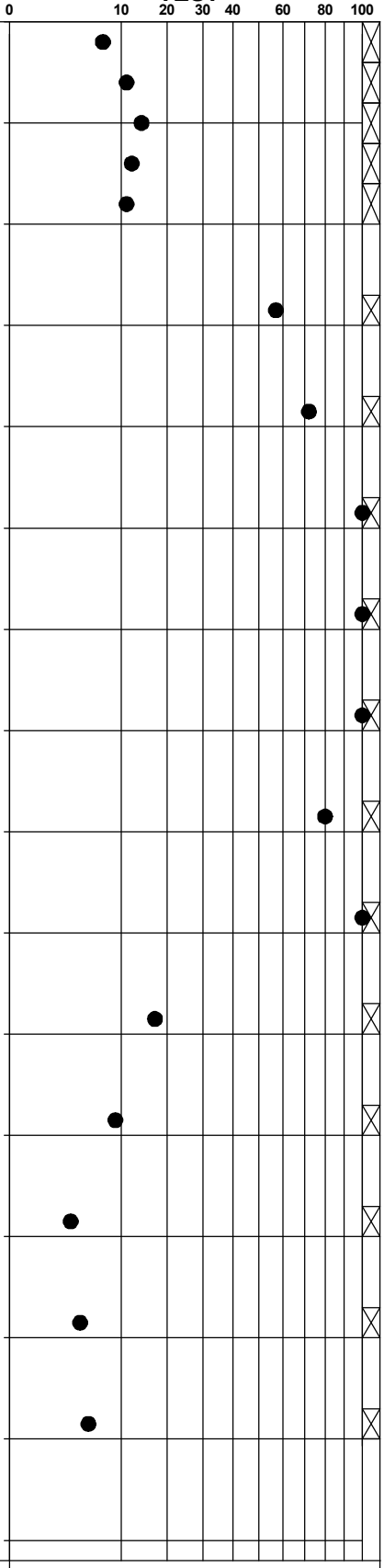
DATE DRILLED 10/31/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 4' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Loose light gray sand (SP)	3-3-4-3	7
2	Medium dense brown silty sand (SM)	4-4-7-8	11
4	Medium dense pale brown slightly silty sand (SP-SM)	3-6-8-6	14
	Gray	6-6-6-6	12
8	Medium dense dark gray sand (SP) <#200 = 3.3%	4-5-6-7	11
	Very dense brown	22-21-36	57
17	Very dense brown slightly silty sand (SP-SM)	18-32-40	72
		50/3	Refusal
27	Very dense brown sand (SP)	50/4	Refusal
	No recovery - soil type shown is assumed	50/2	Refusal
	Very dense yellowish brown	20-30-50	80
	Pale brown	23-50/5	Refusal
47	Medium dense very pale brown slightly clayey sand (SP-SC)	6-9-8	17
	Loose gray <#200 = 11.0%	5-5-4	9
	Very loose	2-1-2	3
	Loose	1-2-2	4
67	Loose gray clayey sand (SC)	1-2-3	5

Depth (ft)	Elev. (ft)
0	65
5	60
10	55
15	50
20	45
25	40
30	35
35	30
40	25
45	20
50	15
55	10
60	5
65	0
70	-5



BORING LOCATION: 27.506423°,-81.316046°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-12

DATE DRILLED 11/8/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 23' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
0		0	60	2-4-7-8	11
2	Medium dense light gray sand (SP)				
4	Loose yellowish brown slightly silty sand (SP-SM) <#200 = 6.8%	5	55	3-3-5-3	8
	Medium dense yellowish brown sand (SP)			5-7-9-9	16
8	Pale brown	10	50	6-8-10-10	18
	Loose very dark gray slightly silty sand (SP-SM)			3-4-5-7	9
	Very dense brown	15	45	22-37-50/5	Refusal
	Very dense brown <#200 = 5.8%	20	40	32-50/5	Refusal
22	Very dense brownish yellow sand (SP)	25	35	50/5	Refusal
		30	30	50/5	Refusal
		35	25	40-50/5	Refusal
	Dense	40	20	10-17-16	33
42	Medium dense very pale brown clayey sand (SC)	45	15	5-10-12	22
47	Very dense pale brown sand (SP)	50	10	17-45-38	83
52	Firm grayish olive silty sand (SM) <#200 = 46.8% LL = 34 PL = 28 PI = 6	55	5	2-3-3	6
57	Loose grayish olive slightly clayey sand (SP-SC)	60	0	2-2-3	5
	Medium dense	65	-5	2-5-7	12
67	Firm grayish olive silty sand (SM) <#200 = 18.3%	70		1-3-3	6

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 27.505428°,-81.312733°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-13

DATE DRILLED 11/9/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table not apparent within 10' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
0		0	65		
2	Medium dense dark gray slightly clayey sand (SP-SC)			4-4-7-8	11
4	Medium dense light gray sand (SP)			5-10-10-10	20
6	Medium dense dark gray silty sand (SM)	5	60	9-13-15-12	28
8	Medium dense brown sand (SP) <#200 = 4.7%			5-7-9-10	16
	Very dark gray slightly silty sand (SP-SM)	10	55	4-5-7-10	12
	Very dense brown	15	50	50/5	Refusal
17	Very dense brown sand (SP)	20	45	28-50/5	Refusal
22	Very dense dark brown slightly silty sand (SP-SM)	25	40	50/5	Refusal
27	Very dense yellowish brown sand (SP)	30	35	18-50/5	Refusal
	Medium dense	35	30	10-14-16	30
	Dense very pale brown	40	25	11-17-16	33
	Loose gray	45	20	9-8-2	10
	Grayish olive	50	15	3-2-2	4
52	Very loose grayish olive slightly clayey sand (SP-SC) <#200 = 10.3%	55	10	1-1-1	2
57	Very loose grayish olive sand (SP)	60	5	1-1-1	2
	Loose	65	0	1-1-3	4
67	Loose grayish olive clayey sand (SC)	70	-5	1-2-4	6

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.505498°,-81.313594°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-14

DATE DRILLED 11/2/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 3' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
	Medium dense light gray slightly silty sand (SP-SM)	3-3-9-10	12
	Gray	4-8-9-8	17
	Loose brown	3-4-4-2	8
6	Loose dark gray sand (SP) <#200 = 4.4%	2-1-3-8	4
8	Very dense dark yellowish brown slightly silty sand (SP-SM)	18-54-50	104
	Dark gray	50/5	Refusal
17	Very dense dark yellowish brown sand (SP)	50/1	Refusal
	Yellowish brown	45-50/4	Refusal
	Brownish yellow	40-50/2	Refusal
	Dense light yellowish brown	13-27-36	63
	Very dense	12-23-32	55
42	Medium dense light gray clayey sand (SC) <#200 = 13.7%	6-6-5	11
47	Soft dark gray clay (CL)	1-1-2	3
52	Loose grayish olive clayey sand (SC)	3-5-5	10
		2-3-6	9
62	Dense grayish olive slightly clayey sand with shell (SP-SC)	10-18-25	43
67	Very stiff grayish olive clay with shell (SP-SC)	7-9-12	21

Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70
Elev. (ft): 65, 60, 55, 50, 45, 40, 35, 30, 25, 20, 15, 10, 5, 0, -5

STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 27.505541°,-81.314687°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-15

DATE DRILLED 11/2/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 4' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Loose light gray sand (SP)	3-3-4-5	7
2	Medium dense light gray slightly silty sand (SP-SM)	4-10-6-5	16
	Dark grayish brown	5-6-8-10	14
	Grayish brown	8-10-10-20	20
	<#200 = 5.1%	7-10-12-14	22
	Very dark gray		
12	Very dense pale brown sand (SP)	16-25-36	61
17	Very dense dark yellowish brown slightly silty sand (SP-SM)	64-50/3	Refusal
22	Very dense yellowish brown sand (SP)	50/5	Refusal
		31-50/3	Refusal
		25-50/5	Refusal
		29-50/5	Refusal
	Light yellowish brown	32-50/6	Refusal
47	Loose light gray slightly clayey sand (SP-SC)	3-3-2	5
52	Medium dense grayish olive sand (SP)	7-12-11	23
57	Medium dense grayish olive slightly clayey sand (SP-SC)	5-8-13	21
		5-12-17	29
	Dense	12-16-32	48

Depth (ft)	Elev. (ft)
0	65
5	60
10	55
15	50
20	45
25	40
30	35
35	30
40	25
45	20
50	15
55	10
60	5
65	0
70	-5

STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.505430°,-81.315740°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-16

DATE DRILLED 10/31/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 3' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Medium dense light gray sand (SP)	0	65	4-5-6-5	11
	Medium dense very dark gray	2	63	4-7-11-11	18
	Dark brown	5	60	7-9-8-8	17
		8	57	5-5-6-6	11
	Very dark brown <#200 = 4.6% Organic content = 2.3%	10	55	3-5-8-15	13
	Very dense dark brown	15	50	24-35-37	72
	Brown	20	45	12-22-24	46
22	Very dense brown sand (SP)	25	40	50/5	Refusal
		30	35	42-50/3	Refusal
32	Very dense pale brown silty sand (SM)	35	30	15-33-47	80
37	Very dense pale brown sand (SP)	40	25	38-50/3	Refusal
		45	20	18-38-50/5	Refusal
47	Loose light gray slightly clayey sand (SP-SC)	50	15	3-2-2	4
52	Loose gray clayey sand (SC)	55	10	2-3-4	7
57	Loose gray slightly clayey sand (SP-SC)	60	5	4-4-5	9
	Medium dense	65	0	5-7-9	16
		70	-5	3-7-15	22

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.505374°,-81.316600°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-17

DATE DRILLED 11/9/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 6' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Loose gray sand (SP)	2-2-2-2	4
2	Loose yellowish brown slightly silty sand (SP-SM)	2-2-5-7	7
4	Medium dense yellowish brown sand (SP)	5-10-11-11	21
6	Medium dense brown slightly silty sand (SP-SM) Dark gray <#200 = 6.2%	5-6-11-11	17
12	Very dense dark grayish brown silty sand (SM)	6-8-12-10	20
17	Very dense yellowish brown sand (SP)	12-20-46	66
		50/5	Refusal
		50/5	Refusal
		50/5	Refusal
	Brown	15-36-43	79
	Dense	12-15-17	32
	Medium dense light gray	3-4-11	15
	Very dense	36-50/1	Refusal
52	Stiff gray silty sand (SM) <#200 = 42.6% LL = 35 PL = 32 PI = 3	3-5-5	10
57	Medium dense gray slightly clayey sand (SP-SC)	5-5-11	16
62	Medium dense grayish olive sand (SP)	2-4-7	11
67	Stiff grayish olive clay (CL) <#200 = 56.2%	3-4-6	10

Depth (ft)	Elev. (ft)
0	60
5	55
10	50
15	45
20	40
25	35
30	30
35	25
40	20
45	15
50	10
55	5
60	0
65	-5
70	

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.504714°,-81.313237°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-18

DATE DRILLED 11/9/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 0.5' bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Loose gray sand (SP)	2-4-4-6	8
2	Loose very dark gray silty sand (SM)	2-3-5-6	8
	Grayish brown	3-3-5-5	8
6	Medium dense brown sand (SP)	8-8-8-10	16
8	Medium dense very dark gray slightly silty sand (SP-SM) <#200 = 6.0% organic content = 3.8%	9-9-12-19	21
12	Very dense yellowish brown sand (SP)	23-50/4	Refusal
		50/5	Refusal
		50/3	Refusal
	Brownish yellow	45-50/3	Refusal
		24-50/3	Refusal
		20-50/5	Refusal
		20-35-45	80
47	Loose very pale brown clayey sand (SC) <#200 = 12.9%	3-3-3	6
52	Loose gray sand (SP)	2-3-7	10
	Medium dense	3-4-10	14
		2-5-9	14
67	Loose gray clayey sand (SC)	2-3-5	8
70			

Depth (ft) | Elev. (ft): 0 / 5 / 10 / 15 / 20 / 25 / 30 / 35 / 40 / 45 / 50 / 55 / 60 / 65 / 70 — 60 / 55 / 50 / 45 / 40 / 35 / 30 / 25 / 20 / 15 / 10 / 5 / 0 / -5

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 27.504747°,-81.314715°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22

BORING NO. SPT-19

DATE DRILLED 11/2/2022
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion

TEST BORING RECORD
Madrid CPWG

REMARKS: Water table encountered at 1' bgs. No loss of circulation. Safety hammer used.

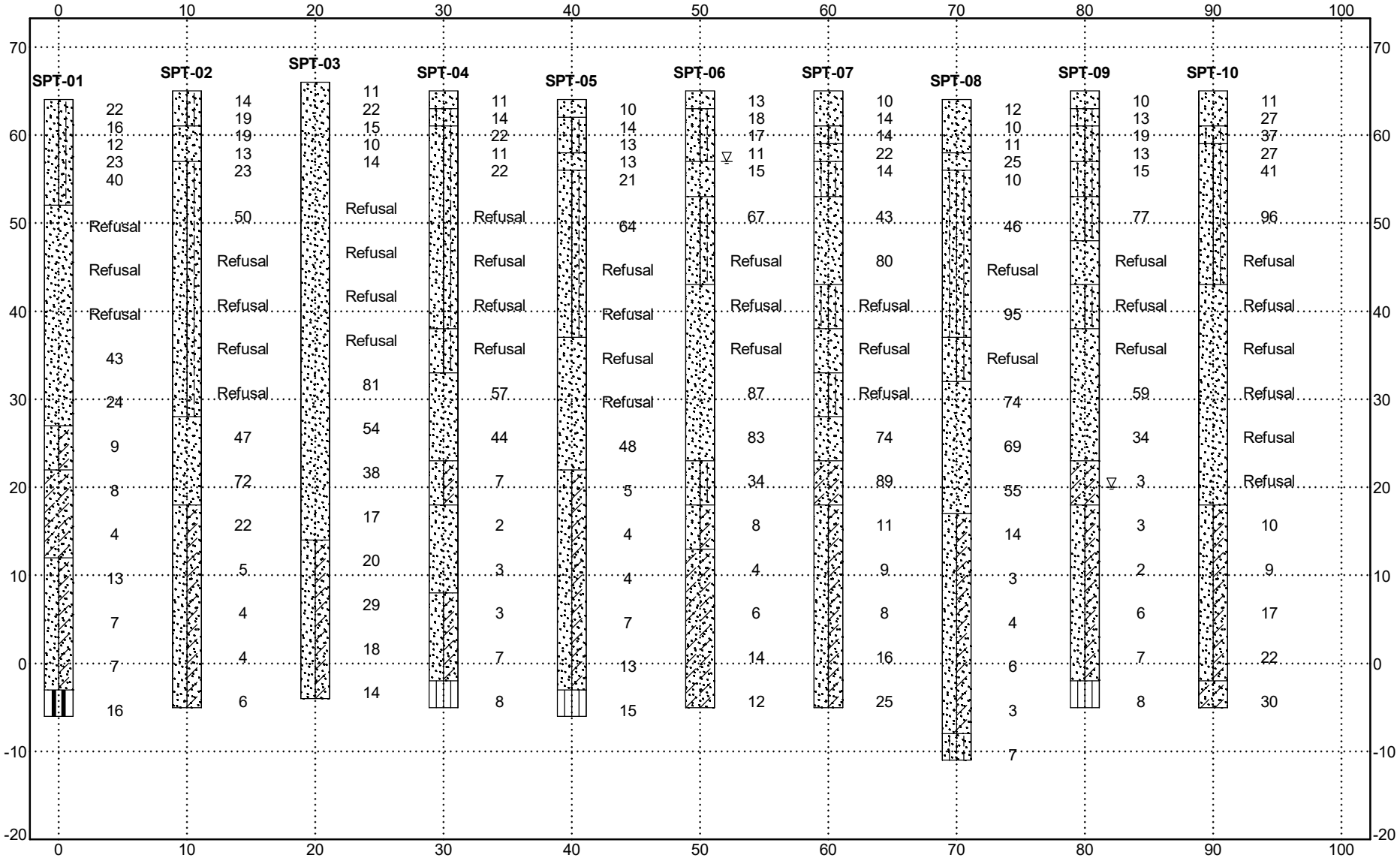
Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Loose light gray sand (SP)	0		3-3-5-7	8
				3-4-5-7	9
4	Medium dense brown slightly silty sand (SP-SM)	5	60	4-6-8-9	14
	Gray			6-6-7-11	13
8	Medium dense very dark gray silty sand (SM) <#200 = 3.2% organic content = 2.0%	10	55	6-6-7-20	13
12	Very dense yellowish brown sand (SP)	15	50	29-50/5	Refusal
		20	45	25-50/5	Refusal
		25	40	24-50/4	Refusal
		30	35	22-35-50/5	Refusal
		35	30	16-30-40	70
	Pale brown	40	25	16-42-26	68
	Dense gray	45	20	11-26-8	34
47	Very loose grayish olive slightly silty sand (SP-SM)	50	15	1-1-1	2
52	Very loose grayish olive slightly clayey sand (SP-SC)	55	10	3-2-1	3
	Loose	60	5	3-2-3	5
	Medium dense	65	0	3-4-9	13
		70	-5	6-7-9	16

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 27.504762°,-81.315758°

MADRID CPWG STANDARD LOG W/ LAB 15226 BORING LOGS.GPJ NEW MEG TEMPLATE.GDT 12/12/22



TEST BORING FENCE RECORD

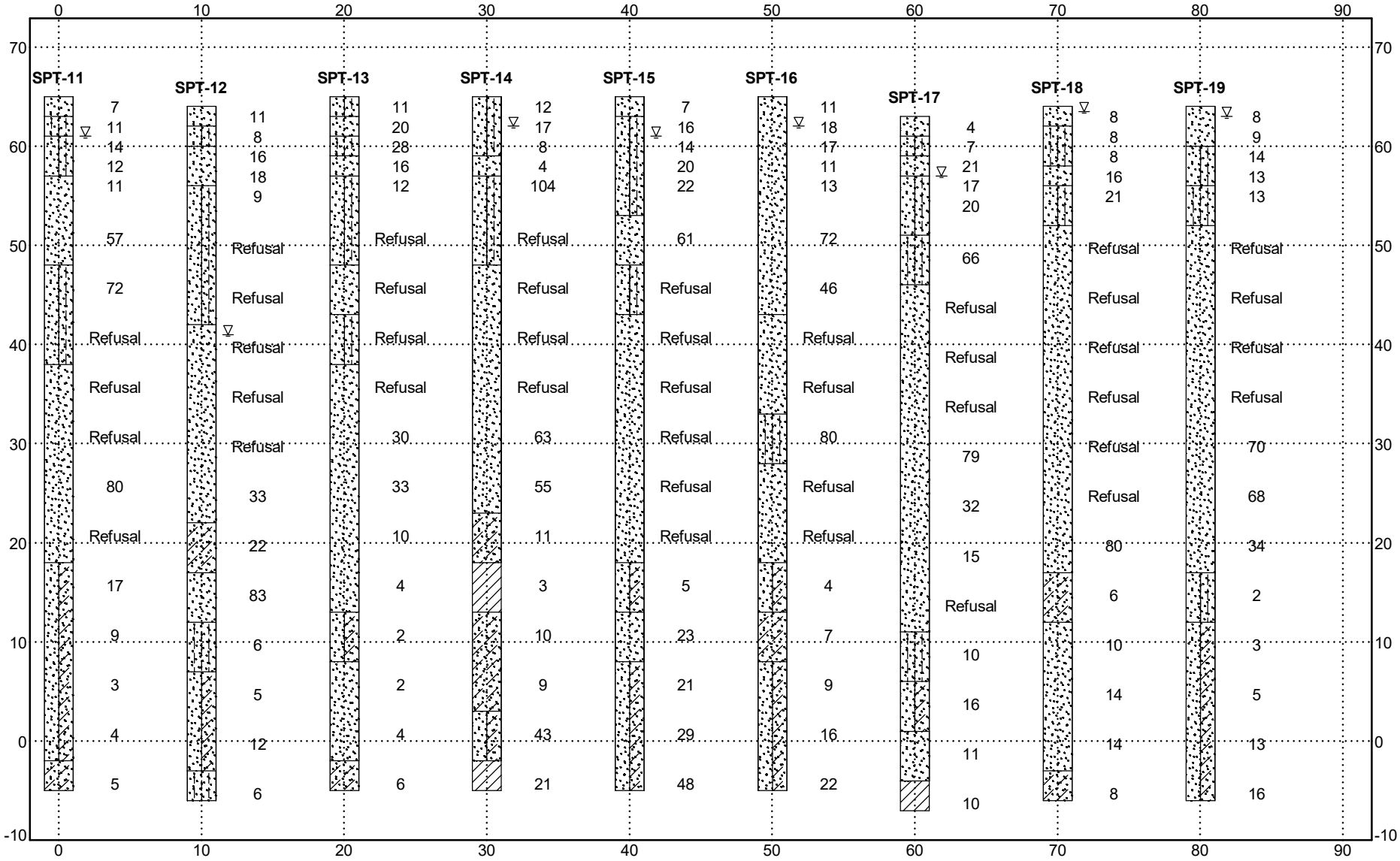
PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion
PAGE 1 OF 1

Madrid CPWG

LEGEND

- Water Table
- Loss of Drilling Fluid Circulation
- USCS slightly silty sand
- USCS clayey sand
- USCS silt
- USCS sand
- USCS highly plastic silt
- USCS slightly clayey sand
- USCS silty sand

FENCE NO HORIZONTAL UNIT 15226 BORING LOGS.GPJ FDOT.GDT 12/12/22



TEST BORING FENCE RECORD

PROJECT NUMBER 15226
PROJECT Highlands County Class I FL Expansion
PAGE 1 OF 1

Madrid CPWG

LEGEND

- Water Table
- Loss of Drilling Fluid Circulation
- USCS sand
- USCS slightly clayey sand
- USCS silty sand
- USCS clayey sand
- USCS slightly silty sand
- USCS clay

FENCE NO HORIZONTAL UNIT 15226 BORING LOGS.GPJ FDOT.GDT 12/12/22

Appendix B

2030 State Road 60 East
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(863)533-9007

ASTM D1140 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring **Date Tested:** 11/11/2022
Client: Jones Edmunds **Tested By:** BJN

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
SPT-6 13.5-15'	236	118.75	102.50	8.24	85.3%	17.2%	97.08	5.8%
SPT-14 6-8'	200	111.28	97.66	8.24	86.8%	15.2%	93.95	4.1%
SPT-14 43.5-45'	107	110.70	89.59	8.18	79.4%	25.9%	78.41	13.7%
SPT-15 6-8'	120	109.16	97.09	8.26	88.0%	13.6%	92.55	5.1%
SPT-19 8-10'	15	116.02	98.46	8.24	83.7%	19.5%	95.56	3.2%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content } (\%) = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content } (\%) = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve } (\%) = \frac{(S_D - S_R)}{S_D} * 100$$

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AASHTO T267 ORGANIC CONTENT

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/11/2022
Technician: BJN

Sample	Container Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moist-ure Content (%)	Furnace Container Name	$W_{fC}+S_D$ (g)	$W_{fC}+S_{FD}$ (g)	W_{fC} (g)	Organic Content (%)
SPT-6 13.5-15'	J	102.16	87.45	8.23	84.3%	18.6%	2	134.43	131.49	55.22	3.7%
SPT-19 8-10'	N	105.03	89.08	8.34	83.5%	19.8%	4	136.74	135.13	55.99	2.0%

Average Organic Content (%): 2.9%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
W_{fC} = Weight of Furnace Container
S_{FD} = Weight of Furnace Dried Sample

$$\text{Solids Content (\%)} = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content (\%)} = \frac{(S_W - S_D)}{S_D} * 100$$

$$\text{Organic Content (\%)} = \frac{(S_D - S_{FD})}{S_D} * 100$$

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ATTERBERG LIMITS DETERMINATION AASHTO T89/90

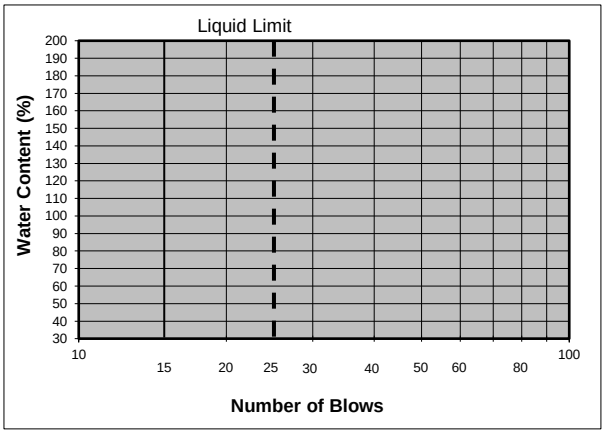
Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

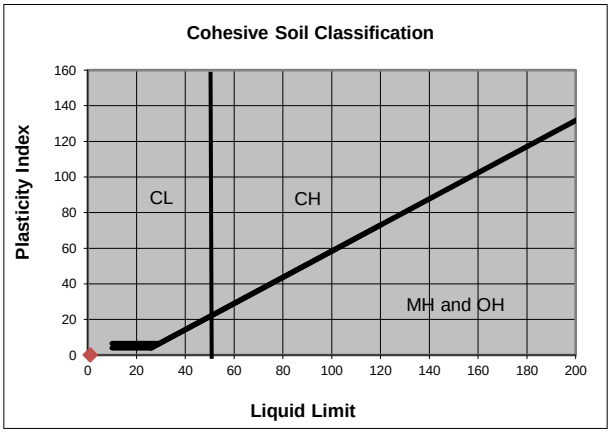
Date Tested: 11/11/2022
Technician: BJN

Sample Number: SPT-14
Soil Description:

Sample Location: 43.5 TO 45'
USCS Code:

Liquid Limit					
Sample Number					
W_C+S_W (g)					
W_C+S_D (g)					
W_C (g)					
S_D (g)					
W_{H2O} (g)					
Number of Blows					
Moisture Content (%)					





Plastic Limit				
Sample Number				
W_C+S_W (g)				
W_C+S_D (g)				
W_C (g)				
S_D (g)				
W_{H2O} (g)				
Moisture Content (%)				

Summary	
% < #200 =	**13.7**
Liquid Limit =	
Plastic Limit =	**Not Plastic**
Plasticity Index =	

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = #DIV/0!

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ASTM D1140 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring **Date Tested:** 11/17/2022
Client: Jones Edmunds **Tested By:** BJN

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
SPT-9 4-6'	233	113.42	101.67	8.17	88.8%	12.6%	97.89	4.0%
SPT-9 18.5-20'	97	110.45	95.70	8.20	85.6%	16.9%	92.24	4.0%
SPT-9 68.5-70'	101	113.33	70.80	8.21	59.5%	68.0%	37.33	53.5%
SPT-12 2-4'	202	108.77	93.56	8.21	84.9%	17.8%	87.78	6.8%
SPT-12 18.5-20'	126	108.82	94.00	8.21	85.3%	17.3%	89.02	5.8%
SPT-12 53.5-55'	234	109.26	73.25	8.23	64.4%	55.4%	42.85	46.8%
SPT-12 68.5-70'	237	108.63	80.78	8.21	72.3%	38.4%	67.51	18.3%
SPT-13 6-8'	218	114.60	101.33	8.20	87.5%	14.2%	96.95	4.7%
SPT-13 53.5-55'	135	106.42	83.75	8.18	76.9%	30.0%	75.98	10.3%
SPT-17 8-10'	235	106.16	90.63	8.22	84.1%	18.8%	85.56	6.2%
SPT-17 53.5-55'	204	105.16	66.97	8.17	60.6%	64.9%	41.92	42.6%
SPT-17 68.5-70'	119	105.06	70.62	8.17	64.5%	55.1%	35.52	56.2%
SPT-18 8-10'	226	103.40	87.35	8.19	83.1%	20.3%	82.60	6.0%
SPT-18 48.5-50'	113	107.15	85.47	8.19	78.1%	28.1%	75.49	12.9%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content } (\%) = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content } (\%) = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve } (\%) = \frac{(S_D - S_R)}{S_D} * 100$$

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AASHTO T267 ORGANIC CONTENT

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/17/2022
Technician: BJN

Sample	Container Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moist-ure Content (%)	Furnace Container Name	$W_{fC}+S_D$ (g)	$W_{fC}+S_{FD}$ (g)	W_{fC} (g)	Organic Content (%)
SPT-18 8-10'	X	103.02	87.25	8.33	83.3%	20.0%	6	135.87	132.85	57.15	3.8%

Average Organic Content (%): 3.8%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
W_{fC} = Weight of Furnace Container
S_{FD} = Weight of Furnace Dried Sample

$$\text{Solids Content (\%)} = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content (\%)} = \frac{(S_W - S_D)}{S_D} * 100$$

$$\text{Organic Content (\%)} = \frac{(S_D - S_{FD})}{S_D} * 100$$

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ATTERBERG LIMITS DETERMINATION AASHTO T89/90

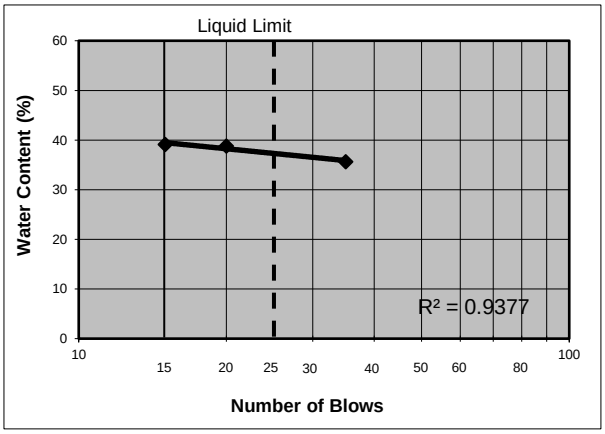
Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

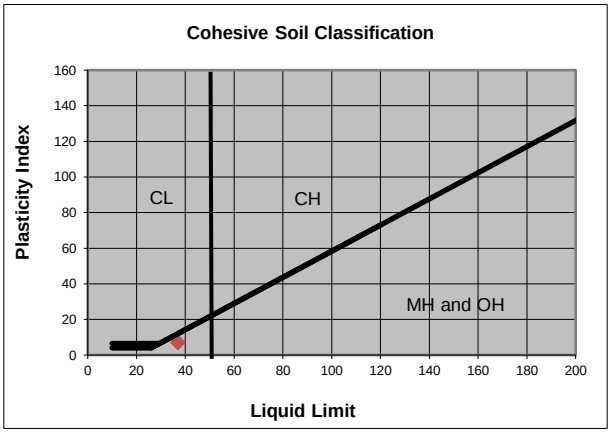
Date Tested: 11/17/2022
Technician: BJN

Sample Number: SPT-9
Soil Description: lean very sandy silt

Sample Location: 68.5 TO 70'
USCS Code: ML

Liquid Limit					
Sample Number	36	37	38		
W_C+S_W (g)	20.15	20.42	20.44		
W_C+S_D (g)	18.43	18.50	18.48		
W_C (g)	13.61	13.55	13.47		
S_D (g)	4.82	4.95	5.01		
W_{H2O} (g)	1.72	1.92	1.96		
Number of Blows	35	20	15		
Moisture Content (%)	35.68	38.79	39.12		





Plastic Limit				
Sample Number	15	34	35	
W_C+S_W (g)	17.35	17.56	17.37	
W_C+S_D (g)	16.47	16.66	16.48	
W_C (g)	13.58	13.59	13.55	
S_D (g)	2.89	3.07	2.93	
W_{H2O} (g)	0.88	0.90	0.89	
Moisture Content (%)	30.45	29.32	30.38	

Summary	
% < #200 =	**53.5**
Liquid Limit =	**37**
Plastic Limit =	**30**
Plasticity Index =	**7**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.52

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ATTERBERG LIMITS DETERMINATION AASHTO T89/90

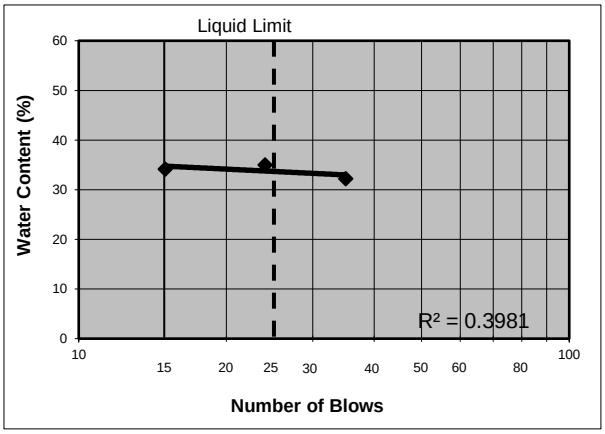
Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

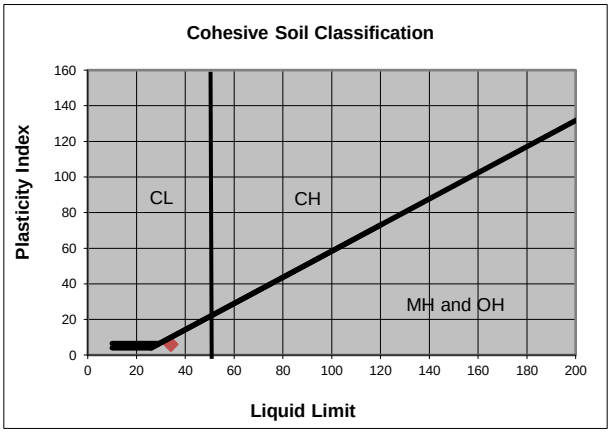
Date Tested: 11/18/2022
Technician: BJN

Sample Number: SPT-12
Soil Description: silty sand

Sample Location: 53.5 TO 55'
USCS Code: SM

Liquid Limit					
Sample Number	31	40	48		
W_C+S_W (g)	20.56	21.75	20.88		
W_C+S_D (g)	18.84	19.61	19.01		
W_C (g)	13.51	13.50	13.54		
S_D (g)	5.33	6.11	5.47		
W_{H2O} (g)	1.72	2.14	1.87		
Number of Blows	35	24	15		
Moisture Content (%)	32.27	35.02	34.19		





Plastic Limit				
Sample Number	9	14	20	
W_C+S_W (g)	17.23	17.31	17.18	
W_C+S_D (g)	16.42	16.48	16.41	
W_C (g)	13.55	13.54	13.60	
S_D (g)	2.87	2.94	2.81	
W_{H2O} (g)	0.81	0.83	0.77	
Moisture Content (%)	28.22	28.23	27.40	

Summary	
% < #200 =	**46.8**
Liquid Limit =	**34**
Plastic Limit =	**28**
Plasticity Index =	**6**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.39

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ATTERBERG LIMITS DETERMINATION AASHTO T89/90

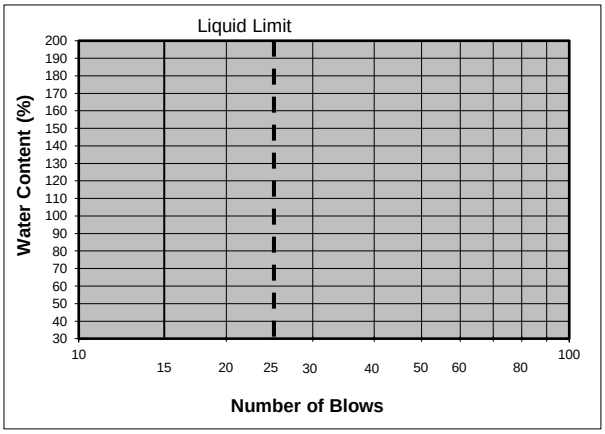
Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

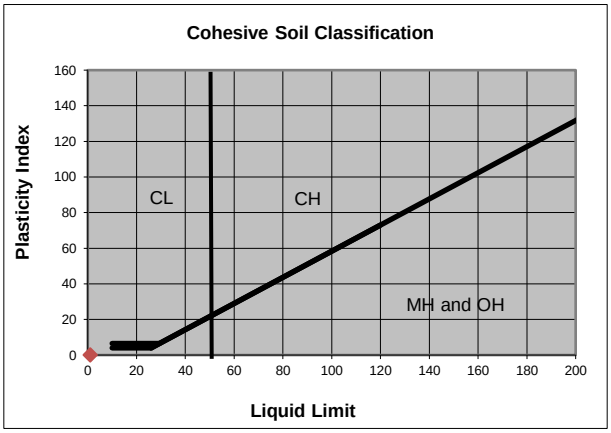
Date Tested: 11/17/2022
Technician: BJN

Sample Number: SPT-12
Soil Description: silty sand

Sample Location: 68.5 TO 70'
USCS Code: SM

Liquid Limit					
Sample Number					
W_C+S_W (g)					
W_C+S_D (g)					
W_C (g)					
S_D (g)					
W_{H2O} (g)					
Number of Blows					
Moisture Content (%)					





Plastic Limit				
Sample Number				
W_C+S_W (g)				
W_C+S_D (g)				
W_C (g)				
S_D (g)				
W_{H2O} (g)				
Moisture Content (%)				

Summary	
% < #200 =	**18.3**
Liquid Limit =	
Plastic Limit =	**Not Plastic**
Plasticity Index =	

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = #DIV/0!

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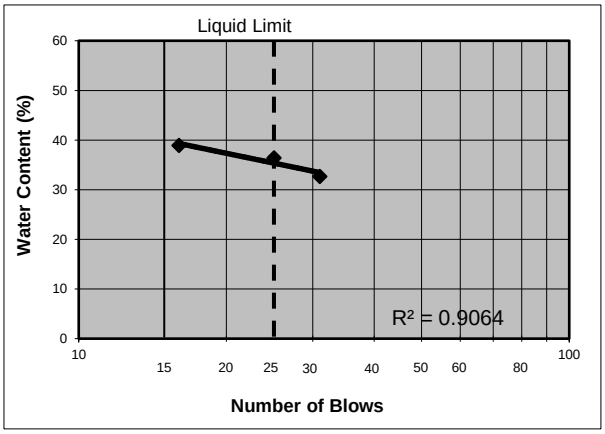
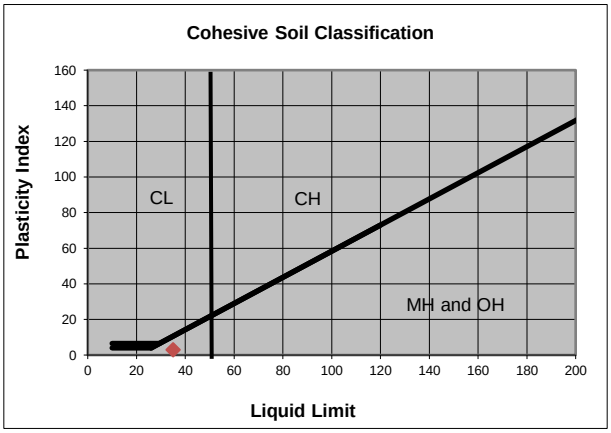
ATTERBERG LIMITS DETERMINATION AASHTO T89/90

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/18/2022
Technician: BJN

Sample Number: SPT-17
Soil Description: Dark gray silty sand
Sample Location: 53.5 TO 55'
USCS Code: SM

Liquid Limit					
Sample Number	37	36	38		
W_C+S_W (g)	20.68	20.04	20.65		
W_C+S_D (g)	18.92	18.32	18.64		
W_C (g)	13.54	13.60	13.48		
S_D (g)	5.38	4.72	5.16		
W_{H2O} (g)	1.76	1.72	2.01		
Number of Blows	31	25	16		
Moisture Content (%)	32.71	36.44	38.95		





Plastic Limit				
Sample Number	15	34	35	
W_C+S_W (g)	17.34	17.38	17.38	
W_C+S_D (g)	16.43	16.46	16.47	
W_C (g)	13.58	13.57	13.55	
S_D (g)	2.85	2.89	2.92	
W_{H2O} (g)	0.91	0.92	0.91	
Moisture Content (%)	31.93	31.83	31.16	

Summary	
% < #200 =	**42.6**
Liquid Limit =	**35**
Plastic Limit =	**32**
Plasticity Index =	**3**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.34

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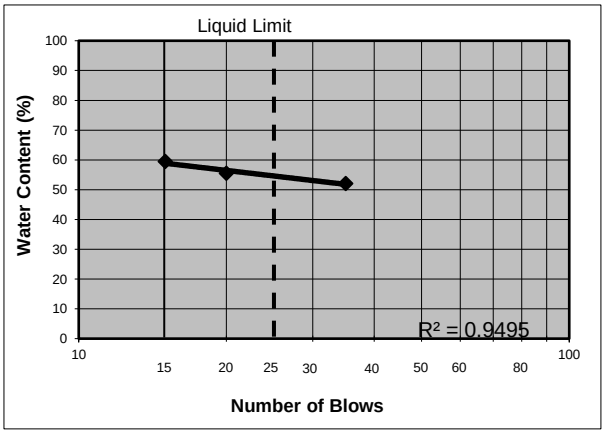
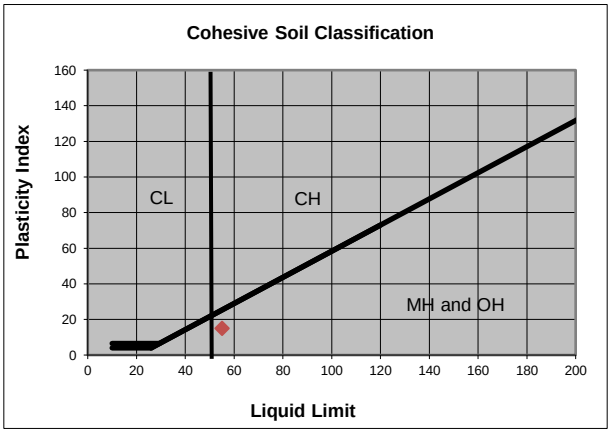
ATTERBERG LIMITS DETERMINATION AASHTO T89/90

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/18/2022
Technician: BJN

Sample Number: SPT-1
Soil Description: Gray highly plastic silt
Sample Location: 68.5 TO 70'
USCS Code: MH

Liquid Limit					
Sample Number	5	7	8		
W_C+S_W (g)	20.75	20.41	20.63		
W_C+S_D (g)	18.28	18.00	17.97		
W_C (g)	13.54	13.66	13.50		
S_D (g)	4.74	4.34	4.47		
W_{H2O} (g)	2.47	2.41	2.66		
Number of Blows	35	20	15		
Moisture Content (%)	52.11	55.53	59.51		





Plastic Limit				
Sample Number	1	2		
W_C+S_W (g)	17.67	17.91		
W_C+S_D (g)	16.43	16.67		
W_C (g)	13.38	13.56		
S_D (g)	3.05	3.11		
W_{H2O} (g)	1.24	1.24		
Moisture Content (%)	40.66	39.87		

Summary	
% < #200 =	**N/A**
Liquid Limit =	**55**
Plastic Limit =	**40**
Plasticity Index =	**15**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.39

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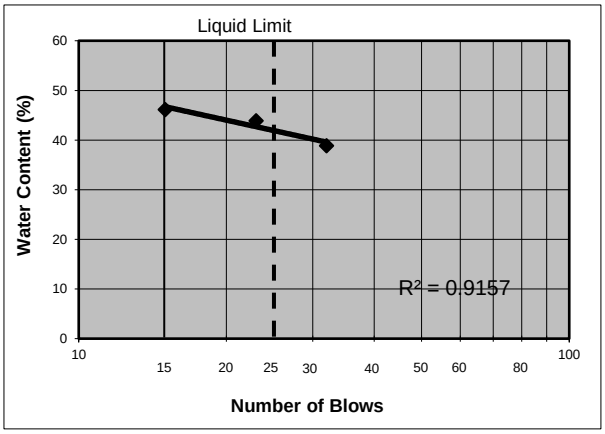
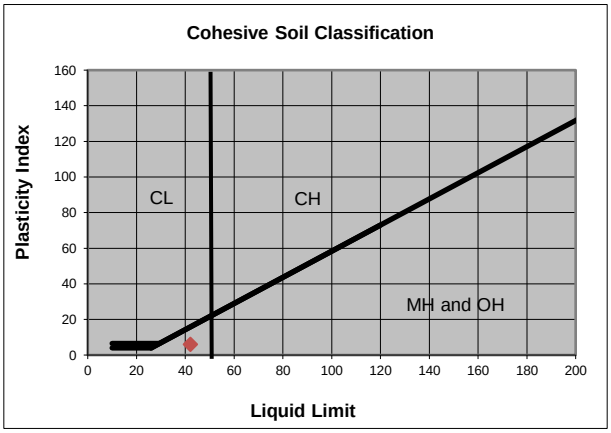
ATTERBERG LIMITS DETERMINATION AASHTO T89/90

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/18/2022
Technician: BJN

Sample Number: SPT-4
Soil Description: Gray silt
Sample Location: 68.5 TO 70'
USCS Code: ML

Liquid Limit					
Sample Number	28	29	46		
W_C+S_W (g)	20.00	20.21	21.37		
W_C+S_D (g)	18.20	18.18	18.90		
W_C (g)	13.57	13.56	13.55		
S_D (g)	4.63	4.62	5.35		
W_{H2O} (g)	1.80	2.03	2.47		
Number of Blows	32	23	15		
Moisture Content (%)	38.88	43.94	46.17		





Plastic Limit				
Sample Number	11	42	47	
W_C+S_W (g)	17.38	17.39		
W_C+S_D (g)	16.37	16.37		
W_C (g)	13.58	13.49		
S_D (g)	2.79	2.88		
W_{H2O} (g)	1.01	1.02		
Moisture Content (%)	36.20	35.42		

Summary	
% < #200 =	**N/A**
Liquid Limit =	**42**
Plastic Limit =	**36**
Plasticity Index =	**6**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.39

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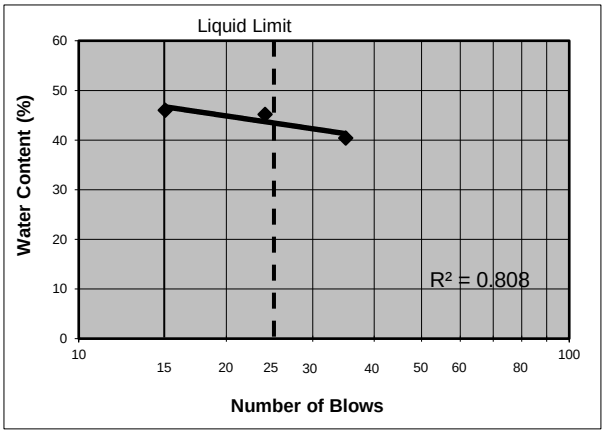
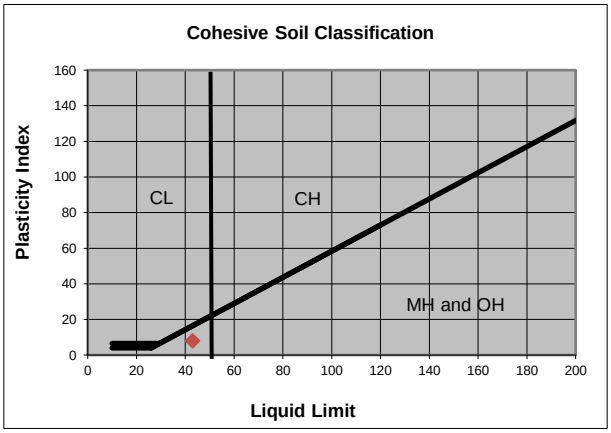
ATTERBERG LIMITS DETERMINATION AASHTO T89/90

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/18/2022
Technician: BJN

Sample Number: SPT-5
Soil Description: Gray silt
Sample Location: 68.5 TO 70'
USCS Code: ML

Liquid Limit					
Sample Number	30	19	26		
W_C+S_W (g)	20.43	20.14	22.19		
W_C+S_D (g)	18.44	18.11	19.48		
W_C (g)	13.52	13.62	13.59		
S_D (g)	4.92	4.49	5.89		
W_{H2O} (g)	1.99	2.03	2.71		
Number of Blows	35	24	15		
Moisture Content (%)	40.45	45.21	46.01		





Plastic Limit				
Sample Number	16	27	49	
W_C+S_W (g)	17.37	17.38	17.45	
W_C+S_D (g)	16.39	16.37	16.49	
W_C (g)	13.60	13.50	13.80	
S_D (g)	2.79	2.87	2.69	
W_{H2O} (g)	0.98	1.01	0.96	
Moisture Content (%)	35.13	35.19	35.69	

Summary	
% < #200 =	**N/A**
Liquid Limit =	**43**
Plastic Limit =	**35**
Plasticity Index =	**8**

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = 0.25

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ASTM D2434-68 CONSTANT HEAD PERMEABILITY

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

Date Tested: 11/16/2022
Tested By: BJN

Boring Number: TP-1 Vert
Soil Description:

Sample Interval:
USCS Code:
< #200 sieve:
Post-Test Moisture: 23.9 %
Natural Moisture: 7.6 %

Unit weight determination *(input in yellow)*

Weight in-situ soil + Shelby tube:	1515.17	g
Weight post-test soil + Shelby:	1644.82	g
Weight of Shelby tube	419.09	g
Weight of in-situ soil:	1096.08	g
Weight of post-test (sat.) soil:	1225.73	g
Weight of soil dry:	1018.66	g
Diameter of Permeameter:	7.29	cm
Height of soil in Permeameter:	15.02	cm
Area of soil in Permeameter:	41.74	cm^2
Post-Test Unit Weight of soil:	1.96	g/cm3

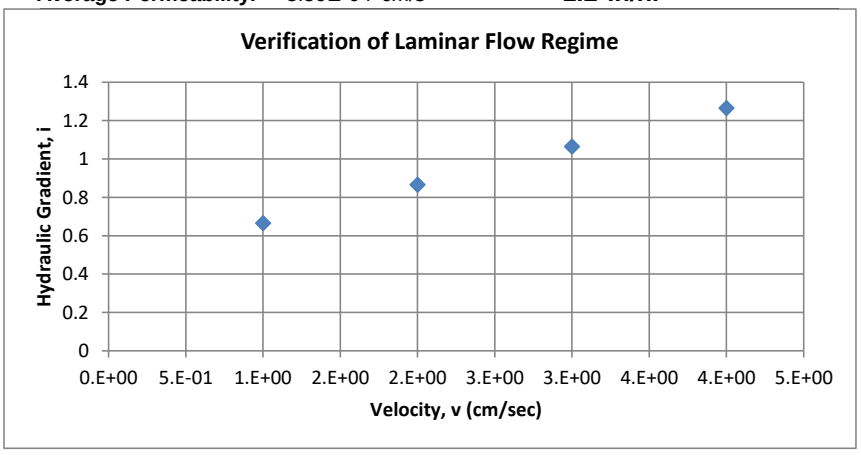
Sample Density
122.1 pcf (post-test)
109.1 pcf (in-situ)
101.4 pcf (dry)

Permeability determination

Length of soil in Permeameter, ***l*** :	15.02	cm
Cross sectional Area, ***A*** :	41.74	cm^2

Trial No.	Head, ***h*** (cm)	Flow, Q_{out} (cm^3)	Time, ***t*** (s)	Temp, ***T*** (°C)	Permeability at ***T***, k_T (cm/s)	Ratio of Viscosity, $\eta_T:\eta_{20°C}$	Hydraulic Gradient, ***i***	Velocity, ***v*** (cm/sec)	Permeability at 20°C, $k_{20°C}$ (cm/s)
1	10	14.8	600	23	8.88E-04	0.9311	0.66577896	5.91E-04	8.26E-04
2	13	20.34	600	23	9.38E-04	0.9311	0.86551265	8.12E-04	8.74E-04
3	16	24.71	600	23	9.26E-04	0.9311	1.06524634	9.87E-04	8.62E-04
4	19	29.71	600	23	9.38E-04	0.9311	1.26498003	1.19E-03	8.73E-04
5									

Average Permeability: 8.59E-04 cm/s **1.2 in/hr**



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ASTM D2434-68 CONSTANT HEAD PERMEABILITY

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

Date Tested: 11/16/2022
Tested By: BJN

Boring Number: TP-1 Horz
Soil Description:

Sample Interval:
USCS Code:
< #200 sieve:
Post-Test Moisture: 35.1 %
Natural Moisture: 1.8 %

Unit weight determination *(input in yellow)*

Weight in-situ soil + Shelby tube:	1296.55	g
Weight post-test soil + Shelby:	1547.95	g
Weight of Shelby tube	425.85	g
Weight of in-situ soil:	870.70	g
Weight of post-test (sat.) soil:	1122.10	g
Weight of soil dry:	855.30	g
Diameter of Permeameter:	7.30	cm
Height of soil in Permeameter:	15.22	cm
Area of soil in Permeameter:	41.85	cm^2
Post-Test Unit Weight of soil:	1.76	g/cm3

Sample Density

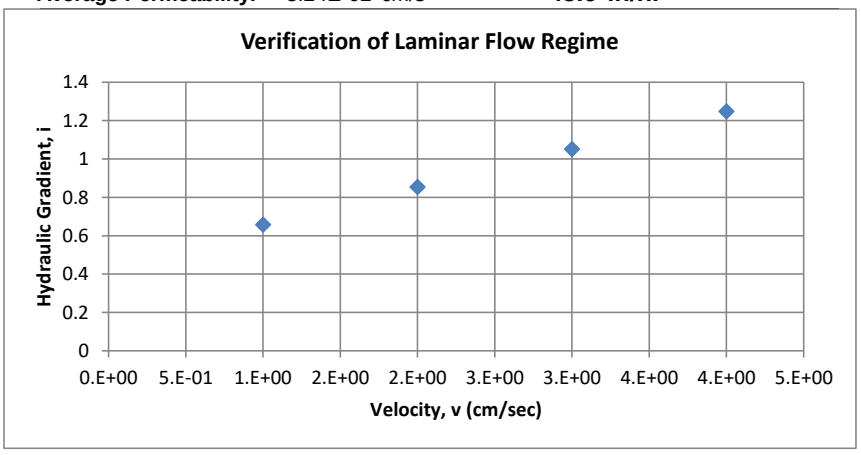
110.0 pcf (post-test)
85.3 pcf (in-situ)
83.8 pcf (dry)

Permeability determination

Length of soil in Permeameter, ***l*** :	15.22	cm
Cross sectional Area, ***A*** :	41.85	cm^2

Trial No.	Head, ***h*** (cm)	Flow, Q_{out} (cm^3)	Time, ***t*** (s)	Temp, ***T*** (°C)	Permeability at ***T***, k_T (cm/s)	Ratio of Viscosity, $\eta_T:\eta_{20°C}$	Hydraulic Gradient, ***i***	Velocity, ***v*** (cm/sec)	Permeability at 20°C, $k_{20°C}$ (cm/s)
1	10	55.74	60	23	3.38E-02	0.9311	0.65703022	2.22E-02	3.15E-02
2	13	75.05	60	23	3.50E-02	0.9311	0.85413929	2.99E-02	3.26E-02
3	16	92.45	60	23	3.50E-02	0.9311	1.05124836	3.68E-02	3.26E-02
4	19	110.66	60	23	3.53E-02	0.9311	1.24835742	4.41E-02	3.29E-02
5									

Average Permeability: 3.24E-02 cm/s **45.9 in/hr**



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ASTM D2434-68 CONSTANT HEAD PERMEABILITY

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

Date Tested: 11/16/2022
Tested By: BJN

Boring Number: TP-2 Vert
Soil Description:

Sample Interval:
USCS Code:
< #200 sieve:
Post-Test Moisture: 30.7 %
Natural Moisture: 1.3 %

Unit weight determination *(input in yellow)*

Weight in-situ soil + Shelby tube:	1308.96	g
Weight post-test soil + Shelby:	1560.97	g
Weight of Shelby tube	414.09	g
Weight of in-situ soil:	894.87	g
Weight of post-test (sat.) soil:	1146.88	g
Weight of soil dry:	883.39	g
Diameter of Permeameter:	7.21	cm
Height of soil in Permeameter:	14.83	cm
Area of soil in Permeameter:	40.83	cm^2
Post-Test Unit Weight of soil:	1.89	g/cm3

Sample Density

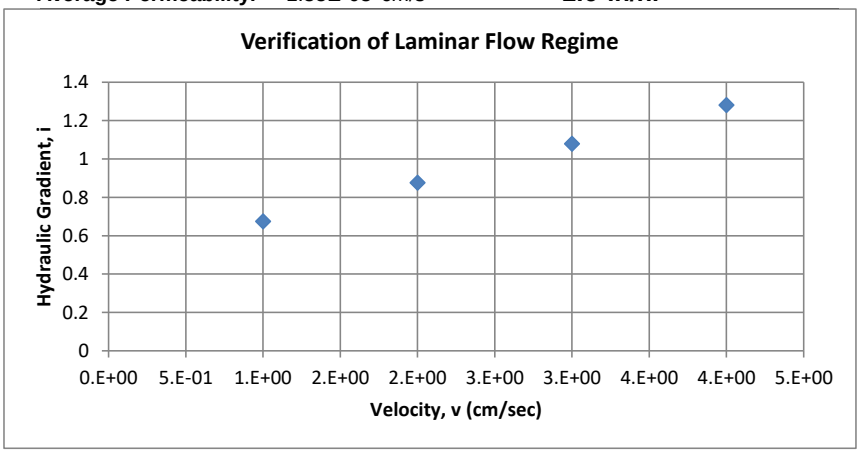
118.3 pcf (post-test)
92.3 pcf (in-situ)
91.1 pcf (dry)

Permeability determination

Length of soil in Permeameter, ***l*** :	14.83	cm
Cross sectional Area, ***A*** :	40.83	cm^2

Trial No.	Head, ***h*** (cm)	Flow, Q_{out} (cm^3)	Time, ***t*** (s)	Temp, ***T*** (°C)	Permeability at ***T***, k_T (cm/s)	Ratio of Viscosity, $\eta_T:\eta_{20°C}$	Hydraulic Gradient, ***i***	Velocity, ***v*** (cm/sec)	Permeability at 20°C, $k_{20°C}$ (cm/s)
1	10	32.6	600	23	1.97E-03	0.9311	0.67430883	1.33E-03	1.84E-03
2	13	42.19	600	23	1.96E-03	0.9311	0.87660148	1.72E-03	1.83E-03
3	16	52.86	600	23	2.00E-03	0.9311	1.07889413	2.16E-03	1.86E-03
4	19	62.83	600	23	2.00E-03	0.9311	1.28118678	2.56E-03	1.86E-03
5									

Average Permeability: 1.85E-03 cm/s **2.6 in/hr**



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ASTM D2434-68 CONSTANT HEAD PERMEABILITY

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

Date Tested: 11/16/2022
Tested By: BJN

Boring Number: TP-2 Horz
Soil Description:

Sample Interval:
USCS Code:
< #200 sieve:
Post-Test Moisture: 25.4 %
Natural Moisture: 4.7 %

Unit weight determination *(input in yellow)*

Weight in-situ soil + Shelby tube:	1419.78	g
Weight post-test soil + Shelby:	1592.68	g
Weight of Shelby tube	425.65	g
Weight of in-situ soil:	994.13	g
Weight of post-test (sat.) soil:	1167.03	g
Weight of soil dry:	949.50	g
Diameter of Permeameter:	7.25	cm
Height of soil in Permeameter:	14.69	cm
Area of soil in Permeameter:	41.28	cm^2
Post-Test Unit Weight of soil:	1.92	g/cm3

Sample Density

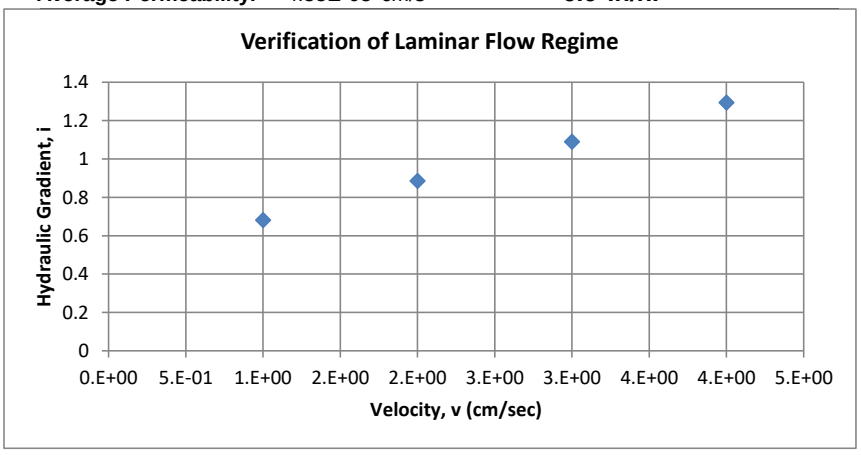
120.1 pcf (post-test)
102.3 pcf (in-situ)
97.7 pcf (dry)

Permeability determination

Length of soil in Permeameter, l:	14.69	cm
Cross sectional Area, A:	41.28	cm^2

Trial No.	Head, h (cm)	Flow, Q_{out} (cm^3)	Time, t (s)	Temp, T (°C)	Permeability at T, k_T (cm/s)	Ratio of Viscosity, η η_T:$\eta_{20°C}$	Hydraulic Gradient, i	Velocity, v (cm/sec)	Permeability at 20°C, $k_{20°C}$ (cm/s)
1	10	45.12	600	23	2.68E-03	0.9311	0.68073519	1.82E-03	2.49E-03
2	13	135.91	600	23	6.20E-03	0.9311	0.88495575	5.49E-03	5.77E-03
3	16	167.8	600	23	6.22E-03	0.9311	1.08917631	6.77E-03	5.79E-03
4	19	183.54	600	23	5.73E-03	0.9311	1.29339687	7.41E-03	5.33E-03
5									

Average Permeability: 4.85E-03 cm/s **6.9 in/hr**



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ASTM D2434-68 CONSTANT HEAD PERMEABILITY

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

Date Tested: 11/16/2022
Tested By: BJN

Boring Number: TP-3 Vert
Soil Description:

Sample Interval:
USCS Code:
< #200 sieve:
Post-Test Moisture: 23.4 %
Natural Moisture: 12.0 %

Unit weight determination *(input in yellow)*

Weight in-situ soil + Shelby tube:	1452.92	g
Weight post-test soil + Shelby:	1543.99	g
Weight of Shelby tube	406.19	g
Weight of in-situ soil:	1046.73	g
Weight of post-test (sat.) soil:	1137.80	g
Weight of soil dry:	934.58	g
Diameter of Permeameter:	7.27	cm
Height of soil in Permeameter:	14.88	cm
Area of soil in Permeameter:	41.51	cm^2
Post-Test Unit Weight of soil:	1.84	g/cm3

Sample Density

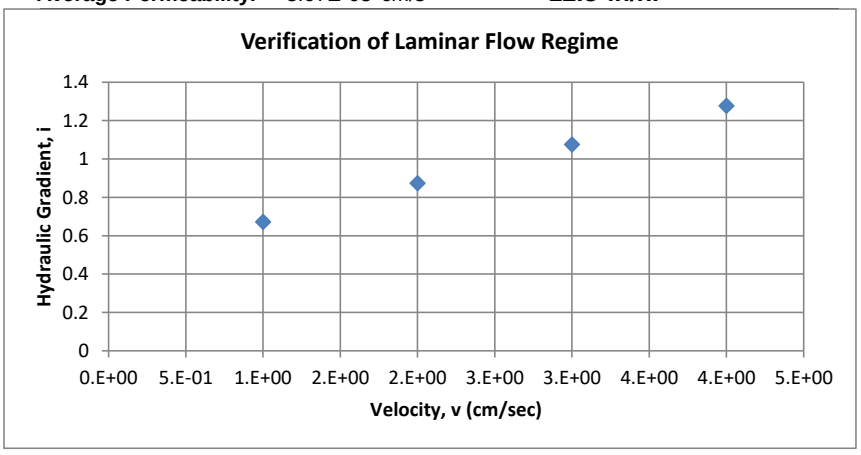
115.0 pcf (post-test)
105.8 pcf (in-situ)
94.5 pcf (dry)

Permeability determination

Length of soil in Permeameter, l:	14.88	cm
Cross sectional Area, A:	41.51	cm^2

Trial No.	Head, h (cm)	Flow, Q_{out} (cm^3)	Time, t (s)	Temp, T (°C)	Permeability at T, k_T (cm/s)	Ratio of Viscosity, η η_T:$\eta_{20°C}$	Hydraulic Gradient, i	Velocity, v (cm/sec)	Permeability at 20°C, $k_{20°C}$ (cm/s)
1	10	78.96	300	23	9.43E-03	0.9311	0.67204301	6.34E-03	8.78E-03
2	13	104.06	300	23	9.56E-03	0.9311	0.87365591	8.36E-03	8.91E-03
3	16	122.26	300	23	9.13E-03	0.9311	1.07526882	9.82E-03	8.50E-03
4	19	145.07	300	23	9.12E-03	0.9311	1.27688172	1.16E-02	8.49E-03
5									

Average Permeability: 8.67E-03 cm/s **12.3 in/hr**



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ASTM D2434-68 CONSTANT HEAD PERMEABILITY

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

Date Tested: 11/16/2022
Tested By: BJN

Boring Number: TP-3 Horz
Soil Description:

Sample Interval:
USCS Code:
< #200 sieve:
Post-Test Moisture: 20.6 %
Natural Moisture: 15.9 %

Unit weight determination *(input in yellow)*

Weight in-situ soil + Shelby tube:	1572.91	g
Weight post-test soil + Shelby:	1597.28	g
Weight of Shelby tube	423.27	g
Weight of in-situ soil:	1149.64	g
Weight of post-test (sat.) soil:	1174.01	g
Weight of soil dry:	991.92	g
Diameter of Permeameter:	7.31	cm
Height of soil in Permeameter:	14.86	cm
Area of soil in Permeameter:	41.97	cm^2
Post-Test Unit Weight of soil:	1.88	g/cm3

Sample Density

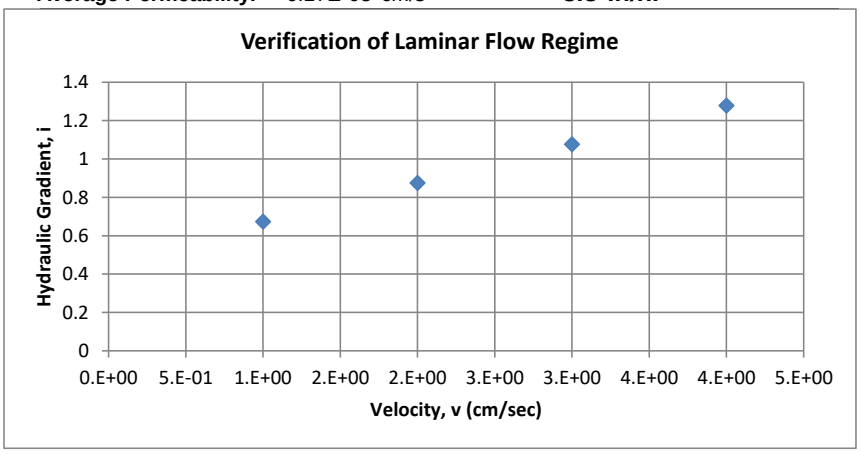
117.5 pcf (post-test)
115.1 pcf (in-situ)
99.3 pcf (dry)

Permeability determination

Length of soil in Permeameter, l:	14.86	cm
Cross sectional Area, A:	41.97	cm^2

Trial No.	Head, h (cm)	Flow, Q_{out} (cm^3)	Time, t (s)	Temp, T (°C)	Permeability at T, k_T (cm/s)	Ratio of Viscosity, η η_T:$\eta_{20°C}$	Hydraulic Gradient, i	Velocity, v (cm/sec)	Permeability at 20°C, $k_{20°C}$ (cm/s)
1	10	53.71	300	23	6.34E-03	0.9311	0.67294751	4.27E-03	5.90E-03
2	13	75.2	300	23	6.83E-03	0.9311	0.87483176	5.97E-03	6.36E-03
3	16	91.81	300	23	6.77E-03	0.9311	1.07671602	7.29E-03	6.31E-03
4	19	106	300	23	6.58E-03	0.9311	1.27860027	8.42E-03	6.13E-03
5									

Average Permeability: 6.17E-03 cm/s **8.8 in/hr**



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ASTM D1140 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring **Date Tested:** 11/7/2022
Client: Jones Edmunds **Tested By:** BJN

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
SPT-1 2-4'	223	107.33	91.28	8.21	83.8%	19.3%	85.32	7.2%
SPT-2 18.5-20'	1	111.54	95.85	8.25	84.8%	17.9%	89.72	7.0%
SPT-3 8-10'	92	120.75	102.94	8.35	84.2%	18.8%	98.97	4.2%
SPT-4 8-10'	131	110.00	93.64	8.18	83.9%	19.1%	88.78	5.7%
SPT-4 43.5-45'	104	108.59	85.97	8.13	77.5%	29.1%	75.34	13.7%
SPT-5 8-10'	16	110.55	95.43	8.15	85.2%	17.3%	90.98	5.1%
SPT-5 48.5-50'	117	102.99	79.99	8.17	75.7%	32.0%	71.49	11.8%
SPT-7 13.5-15'	13	116.08	101.38	8.20	86.4%	15.8%	97.91	3.7%
SPT-8 4-6'	14	105.77	96.50	8.21	90.5%	10.5%	92.78	4.2%
SPT-8 73.5-75'	212	107.04	72.93	8.21	65.5%	52.7%	45.81	41.9%
SPT-10 13.5-15'	233	116.15	100.69	8.15	85.7%	16.7%	95.32	5.8%
SPT-11 8-10'	229	110.83	90.03	8.18	79.7%	25.4%	87.31	3.3%
SPT-11 53.5-55'	206	121.66	95.23	8.14	76.7%	30.3%	85.68	11.0%
SPT-16 8-10'	97	114.15	98.00	8.63	84.7%	18.1%	93.90	4.6%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content } (\%) = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content } (\%) = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve } (\%) = \frac{(S_D - S_R)}{S_D} * 100$$

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AASHTO T267 ORGANIC CONTENT

Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds
Date Tested: 11/7/2022
Technician: BJN

Sample	Container Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	Furnace Container Name	$W_{fC}+S_D$ (g)	$W_{fC}+S_{FD}$ (g)	W_{fC} (g)	Organic Content (%)
SPT-4 8-10'	221	101.55	85.68	8.19	83.0%	20.5%	2	132.92	129.59	55.22	4.3%
SPT-7 2-4'	132	105.91	93.85	8.22	87.7%	14.1%	4	141.62	138.38	55.99	3.8%
SPT-16 8-10'	219	104.50	89.02	8.19	83.9%	19.2%	6	137.87	136.05	57.17	2.3%

Average Organic Content (%): 3.4%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
W_{fC} = Weight of Furnace Container
S_{FD} = Weight of Furnace Dried Sample

$$\text{Solids Content (\%)} = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content (\%)} = \frac{(S_W - S_D)}{S_D} * 100$$

$$\text{Organic Content (\%)} = \frac{(S_D - S_{FD})}{S_D} * 100$$

2030 State Road 60 East
Bartow, Florida 33830
(863) 533-9007

ATTERBERG LIMITS DETERMINATION AASHTO T89/90

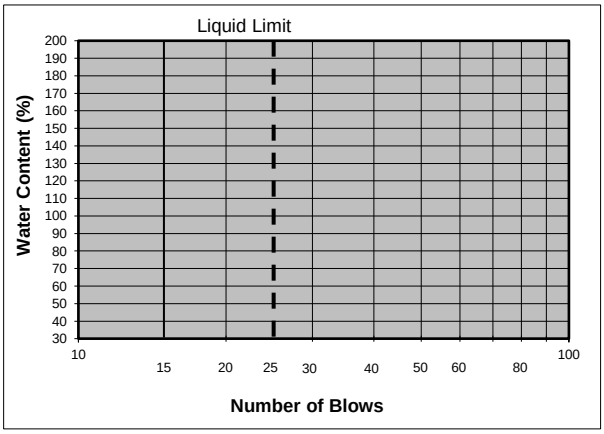
Project Number: 15226
Project Name: Highlands County Class I FL Expansion
Project Location: Sebring
Client: Jones Edmunds

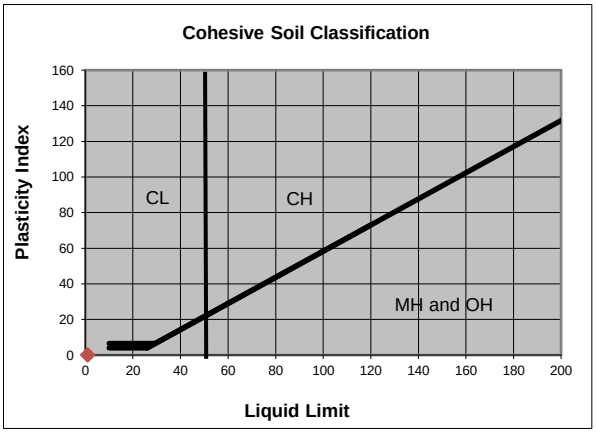
Date Tested: 11/7/2022
Technician: BJN

Sample Number: SPT-8
Soil Description: silty sand

Sample Location: 73.5 TO 75'
USCS Code: SM

Liquid Limit					
Sample Number					
W_C+S_W (g)					
W_C+S_D (g)					
W_C (g)					
S_D (g)					
W_{H2O} (g)					
Number of Blows					
Moisture Content (%)					





Plastic Limit				
Sample Number				
W_C+S_W (g)				
W_C+S_D (g)				
W_C (g)				
S_D (g)				
W_{H2O} (g)				
Moisture Content (%)				

Summary	
% < #200 =	**41.9**
Liquid Limit =	
Plastic Limit =	**Not Plastic**
Plasticity Index =	

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

σ = #DIV/0!

CONTRACT DRAWINGS

PATH=Y:\08345-HIGHLANDS COUNTY\PROJECTS\045-01-HCSWMC-CLASS-I-EXPANSION\CAD\DWGS CONST\GENERAL\08345045-G01.DWG

© Jones Edmunds 2234

22x34

HIGHLANDS COUNTY

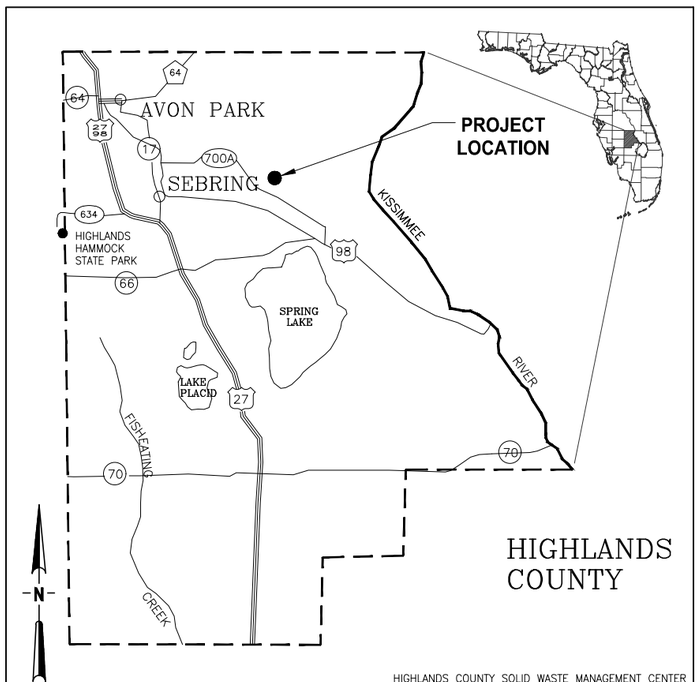
SOLID WASTE MANAGEMENT CENTER

CELL 5 LANDFILL EXPANSION

COUNTY PROJECT No 21078 ITB 23-030

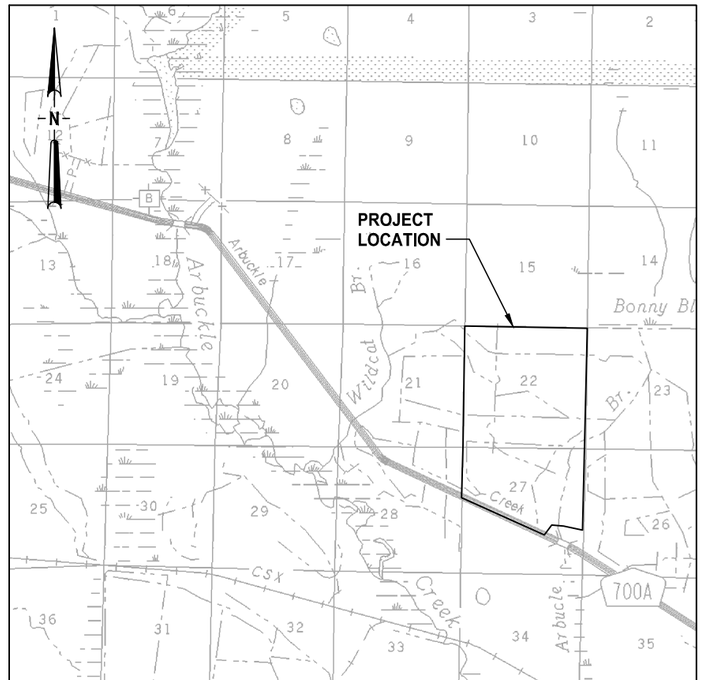
SOLID WASTE DEPARTMENT
HIGHLANDS COUNTY, FLORIDA

SITE ADDRESS: 12700 ARBUCKLE CREEK ROAD, SEBRING, FLORIDA 33870



HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
HIGHLANDS COUNTY, FLORIDA
SECTION 22/27, TOWNSHIP 34, RANGE 30 EAST

SITE VICINITY MAP



PROJECT LOCATION

PREPARED BY:

JonesEdmunds

730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

GEORGE A. REINHART III, STATE OF FLORIDA
PROFESSIONAL ENGINEER LICENSE NO. PE 66516
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY GEORGE A. REINHART, III, P.E., ON THE DATE INDICATED HERE.

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JONES EDMUNDS
730 NE WALDO ROAD
GAINESVILLE, FLORIDA 32641
E.O.R.: GEORGE A. REINHART, III, P.E., No. 66516

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR DRAWINGS G1-G5, C1-C30, AND EC1-EC3.

MICHAEL L. CLARK — LICENSE — No. 48898 — STATE OF FLORIDA — PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY MICHAEL L. CLARK, PE, ON THE DATE ADJACENT TO THE SEAL.

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JONES EDMUNDS
730 NE WALDO ROAD
GAINESVILLE, FLORIDA 32641
CERTIFICATE OF AUTHORIZATION #1841
E.O.R.: MICHAEL L. CLARK, PE, No. 48898

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR THE FOLLOWING SHEETS IN ACCORDANCE WITH RULE 61G15-23.004, F.A.C.: E1-E10.

MONRAD R. THUE, STATE OF FLORIDA
PROFESSIONAL ENGINEER LICENSE NO. PE 32071
THIS ITEM HAS BEEN DIGITALLY SIGNED AND MONRAD R. THUE, P.E., ON THE DATE INDICATED HERE.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

GSE ENGINEERING & CONSULTING, INC.
5590 SW 64TH STREET, SUITE B
GAINESVILLE, FLORIDA
MONRAD R. THUE, P.E., No. 32071

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR DRAWINGS S1-#.

PROJECT No: 08345-045-01

SEPTEMBER 2023

BID DOCUMENTS

LAST SAVED: 9/15/2023 3:30 PMBY:PUPSTILL PLOTTED:9/19/2023 01:37 PMBY:PAUL E. UPSTILL

PLOTTED: 9/19/2023 01:37 PM PAUL E. UPSTILL

ABBREVIATIONS

&	AND
@	AT
ACM	ASBESTOS CONTAINING MATERIAL
ADA	AMERICANS WITH DISABILITIES ACT
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
ALT	ALTERNATIVE
ALUM	ALUMINUM
AMPS	AMPERES
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE, APPROXIMATELY
AR	AIR RELEASE
ARV	AIR RELEASE VALVE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AV	AIR VACUUM
AVG	AVERAGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BCCMP	BITUMINOUS COATED CORRUGATED METAL PIPE
BLD	BLIND
BLDG	BUILDING
BF	BLIND FLANGE
BFP	BACKFLOW PREVENTOR
BFV	BUTTERFLY VALVE
B/L	BASE LINE
BO	BLOW-OFF
BPZ	PIEZOMETER
BTM	BOTTOM
BV	BALL VALVE
BWJ	BUTT-WELDED JOINT
BYP	BY-PASS
C	CELSIUS
CA	COMPRESSED AIR
CAP	CORRUGATED ALUMINUM PIPE
CAT	CATALOGUE
CB	CATCH BASIN
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE
CI	CAST IRON
CIP	CAST IRON PIPE
C/L	CENTERLINE
CLR	CLEAR
CM	CONCRETE MONUMENT, CENTIMETER
CMP	CORRUGATED METAL PIPE
CO	COMPANY/CLEANOUT
CON	CONCENTRIC
CONC	CONCRETE
CONT	CONTINUOUS
CORR	CORRUGATED
CORP	CORPORATION
CPT	CONE PENETRATION TEST
CS	CARBON STEEL
CV	CHECK VALVE
CY	CUBIC YARDS
DBI	DITCH BOTTOM INLET
DBL	DOUBLE
DET	DETAIL
DI	DUCTILE IRON
DIP	DUCTILE IRON PIPE
DIA	DIAMETER
ø	DIAMETER
DIM	DIMENSION
DIV	DIVISION
DS	DROP STRUCTURE
DW	DEEP WELL
DWG	DRAWING
E	EAST
ECC	ECCENTRIC
EA	EACH
EF	EACH FACE
EL	ELEVATION
ELL	ELBOW
ENCL	ENCLOSE, ENCLOSURE
EOL	EDGE OF LINER
EOP	EDGE OF PAVEMENT
ETC	ET CETERA
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EXIST	EXISTING
EXP	EXPANSION
FAB	FABRICATION
FAC	FLORIDA ADMINISTRATIVE CODE
FCA	FLANGED COUPLING ADAPTER
FCV	FLOW CONTROL VALVE
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FDOT	FLORIDA DEPARTMENT OF TRANSPORTATION
FG	FIBERGLASS
FH	FIRE HYDRANT
FIN	FINISHED
FJ	FLANGED JOINT
FLG	FLANGE
FM	FORCE MAIN
FND	FOUNDATION
FNPT	FEMALE NATIONAL PIPE THREAD
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FOOT
FW	FINISHED WATER
GALV	GALVANIZED
GCL	GEOSYNTHETIC CLAY LINER
GFFR	GROUT FILLED FIBER REVETMENT
GPM	GALLONS PER MINUTE
GR	GRADE
GS	GALVANIZED STEEL
GV	GATE VALVE
GMW	GROUNDWATER MONITORING WELL
HCSWMC	HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
HDPE	HIGH DENSITY POLYETHYLENE
HP	HIGH POINT
H, HORIZ	HORIZONTAL
HP	HIGH POINT/HORSE POWER
HWA	HIGH WATER ALARM
HWL	HIGH WATER LEVEL
ID	IDENTIFICATION, INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSULATED FLANGE
IN	INCHES
INV	INVERT
IPS	IRON PIPE SIZE
K	HYDRAULIC CONDUCTIVITY
L	LENGTH
LBR	LIMEROCK BEARING RATIO
LBS	POUNDS
LCS	LEACHATE COLLECTION SYSTEM
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
LDS	LEAK DETECTION SYSTEM
LF	LINEAR FEET
LFG	LANDFILL GAS HEADER
LFGCCS	LANDFILL GAS COLLECTION AND CONTROL SYSTEM
LFGTE	LANDFILL GAS TO ENERGY PLANT
LFM	LEACHATE FORCE MAIN
LR	LONG RADIUS
LRL	LEACHATE RECIRCULATION LINE
LT	LEFT
LWA	LOW WATER ALARM
LWL	LOW WATER LEVEL
MAG	MAGNETIC
MAX	MAXIMUM
MES	MITERED END SECTION
MFR	MANUFACTURER
MH	MANHOLE
MIL	THOUSANDTHS OF AN INCH
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MSL	MEAN SEA LEVEL
MNPT	MALE NATIONAL PIPE THREAD
MT	MOUNT
MUTCD	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
MW	MONITORING WELL
N	NORTH
NAVD	NORTH AMERICAN VERTICAL DATUM
N/A	NOT APPLICABLE
N/AVAIL	NOT AVAILABLE
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NIC	NOT IN CONTRACT
No	NUMBER
NON-PERF	NONPERFORATED
NOM	NOMINAL
NPT	AMERICAN STANDARD TAPER PIPE THREAD
NSF	NATIONAL SANITATION FOUNDATION
NTS	NOT TO SCALE
NW	NORTHWEST
OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
PC	POINT OF CURVE
PE	PLAIN END
PERF	PERFORATED
PLS	PROFESSIONAL LAND SURVEYOR
#	POUND
PI	PRESSURE INDICATOR/GAUGE
PID	PROPERTY IDENTIFICATION NUMBER
PL	PLATE
P/L	PROPERTY LINE
PP	POWER POLE
PS	PUMP STATION
PSI	POUND PER SQUARE INCH
PT	PRESSURE TREATED
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
R	RADIUS
R/W, ROW	RIGHT OF WAY
RCP	REINFORCED CONCRETE PIPE
RED	REDUCER
REF	REFERENCE
REINF	REINFORCED
REQD	REQUIRED
RJ	RESTRAINED JOINT
RPOJ	RESTRAINED PUSH ON JOINT
RT	RIGHT
RW	RAW WATER
S	SOUTH
SAN	SANITARY
SCH	SCHEDULE
SEC	SECOND
SDR	STANDARD DIMENSION RATIO
SECT	SECTION
SF	SQUARE FEET
SG	STAFF GAUGE
SHWT	SEASONAL HIGH WATER TABLE
SIM	SIMILAR
SPEC	SPECIFICATION
SPT	STANDARD PENETRATION TEST
SQ	SQUARE
SR	STATE ROAD
SS	STAINLESS STEEL
SSHHMB	STAINLESS STEEL HEX HEAD MACHINE BOLT
SSRHMS	STAINLESS STEEL ROUND HEAD MACHINE SCREW
STA	STATION
STD	STANDARD
STL	STEEL
SW	STORMWATER/SOUTHWEST
SFWMD	SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SWJ	SOLVENT WELD JOINT
T	TANGENT
T/	TOP OF
TBM	TURNING BENCH MARK
TGS	THREADED GALVANIZED STEEL
TGSP	THREADED GALVANIZED STEEL PIPE
TH	TEST HOLE
THD	THREADED
THK	THICK
TRC	TOTAL RESIDUAL CHLORINE
TS	TUBE STEEL
TYP	TYPICAL
ULC	ULTRASONIC LEVEL CONTROLLER
UNO	UNLESS NOTED OTHERWISE
USC&GS	UNITED STATES COASTAL AND GEODETIC SURVEY
USGS	UNITED STATES GEOLOGICAL SURVEY
V, VERT	VERTICAL
W	WEST
WJ	WELDED JOINT
WM	WATER MAIN
WSWT	WET SEASON WATER TABLE
WWF	WELDED WIRE FABRIC
WGT	WEIGHT
W/	WITH
△	DELTA, ANGULAR CHANGE

DRAWING INDEX

BID DOCUMENTS

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LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

DRAWING INDEX AND ABBREVIATIONS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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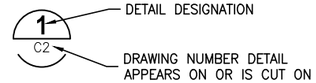
PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: G2

PLOTTED: 9/19/2023 01:37 PM PAUL E. UPSTILL

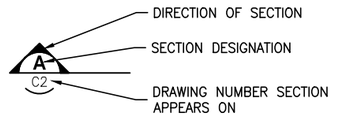
CIVIL LEGEND

- PROPERTY BOUNDARY
- EXISTING STORMWATER INLET
- EXISTING LIMITS OF WASTE
- FM — EXISTING FORCE MAIN
- 107 — EXISTING CONTOUR
- 108.25 — EXISTING GRADE SPOT ELEVATION
- X — EXISTING FENCE
- 107 — PROPOSED CONTOUR
- CELLS 5 AND 7 EDGE OF LINER
- PROPOSED LEACHATE COLLECTION PIPE
- LFM — PROPOSED LEACHATE FORCE MAIN
- LOC — LIMITS OF CONSTRUCTION
- GCL
- GEOCOMPOSITE
- CONCRETE
- LIMEROCK
- ROADWAY SUBBASE (SECTION)
- TRENCH GRAVEL
- SUBGRADE OR BACKFILL
- COMPACTED SUBGRADE
- SOLID WASTE
- PROTECTIVE SOIL/DRAINAGE LAYER
- DRAINAGE MEDIA
- PERFORATED PIPE
- EXISTING CLEAN SOIL
- CLEAN SOIL FILL
- AREA OF DEMOLITION
- ITEM TO BE DEMOLISHED

- GRASS (OR APPROVED ALTERNATE)
- 102.0 + — GRADE SPOT ELEVATION
- STORMWATER/SURFACE WATER FLOW
- MW-13 — EXISTING MONITORING WELL
- LFG-8 — EXISTING GAS PROBE
- LFG-11 — PROPOSED GAS PROBE
- LC — EXISTING LEACHATE CLEANOUT
- LCR-1 — EXISTING LEACHATE COLLECTION RISER
- SPT-27 I-2 — SPT BORING
- MW-38 — PROPOSED GROUNDWATER MONITORING WELL



DETAIL DESIGNATION



SECTION DESIGNATION

SECTION DESIGNATION

BID DOCUMENTS

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LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LEGENDS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: G3

PLOTTED: 9/19/2023 01:37 PM PAUL E. UPSTILL

GENERAL NOTES

1. THE BEARINGS SHOWN HEREON ARE BASED ON GRID NORTH AND ARE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983/2011. HORIZONTAL COORDINATES VALUES WHERE ESTABLISHED USING GEODETIC GRADE GPS AND THE FLORIDA'S DEPARTMENT OF TRANSPORTATION, FLORIDA PERMANENT REFERENCE NETWORK CORRECTION SERVICE.

2. ALL ELEVATIONS SURVEYED WITHIN THE LIMITS OF CONSTRUCTION ARE PROVIDED BY WGI, INC. DATED DECEMBER 20, 2022 AND ARE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. ELEVATIONS WERE ESTABLISHED BASED ON THE VERTICAL DATUM MONUMENT WITHIN THE LIMITS OF CONSTRUCTION WHICH IS TO BE PROTECTED. IF IN DANGER OF DAMAGE, THE COUNTY SHALL NOTIFY:

   REGIONAL GEODETIC ADVISOR

   GULF COAST REGIONAL GEODETIC ADVISOR
   DENIS RIORDAN, NOAA
   C/O MDOT
   1109 SOUTH MARION AVENUE
   MS 2022
   LAKE CITY FL 32025-5874
   GOOGLE: (386) 243-0769
   MOBILE: (240) 678-2107
   E-MAIL: DENIS.RIORDAN@NOAA.GOV

3. CONSTRUCTION MONUMENTS FOR VERTICAL AND HORIZONTAL CONTROL HAVE BEEN PROVIDED AT THE PROJECT SITE. THE CONTRACTOR SHALL VERIFY THE ACCURACY OF THESE MONUMENTS TO THEIR OWN SATISFACTION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROPER VERTICAL AND HORIZONTAL ALIGNMENT OF CONSTRUCTED FACILITIES AND FINISHED GRADE.

4. THE CONTRACTOR SHALL PROVIDE A PROFESSIONAL SURVEYOR AND MAPPER LICENSED IN FLORIDA TO ESTABLISH THE CONSTRUCTION SITE LAYOUT, PERFORM TOPOGRAPHIC SURVEYS, AND PERFORM ALL OTHER REQUIRED SURVEYING SERVICES.

5. LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARING THESE PLANS. BEFORE CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE LOCATIONS, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES (WHETHER OR NOT SHOWN ON THE PLANS) AFFECTING THEIR OWN WORK.

6. THE INFORMATION PROVIDED IN THESE PLANS IS SOLELY TO ASSIST THE CONTRACTOR IN ASSESSING THE NATURE AND EXTENT OF THE CONDITIONS THAT MAY BE ENCOUNTERED DURING THE COURSE OF WORK. BEFORE BIDDING, ALL CONTRACTORS ARE DIRECTED TO CONDUCT WHATEVER INVESTIGATIONS THEY MAY DEEM NECESSARY TO ARRIVE AT THEIR OWN CONCLUSIONS REGARDING THE ACTUAL CONDITIONS THAT WILL BE ENCOUNTERED, AND UPON WHICH THEIR BIDS SHALL BE BASED.

7. THE CONTRACTOR SHALL BE AWARE THAT SOME UTILITY CONFLICTS MAY EXIST. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ANY AND ALL EXISTING UTILITIES ON THIS PROJECT WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

8. FIELD CONDITIONS MAY NECESSITATE SLIGHT ALIGNMENT AND GRADE DEVIATION OF THE PROPOSED CONSTRUCTION TO AVOID OBSTACLES, AS ORDERED BY THE ENGINEER. THE CONTRACTOR SHALL CONSTRUCT THE PROPOSED FACILITIES TO THE ORDERED DEVIATION WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

9. THE CONTRACTOR SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES TO PERMIT THE LOCATION OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION. CONTACT UTILITIES NOTIFICATION CENTER AT 811 OR 1-800-432-4770.

10. THE CONTRACTOR SHALL REPLACE ALL EXISTING PAVING, STABILIZED EARTH, FENCES, GRASSING, SIGNS, AND OTHER IMPROVEMENTS WITH THE SAME TYPE OF MATERIAL THAT WAS REMOVED DURING CONSTRUCTION OR AS DIRECTED BY THE ENGINEER WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

11. THE CONTRACTOR SHALL PROVIDE WARNING SIGNALS, SIGNS, LIGHTS, BARRICADES, FLAGMEN, ETC. IN ACCORDANCE WITH OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT), AND OTHER APPLICABLE REGULATORY REQUIREMENTS AND AS OTHERWISE NECESSARY TO PROVIDE FOR SITE SAFETY DURING CONSTRUCTION.

12. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY WHEN CONFLICTS BETWEEN THE DRAWINGS AND ACTUAL CONDITIONS ARE DISCOVERED.

13. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH EXISTING COUNTY DESIGN AND CONSTRUCTION STANDARDS UNLESS THOSE STANDARDS CONFLICT WITH THESE CONTRACT DOCUMENTS IN WHICH CASE THESE CONTRACT DOCUMENTS SHALL GOVERN. SUCH CONFLICTS SHALL IMMEDIATELY BE BROUGHT TO THE ENGINEER'S ATTENTION.

14. ALL PIPING SHALL HAVE A MINIMUM COVER OF 36 INCHES BELOW FINAL GRADE UNLESS OTHERWISE NOTED.

15. WHERE DEFLECTION OF PRESSURE PIPE EITHER HORIZONTALLY OR VERTICALLY IS NECESSARY, PIPE DEFLECTION SHALL NOT EXCEED 75 PERCENT OF THE MANUFACTURER'S RECOMMENDED DEFLECTION ANGLE. THE MINIMUM PIPE RADIUS SHALL BE 25 PERCENT IN EXCESS OF THE MANUFACTURER'S RECOMMENDED MINIMUM RADIUS.

16. THE CONTRACTOR SHALL PREVENT DISTURBANCE TO AND UNDERMINING OF ADJACENT STRUCTURES, SLABS, PIPING, AND OTHER UTILITIES OR FACILITIES DURING CONSTRUCTION.

17. THE CONTRACTOR SHALL VERIFY ALL CLEARANCES BEFORE CONSTRUCTION.

18. ALL PIPING SHALL BE PROPERLY SUPPORTED. ALL PIPING THAT WILL BE PRESSURIZED DURING OPERATION SHALL BE PROPERLY RESTRAINED.

19. FACILITIES PROVIDED UNDER THIS PROJECT SHALL BE CLEANED AT THE CLOSE OF CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

20. THE CONTRACTOR SHALL PROVIDE A PROFESSIONAL LAND SURVEYOR LICENSED IN FLORIDA TO ESTABLISH THE CONSTRUCTION SITE LAYOUT, PERFORM TOPOGRAPHIC SURVEYS, AND PERFORM ALL OTHER REQUIRED SURVEYING SERVICES.

21. THE CONTRACTOR SHALL TAKE WHATEVER MEANS NECESSARY TO PROTECT MONITORING WELLS FROM DAMAGE DURING CONSTRUCTION. THE CONTRACTOR SHALL REPAIR OR REPLACE MONITORING WELLS DAMAGED DURING CONSTRUCTION WITH LIKE MATERIALS AND CONSTRUCTION METHODS AS APPROVED BY THE ENGINEER AND THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY SHOULD DAMAGE OCCUR TO ANY MONITORING WELLS.

22. THE CONTRACTOR SHALL COMPLY WITH ALL TERMS, CONDITIONS, AND REQUIREMENTS OF ALL APPLICABLE PERMITS, INCLUDING BUT NOT LIMITED TO FDEP AND WATER MANAGEMENT DISTRICT PERMITS FOR THE SITE.

23. THE CONTRACTOR SHALL PREVENT DAMAGE TO THE EXISTING GEOMEMBRANE. CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY SHOULD DAMAGE OCCUR AND PERFORM REPAIRS AS DIRECTED BY THE ENGINEER WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

24. THE CONTRACTOR SHALL NOT INTERFERE WITH FACILITY OPERATIONS. THE CONTRACTOR SHALL COORDINATE WITH AND NOTIFY THE OWNER A MINIMUM OF 48 HOURS IN ADVANCE OF ALL PLANNED UTILITY OUTAGES AND ROAD CROSSINGS.

25. BEFORE BEGINNING WORK, THE CONTRACTOR SHALL PROVIDE STORMWATER AND EROSION CONTROL PLANS TO PREVENT PONDING AND CONTROL EROSION AND RUNOFF. NO PONDING OF WATER SHALL BE ALLOWED. THE CONTRACTOR SHALL USE WHATEVER MEANS NECESSARY TO PREVENT EROSION AND SHALL BE RESPONSIBLE FOR ALL WORK, INCLUDING PROVIDING EQUIPMENT, LABOR, FILL, ETC NECESSARY TO REMEDIATE AND/OR RESTORE ALL AREAS IMPACTED BY EROSION.

26. -------, C/L, & ● ARE EXAMPLES OF DRAWING ELEMENTS THAT HAVE BEEN SCREENED/SHADOWED TO INDICATE EXISTING CONDITIONS THAT WERE PREVIOUSLY PERMITTED AND/OR CONSTRUCTED.

27. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING STORMWATER RUNOFF, SOLID WASTE, LANDFILL GAS, AND LEACHATE FROM ENTERING OR IMPACTING THE AREAS OF THE WORK. THE CONTRACTOR SHALL INSTALL AND MAINTAIN MANAGEMENT AND CONTROL DEVICES INCLUDING DIVERSION/COLLECTION BERMS, DITCHES, PUMPING STATIONS, WALLS, LINERS, ETC. TO COMPLY WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

28. THE CONTRACTOR SHALL MAINTAIN A CLEAR PATH FOR ALL SURFACE WATER DRAINAGE STRUCTURES AND DITCHES DURING ALL PHASES OF CONSTRUCTION AND SHALL USE WHATEVER MEANS NECESSARY TO MANAGE STORMWATER SUCH THAT THE IMPACT TO CONSTRUCTION IS MINIMIZED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF DAMAGE DUE TO STORMWATER.

29. THE CONTRACTOR SHALL BE AWARE THAT BURIED WASTE AND/OR OTHER BURIED DEBRIS MAY BE ENCOUNTERED DURING THE COURSE OF CONSTRUCTION. THE CONTRACTOR SHALL EXCAVATE DISCOVERED WASTE AND OTHER UNSUITABLE MATERIALS AND DISPOSE OF THEM IN THE LINED PORTIONS OF THE LANDFILL AS REQUIRED TO CONSTRUCT THE FACILITIES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS WITHOUT INCREASE IN CONTRACT PRICE OR TIME. THE CONTRACTOR SHALL ASSUME THAT UP TO 50 BANK CUBIC YARDS OF WASTE WILL BE ENCOUNTERED IN THE PROJECT AREA (EXCLUDING WASTE EXCAVATED DURING GCCS INSTALLATION/MODIFICATIONS) DURING CONSTRUCTION THAT WILL REQUIRE DISPOSAL IN THE LINED PORTIONS OF THE LANDFILL.

30. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING AND PROTECTING THE GEOMEMBRANE AT ALL TIMES. WIND BLOWN GEOMEMBRANE SHALL BE CONSIDERED DAMAGED AND SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

31. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ENVIRONMENTAL PROTECTION DURING THE TERM OF THE CONTRACT, INCLUDING THE WARRANTY PERIOD, FOR THE PERMANENT FEATURES OF THE PROJECT. THE CONTRACTOR'S OPERATIONS SHALL COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS, INCLUDING BUT NOT LIMITED TO THOSE PERTAINING TO WATER, AIR, SOLID WASTE, HAZARDOUS WASTE MATERIALS, OILY SUBSTANCES, AND NOISE POLLUTION. THE CONTRACTOR SHALL IMPLEMENT EROSION AND SEDIMENTATION CONTROL MEASURES AS NECESSARY TO COMPLY WITH THESE REGULATIONS FOR BOTH TEMPORARY AND PERMANENT CONSTRUCTION.

32. UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS, PIPING AND FITTINGS 4" OR GREATER IN DIAMETER SHALL BE HIGH-DENSITY POLYETHYLENE (HDPE) STANDARD DIMENSION RATIO (SDR) 11; PIPING AND FITTINGS LESS THAN 4" IN DIAMETER SHALL BE 200 PSI SDR9.

33. ALL HDPE PIPING AND FITTINGS SHALL BE IRON PIPE SIZE (IPS) UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS.

34. ALL HARDWARE (E.G., NUTS, BOLTS, WASHERS, ETC) SHALL BE STAINLESS STEEL, UNLESS OTHERWISE NOTED IN PLANS OR SPECIFICATIONS.

35. SOLID WASTE GENERATED BY THE CONTRACTOR DURING CONSTRUCTION MUST BE LOADED AND HAULED TO THE SCALE HOUSE WHERE IT WILL BE WEIGHED BEFORE HAULING TO THE LANDFILL WORKING FACE FOR DISPOSAL. CONTRACTOR SHALL PAY THE DISPOSAL FEE FOR ALL SOLID WASTE GENERATED.

36. CONTRACTOR MAY SUBSTITUTE OPTION BASE GROUP 11 MATERIALS LIMITED TO CEMENTED COQUINA LBR 100, SHELL ROCK LBR 100, AND BANK RUN SHELL LBR 100, AS WELL AS CRUSHED CONCRETE BASE GROUP EQUIVALENT, AT NO EXTRA COST TO THE COUNTY.

HEALTH AND SAFETY NOTES

1. THIS PROJECT INVOLVES WORK IN AND AROUND AN ACTIVE CLASS I LANDFILL. THE CONTRACTOR SHALL PROTECT ALL PERSONNEL FROM ALL HAZARDS ASSOCIATED WITH WORKING AT A LANDFILL, INCLUDING CONTACT WITH LEACHATE AND OTHER CONTAMINATED MEDIA, LANDFILL GASES, MICROBIOLOGICAL AIRBORNE CONTAMINANTS, DANGEROUS CHEMICALS, SHARP OBJECTS, AND OTHER HAZARDS (CHEMICAL, PHYSICAL, AND RADIOLOGICAL, ETC.). AT A MINIMUM, THE CONTRACTOR SHALL COMPLY WITH THE BEST MANAGEMENT PRACTICES (MARCH 1992) AVAILABLE FROM THE SOLID WASTE ASSOCIATION OF NORTH AMERICA (SWANA). THE CONTRACTOR SHALL TAKE PRECAUTIONS NECESSARY TO ENSURE WORKER HEALTH AND SAFETY IN COMPLIANCE WITH OSHA CHAPTERS 1910 AND 1926 (SPECIFICALLY WITH 1910.120), AND OTHER APPLICABLE REGULATIONS. A HEALTH AND SAFETY PLAN SHALL BE PREPARED AND APPROVED BY THE CONTRACTOR'S DESIGNATED HEALTH AND SAFETY OFFICER BEFORE ANY WORK ON-SITE.

2. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT PERSONNEL FROM ASPHYXIATION, POISONING, EXPLOSION, AND/OR OTHER HAZARDS DUE TO THE PRESENCE OF LANDFILL GASES, LEACHATE, WASTE, ETC.

3. THE CONTRACTOR IS RESPONSIBLE FOR BECOMING FAMILIAR WITH THE OSHA EXCAVATION SAFETY STANDARDS AND ABIDING BY THEM AS COVERED UNDER THE FLORIDA TRENCH SAFETY ACT (LAWS OF FLORIDA 90-96) EFFECTIVE OCTOBER 1, 1990.

4. A SITE-SPECIFIC HEALTH AND SAFETY PLAN SHALL BE PREPARED BY THE CONTRACTOR BEFORE ANY WORK ON-SITE.

5. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A WRITTEN STATEMENT BEFORE BEGINNING WORK THAT HE/SHE WILL COMPLY WITH APPLICABLE TRENCH SAFETY STANDARDS.

DEWATERING NOTES

1. THE CONTRACTOR SHALL OPERATE THE DEWATERING SYSTEM IN ACCORDANCE WITH THE PERMIT, PLANS, AND SPECIFICATION UNTIL ALL PROTECTIVE COVER SOIL IS INSTALLED AND IS VERIFIED BY RECORD SURVEY.

2. DEWATERING SHALL BE PERFORMED BY THE CONTRACTOR TO INSTALL AND CONSTRUCT THE WORK IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. DEWATERING DISCHARGE SHALL BE IN ACCORDANCE WITH APPLICABLE REGULATIONS AND REQUIREMENTS OF AGENCIES WITH JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING A DEWATERING PLAN AND OBTAINING ALL NECESSARY PERMITS WITHOUT INCREASE IN CONTRACT PRICE OR TIME.

3. CONTRACTOR SHALL DISCHARGE DEWATERING WATER IN A MANNER THAT PREVENTS EROSION AND THE TRANSPORTATION OF SUSPENDED SOLIDS.

4. CONTRACTOR SHALL MONITOR GROUNDWATER LEVELS WITHIN THE VICINITY OF BOTTOM LINER DEWATERING ACTIVITIES FOR A MINIMUM OF 1 MONTH BEFORE DEWATERING COMMENCES AND SHALL CONTINUE TO MONITOR THROUGHOUT THE DURATION OF DEWATERING.

SURVEYOR'S NOTES

1. THE LAST DATE OF FIELD SURVEY WAS DECEMBER 20, 2022.
2. THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE "STANDARDS OF PRACTICE", AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN RULE 5J-17.050 THROUGH 5J-17.053, OF THE FLORIDA ADMINISTRATIVE CODE.
3. ADDITIONS OR DELETIONS TO SURVEY MAPS OR REPORTS BY OTHER THAN THE SIGNING PARTY OR PARTIES IS PROHIBITED WITHOUT WRITTEN CONSENT OF THE SIGNING PARTY OR PARTIES.
4. THE BEARINGS SHOWN HEREON ARE BASED ON GRID NORTH AND ARE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983/2011. HORIZONTAL COORDINATES VALUES WHERE ESTABLISHED USING GEODETIC GRADE GPS AND THE FLORIDA'S DEPARTMENT OF TRANSPORTATION, FLORIDA PERMANENT REFERENCE NETWORK CORRECTION SERVICE.
5. ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929. ELEVATIONS WHERE ESTABLISHED USING GEODETIC GRADE GPS AND THE FLORIDA'S DEPARTMENT OF TRANSPORTATION, FLORIDA PERMANENT REFERENCE NETWORK CORRECTION SERVICE.
6. ALL DISTANCES SHOWN HEREON ARE IN U.S. SURVEY FEET.
7. UNDERGROUND IMPROVEMENTS, IF ANY, WERE NOT LOCATED EXCEPT AS SHOWN.
8. INTERIOR IMPROVEMENTS, IF ANY, WERE NOT LOCATED EXCEPT AS SHOWN.
9. SYMBOLS SHOWN HEREON ARE NOT TO SCALE.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

GENERAL NOTES

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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COORDINATE TABLE

POINT	NORTHING	EASTING	DESCRIPTION
1	1154028.66	553539.48	LINER
2	1154076.80	553587.61	LINER
3	1154052.66	553611.75	LINER
4	1154052.66	554763.42	LINER
5	1154077.72	554788.48	LINER
6	1153467.31	554788.48	LINER
7	1153467.31	553539.48	LINER
8	1153891.32	554771.03	LINER
9	1153628.65	554771.03	LINER
10	1153759.99	554788.48	LINER
11	1153759.99	553539.48	LINER
101	1153901.32	553574.40	SUMP
102	1153901.32	553614.40	SUMP
103	1153895.32	553614.40	SUMP
104	1153891.32	553614.40	SUMP
105	1153887.32	553614.40	SUMP
106	1153881.32	553614.40	SUMP
107	1153881.32	553574.40	SUMP
108	1153891.32	553574.40	SUMP
109	1153932.78	553550.81	SUMP
110	1153932.78	553637.99	SUMP
111	1153925.90	553637.68	SUMP
112	1153856.75	553637.68	SUMP
113	1153849.86	553637.99	SUMP
114	1153849.86	553550.81	SUMP
115	1153861.32	553559.40	SUMP
116	1153871.32	553559.40	SUMP
117	1153871.32	553605.49	SUMP
118	1153861.32	553605.49	SUMP
119	1153881.32	553533.18	SUMP

COORDINATE TABLE

POINT	NORTHING	EASTING	DESCRIPTION
120	1153883.32	553533.18	SUMP
121	1153883.32	553574.40	SUMP
122	1153638.63	553574.40	SUMP
123	1153638.63	553614.40	SUMP
124	1153628.63	553574.40	SUMP
125	1153628.63	553614.40	SUMP
126	1153618.63	553574.40	SUMP
127	1153618.63	553614.40	SUMP
128	1153670.09	553550.81	SUMP
129	1153670.09	553637.99	SUMP
130	1153663.21	553637.68	SUMP
131	1153624.63	553614.40	SUMP
132	1153636.63	553617.44	SUMP
133	1153624.63	553617.39	SUMP
134	1153620.63	553533.18	SUMP
135	1153618.63	553533.18	SUMP
136	1153608.63	553559.40	SUMP
137	1153608.63	553605.49	SUMP
138	1153598.63	553559.40	SUMP
139	1153598.63	553605.49	SUMP
140	1153587.17	553550.81	SUMP
141	1153587.17	553637.99	SUMP
142	1153594.06	553637.68	SUMP
301	1153921.84	553448.28	EOP
302	1153907.84	553462.28	EOP
303	1153846.84	553448.28	EOP
304	1153860.84	553462.28	EOP
305	1153860.84	553510.48	EOP
306	1153907.84	553510.48	PS
307	1153907.84	553527.48	PS

COORDINATE TABLE

POINT	NORTHING	EASTING	DESCRIPTION
308	1153874.84	553527.48	PS
309	1153874.84	553510.48	PS
310	1153659.15	553448.28	EOP
311	1153645.15	553462.28	EOP
312	1153584.15	553448.28	EOP
313	1153598.15	553462.28	EOP
314	1153598.15	553510.48	EOP
315	1153645.15	553510.48	PS
316	1153645.15	553527.48	PS
317	1153612.15	553510.48	PS
318	1153612.15	553527.48	PS
401	1153934.78	553488.50	MES
402	1153834.43	553488.50	MES
403	1153672.09	553488.50	MES
404	1153571.74	553488.50	MES
405	1153411.28	554856.70	MES
406	1153317.11	554856.70	MES
407	1154019.04	554856.82	MES
408	1153956.32	554856.82	MES
409	1155828.11	554672.82	LFM
410	1155828.11	554514.92	LFM
411	1155828.11	554436.05	LFM
412	1155706.91	554436.05	LFM
413	1155325.44	553747.38	LFM
414	1155320.81	553484.50	LFM
415	1155265.67	553429.35	LFM
416	1154087.76	553413.06	LFM
417	1153877.63	553421.38	LFM
418	1153614.94	553421.43	LFM
419	1153411.28	553488.48	MES

COORDINATE TABLE

POINT	NORTHING	EASTING	DESCRIPTION
420	1153317.11	553488.48	MES
421	1152810.56	554860.81	MES
422	1152810.56	554960.33	MES
423	1155562.95	554431.62	LFM
424	1155441.15	554317.73	LFM
425	1155344.95	554315.54	LFM
426	1155313.20	554283.78	LFM
501	1154192.46	553426.28	EOP
502	1154192.46	553448.28	EOP
503	1153421.11	553448.28	EOP
504	1153376.11	553493.28	EOP
505	1153354.11	553493.28	EOP
506	1153309.11	553448.28	EOP
507	1152808.45	553426.28	EOP
508	1152806.99	553448.28	EOP
509	1153376.11	554852.76	EOP
510	1153354.11	554852.76	EOP
511	1153421.11	554897.76	EOP
512	1153309.11	554897.76	EOP
513	1153942.66	554897.76	EOP
514	1153862.67	554919.76	EOP
515	1153885.97	554968.66	EOP
516	1153842.05	555022.76	EOP
517	1153856.03	555034.11	EOP
518	1153918.83	554956.73	EOP
519	1153996.48	554919.76	EOP
520	1153977.66	554862.76	EOP
521	1153977.66	554788.48	EOP
522	1154002.66	554788.48	EOP
523	1154002.66	554862.76	EOP

COORDINATE TABLE

POINT	NORTHING	EASTING	DESCRIPTION
524	1154037.66	554897.76	EOP
525	1154192.46	554897.76	EOP
526	1154192.46	554919.76	EOP
527	1152791.17	554897.76	EOP
528	1152789.71	554919.76	EOP

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

COORDINATE TABLES

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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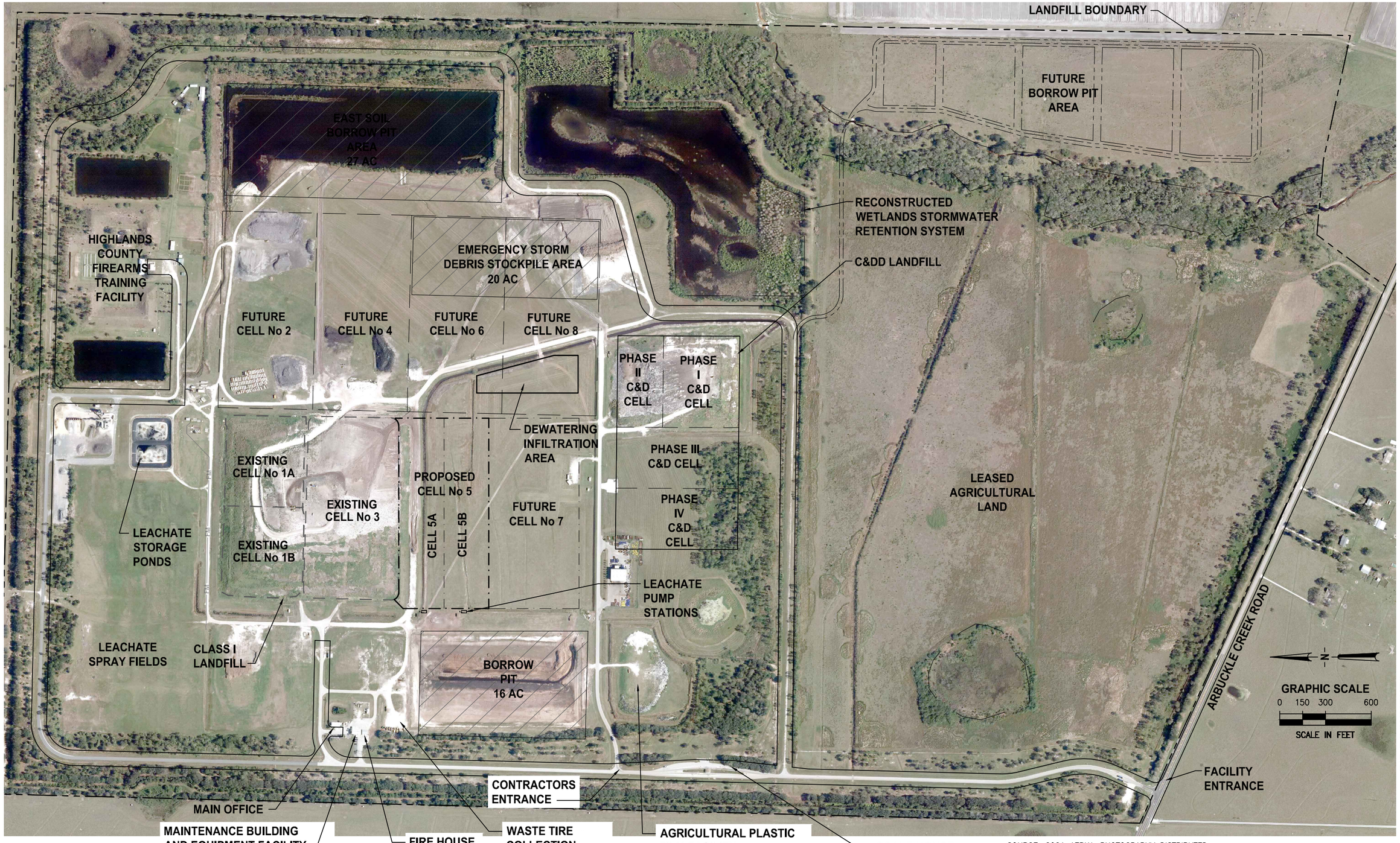

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SITE PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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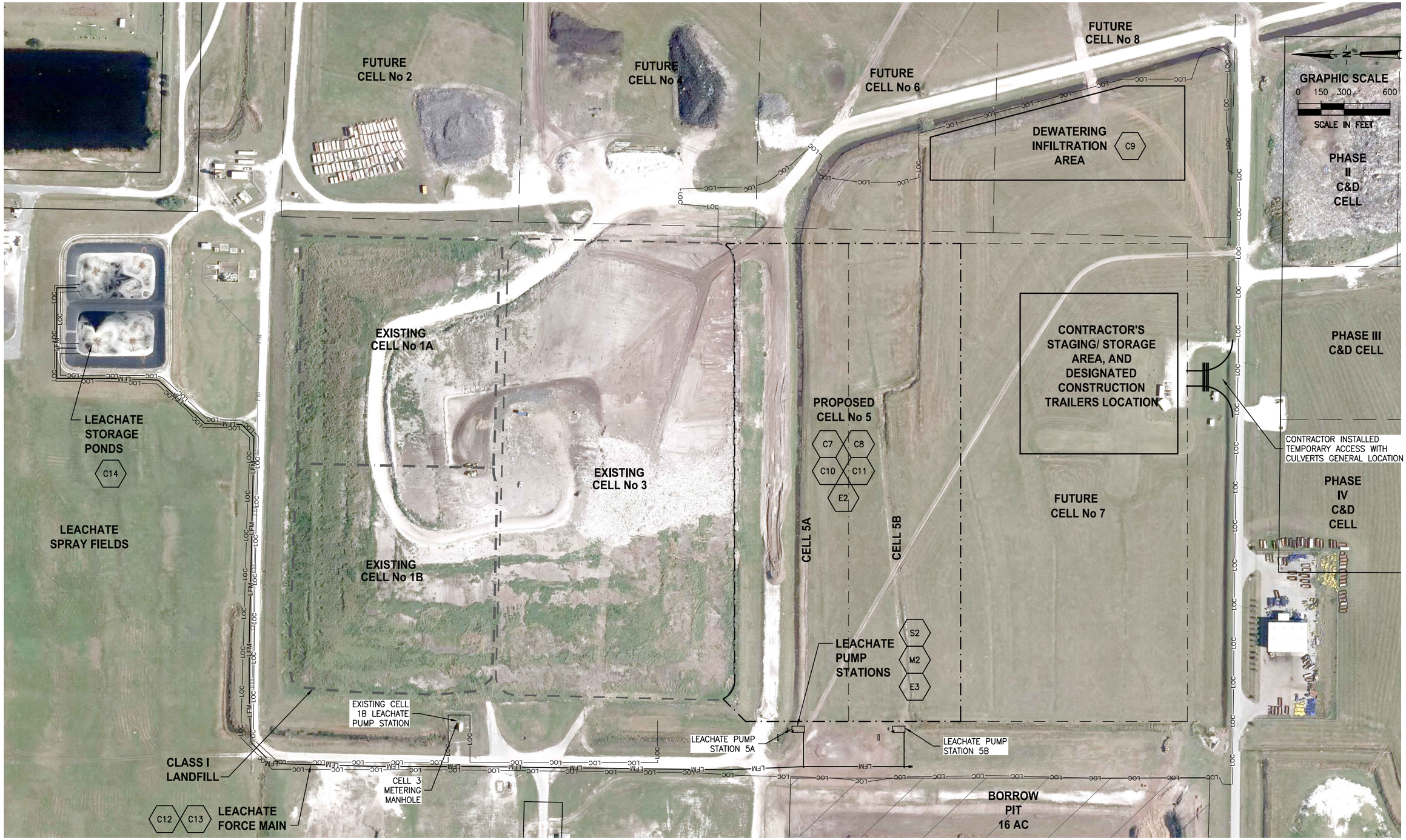

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

PROJECT SITE PLAN AND KEY MAP

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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EAST SOIL BORROW PIT AREA 27 AC

EMERGENCY STORM DEBRIS STOCKPILE AREA 20 AC

FUTURE BORROW PIT AREA

C&DD LANDFILL

LANDFILL BOUNDARY

FUTURE CELL No 2

FUTURE CELL No 4

FUTURE CELL No 6

FUTURE CELL No 8

PHASE II C&D CELL

PHASE I C&D CELL

PHASE III C&D CELL

PHASE IV C&D CELL

CELL No 1A

CELL No 1B

CELL No 3

PROPOSED CELL No 5

FUTURE CELL No 7

CLASS I LANDFILL

CELL 5A

CELL 5B

BORROW PIT 16 AC

GAS PROBE SEE DETAIL 1 C29 (TYP OF 2)

ARBUCKLE CREEK ROAD

FACILITY ENTRANCE

MW-1 MW-2 MW-3 MW-4A MW-5 MW-6 MW-7A MW-8 MW-9 MW-10 MW-11 MW-12 MW-13 MW-14 MW-15 MW-16 MW-17 MW-18 MW-19 MW-20 MW-21 MW-22 MW-23 MW-25 MW-26 MW-27 MW-28 MW-30G MW-31G MW-32G MW-33G MW-34G MW-35G MW-36G MW-37G MW-38 MW-39 MW-40 MW-41 MW-46S

LFG-5 LFG-6 LFG-7 LFG-8 LFG-9 LFG-10 LFG-11 LFG-12

SPT-1 SPT-2 SPT-3 SPT-4 SPT-5 SPT-6 SPT-7 SPT-8 SPT-9 SPT-10 SPT-11 SPT-12 SPT-13 SPT-14 SPT-15 SPT-16 SPT-17 SPT-18 SPT-19

TH-2

GRAPHIC SCALE
0 150 300 600
SCALE IN FEET

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

WELL AND BORING PLAN

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NO.	DATE	DESCRIPTION REVISIONS	BY
1	5/16/2023	CONVERT ALL ELEV. TO NGVD29 PER CLIENT REQ.	SD

CAD
JOB NO. 9245.00
DRAWN BY FS
CHECK BY CG
DATE 01-17-2023

SURVEYOR OF RECORD
CARLOS GUTIERREZ
PSM# 6720

WGI
3111 W. Dr. Martin Luther King Jr. Blvd.
Suite 175, Tampa, FL 33607
www.wginc.com
Phone No. 866.910.2220
Cert No. 6091 - LB No. 7055

TOPOGRAPHIC SURVEY
A PORTION OF THE COUNTY LANDFILL SITE.
PARCEL C-22-34-30-A00-0010-0000. LOCATED
HIGHLANDS COUNTY, FLORIDA.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

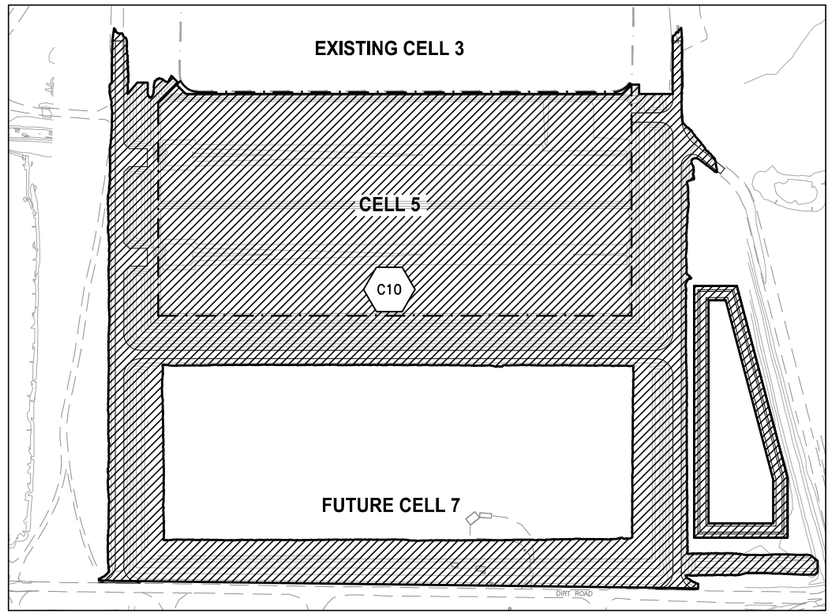
DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

TOPOGRAPHIC SURVEY

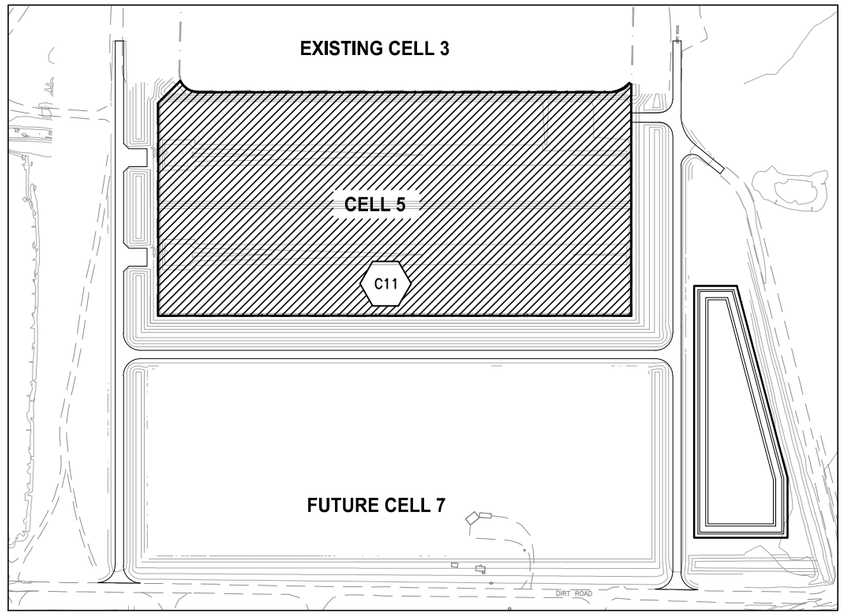
PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C4



NOTES:
1. CLEARING, GRUBBING AND STRIPPING FOR SOME IMPROVEMENTS SUCH AS STORMWATER IMPROVEMENTS, FORCEMAIN PIPING AND GCCS PIPING IS NOT SHOWN. THE CONTRACTOR SHALL INCLUDE THIS EFFORT IN THE APPLICABLE BID ITEM.

PROPOSED CLEARING, GRUBBING, AND STRIPPING LIMITS LOCATION KEY MAP

NTS



PROPOSED DRAINAGE SOIL LOCATION KEY MAP

NTS

LEGEND

AREA INCLUDED IN WORK ITEM

GENERAL NOTES:
1. DO NOT SCALE OFF DRAWING. THIS DRAWING IS INTENDED TO GENERALLY REPRESENT THE NATURE OF THE WORK. REFER TO THE REFERENCED DRAWINGS AND ASSOCIATED DETAILS FOR SPECIFICS OF THE WORK AND FOR USE IN QUANTITY DETERMINATION.

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DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

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730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
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HIGHLANDS COUNTY, FLORIDA

PROPOSED EARTHWORK LOCATION KEY MAP

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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INDEX NO:
DWG NO: C5

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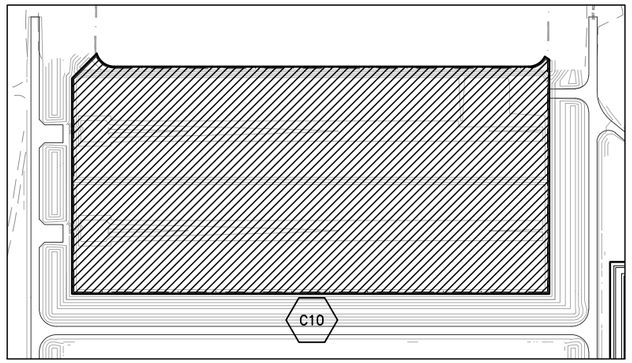
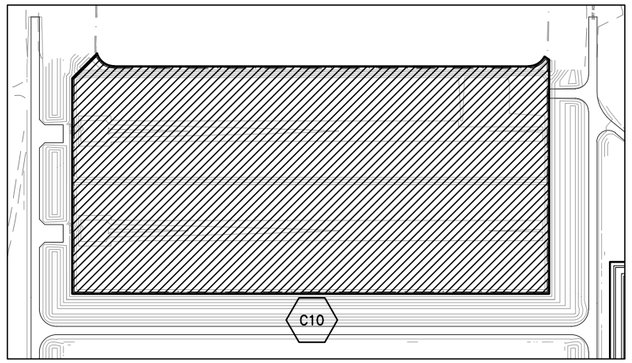


NOTES:
1. LIMITS OF GCL SHOWN ONLY EXTEND TO THE EDGE OF LINER AS INDICATED ON THE PLAN SHEETS. ADDITIONAL GCL MATERIAL REQUIRED IN SOME LOCATIONS WHICH THE CONTRACTOR SHALL QUANTIFY AND ACCOUNT FOR IN THEIR MATERIAL QUANTITY ESTIMATES AS FOLLOWS:
   a. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TIE IN WITH EXISTING LINER SYSTEMS.
   b. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TERMINATION POINT WITHIN THE ANCHOR TRENCH.

PROPOSED GCL LOCATION KEY MAP
NTS



NOTES:
1. LIMITS OF SECONDARY GEOMEMBRANE SHOWN ONLY EXTEND TO THE EDGE OF LINER AS INDICATED ON THE PLAN SHEETS. ADDITIONAL SECONDARY GEOMEMBRANE MATERIAL REQUIRED IN SOME LOCATIONS WHICH THE CONTRACTOR SHALL QUANTIFY AND ACCOUNT FOR IN THEIR MATERIAL QUANTITY ESTIMATES AS FOLLOWS:
   a. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TIE IN WITH EXISTING LINER SYSTEMS.
   b. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TERMINATION POINT WITHIN THE ANCHOR TRENCH.

PROPOSED SECONDARY GEOMEMBRANE LOCATION KEY MAP
NTS

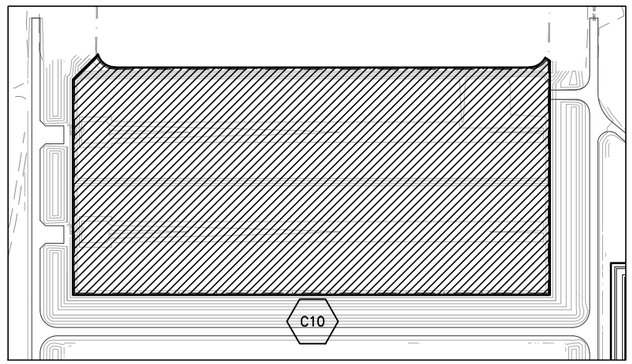
NOTES:
1. LIMITS OF SECONDARY GEOCOMPOSITE SHOWN ONLY EXTEND TO THE EDGE OF LINER AS INDICATED ON THE PLAN SHEETS. ADDITIONAL SECONDARY GEOCOMPOSITE MATERIAL REQUIRED IN SOME LOCATIONS WHICH THE CONTRACTOR SHALL QUANTIFY AND ACCOUNT FOR IN THEIR MATERIAL QUANTITY ESTIMATES AS FOLLOWS:
   a. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TIE IN WITH EXISTING LINER SYSTEMS.
   b. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TERMINATION POINT WITHIN THE ANCHOR TRENCH.
2. ADDITIONAL SECONDARY GEOCOMPOSITE LAYERS REQUIRED IN SOME LOCATIONS AS FOLLOWS:
   a. TWO LAYERS OF SECONDARY GEOCOMPOSITE ARE REQUIRED IN THE LEACHATE COLLECTION TRENCH LEAK DETECTION LAYER.
   b. TWO LAYERS OF SECONDARY GEOCOMPOSITE ARE REQUIRED IN THE LEAK DETECTION SUMP.
   c. THREE LAYERS OF SECONDARY GEOCOMPOSITE ARE REQUIRED AT THE NORTHERN TIE IN TO THE PHASE I LINER SYSTEM. THE ADDITIONAL LAYERS ARE 8 FEET IN WIDTH (NORTH TO SOUTH) AND EXTEND FOR THE ENTIRE LENGTH (EAST TO WEST) OF THE NORTHERN LINER SYSTEM TIE IN.

PROPOSED SECONDARY GEOCOMPOSITE LOCATION KEY MAP
NTS

N

LEGEND

AREA INCLUDED IN WORK ITEM



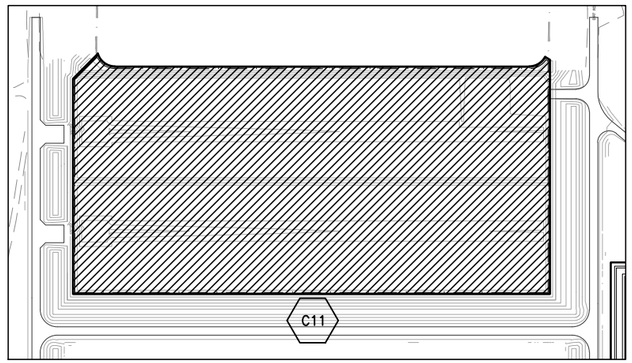
NOTES:
1. LIMITS OF PRIMARY GEOMEMBRANE SHOWN ONLY EXTEND TO THE EDGE OF LINER AS INDICATED ON THE PLAN SHEETS. ADDITIONAL PRIMARY GEOMEMBRANE MATERIAL REQUIRED IN SOME LOCATIONS WHICH THE CONTRACTOR SHALL QUANTIFY AND ACCOUNT FOR IN THEIR MATERIAL QUANTITY ESTIMATES AS FOLLOWS:
   a. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TIE IN WITH EXISTING LINER SYSTEMS.
   b. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TERMINATION POINT WITHIN THE ANCHOR TRENCH.

PROPOSED PRIMARY GEOMEMBRANE LOCATION KEY MAP
NTS

NOTES:
1. LIMITS OF PRIMARY GEOCOMPOSITE SHOWN ONLY EXTEND TO THE EDGE OF LINER AS INDICATED ON THE PLAN SHEETS. ADDITIONAL PRIMARY GEOCOMPOSITE MATERIAL REQUIRED IN SOME LOCATIONS WHICH THE CONTRACTOR SHALL QUANTIFY AND ACCOUNT FOR IN THEIR MATERIAL QUANTITY ESTIMATES AS FOLLOWS:
   a. EXTENDING FROM THE EDGE OF LINER AS SHOWN ON THE PLAN SHEETS TO THE TIE IN WITH EXISTING LINER SYSTEMS.

PROPOSED PRIMARY GEOCOMPOSITE LOCATION KEY MAP
NTS

PROPOSED RAIN TARP KEY MAP
NTS



PROPOSED SAND BAG LOCATION KEY MAP
NTS

GENERAL NOTES:
1. DO NOT SCALE OFF DRAWING. THIS DRAWING IS INTENDED TO GENERALLY REPRESENT THE NATURE OF THE WORK. REFER TO THE REFERENCED DRAWINGS AND ASSOCIATED DETAILS FOR SPECIFICS OF THE WORK AND FOR USE IN QUANTITY DETERMINATION.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

PROPOSED GEOSYNTHETICS LOCATION KEY MAP

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C6

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DEMOLISH METERING MANHOLE (SEE C13)

EXISTING CELL 3

EXISTING EOL

ABANDON LFG PROBE PER WATER MANAGEMENT DISTRICT REQUIREMENTS (SEE TABLE THIS DWG)

DEMOLISH AND DISPOSE OF CULVERT PIPE AND MITERED END SECTIONS

DIRT ROAD

MW-29

MW-30

MW-31

ABANDON WELL (SEE NOTE 6)

ABANDON WELL (SEE NOTE 6)

DEMOLISH AND DISPOSE OF FENCE

ABANDON WELL (SEE NOTE 6)

DEMOLISH AND DISPOSE OF CULVERT PIPE AND MITERED END SECTIONS

LFG-8

ABANDON LFG PROBE PER WATER MANAGEMENT DISTRICT REQUIREMENTS (SEE TABLE THIS DWG)

DEMOLISH AND DISPOSE OF CONCRETE RETAINING WALL

LFG-7

DIRT ROAD

PROTECT WELL LFG-7

PROTECT WELL MW-33

DEMOLISH AND DISPOSE OF CULVERT PIPE AND MITERED END SECTIONS

MW-33

CELL 5

CELL 5 NEW CONSTRUCTION TIE-TO-GRADE LINE AND LIMITS OF DEMOLITION

-N-

GRAPHIC SCALE

0 30 60 120

SCALE IN FEET

WELL ABANDONMENT TABLE

WELL ID	LOCATION		LINER GRADE EL	LENGTH CUT BELOW LINER	NEW TOP OF CASING ELEVATION FEET NGVD
	NORTHING	EASTING			
LFG-8	1154036.12	554555.72	67.4	5	64.4
LFG-9	1154060.68	553829.57	0.0	5	-3.0
MW-29	1153939.11	553576.33	24.1	5	21.1
MW-30	1153935.90	554022.30	22.8	5	19.8
MW-31	1153929.19	554401.03	30.0	5	27.0

LEGEND

AREA OF DEMOLITION

NOTES

1. OTHER PREVIOUSLY ABANDONED IMPROVEMENTS SUCH AS PIPES, CONCRETE, AND CONDUIT MAY BE ENCOUNTERED THAT ARE NOT SPECIFICALLY IDENTIFIED FOR DEMOLITION. ANY ITEMS FOUND BY THE CONTRACTOR SHALL BE IDENTIFIED BY THE OWNER AND DEMOLISHED WITHOUT INCREASE TO THE CONTRACT PRICE OR TIME.
2. REMOVE BOLLARDS AND CONCRETE PADS ASSOCIATED WITH GROUNDWATER WELLS AND GAS PROBES DESIGNATED FOR DEMOLITION.
3. STOCKPILE DEMOLISHED CLEAN FILL, AGGREGATE, RIPRAP, PIPE, ASPHALT, AND CONCRETE ON SITE AS DIRECTED BY OWNER.
4. CLEAR, GRUB, AND STRIP AREAS TO RECEIVE EARTHWORK. DISPOSE ON-SITE AS DIRECTED BY OWNER.
5. CONTRACTOR SHALL VERIFY THAT ALL ELECTRICAL SYSTEMS, CONDUCTORS, AND EQUIPMENT ARE DE-ENERGIZED AND RENDERED SAFE PRIOR TO BEGINNING WORK. COORDINATE OUTAGES WITH OWNER.
6. ABANDON ALL GROUNDWATER MONITORING WELL AND GAS PROBES SCHEDULED FOR DEMOLITION IN ACCORDANCE WITH REGULATORY REQUIREMENTS AND DEMOLISH TO A MINIMUM DEPTH OF 5 FEET BELOW FINAL PROPOSED GRADE.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

DEMOLITION PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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INDEX NO:
DWG NO: C7

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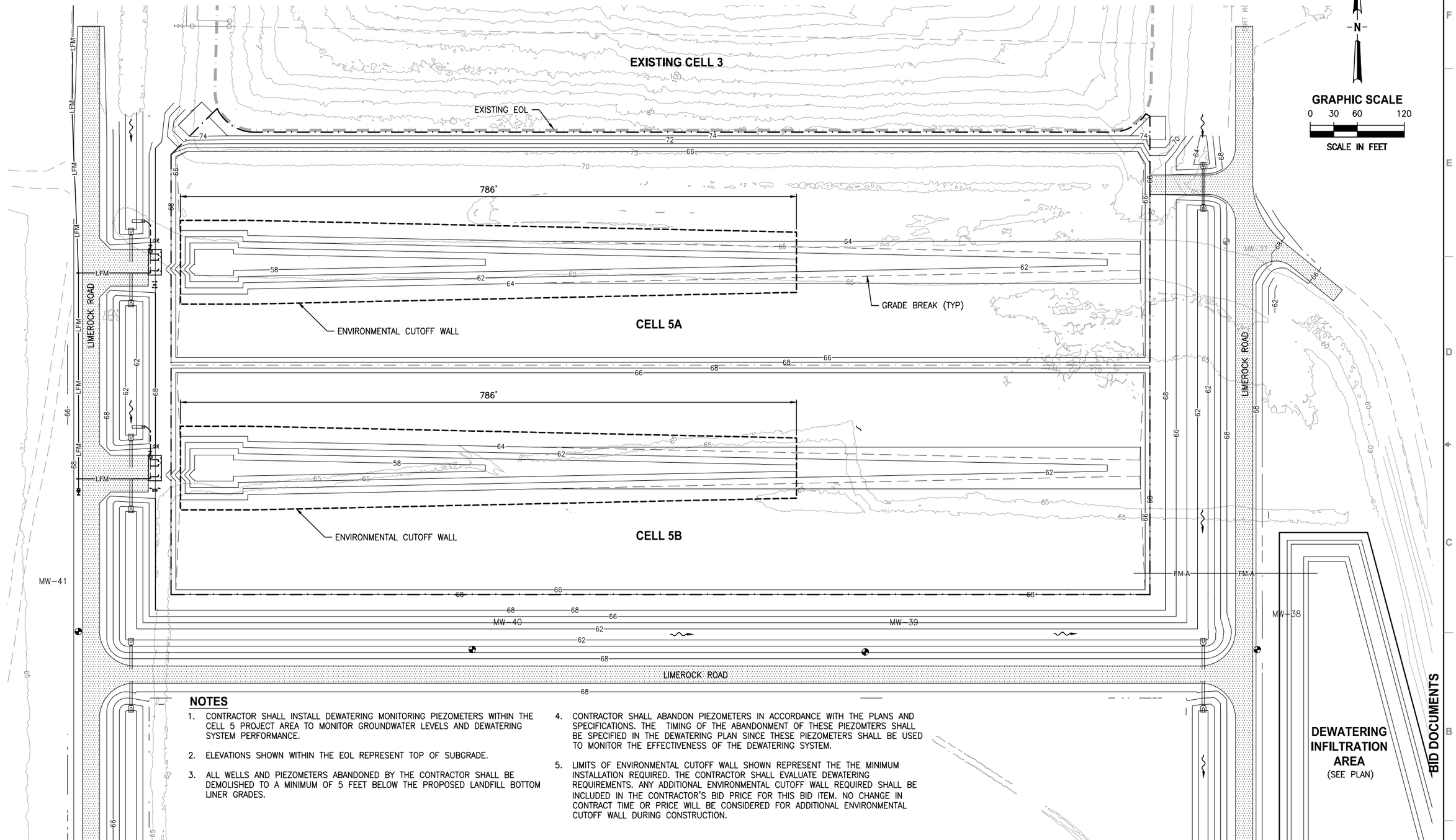

NOTES

1. CONTRACTOR SHALL INSTALL DEWATERING MONITORING PIEZOMETERS WITHIN THE CELL 5 PROJECT AREA TO MONITOR GROUNDWATER LEVELS AND DEWATERING SYSTEM PERFORMANCE.
2. ELEVATIONS SHOWN WITHIN THE EOL REPRESENT TOP OF SUBGRADE.
3. ALL WELLS AND PIEZOMETERS ABANDONED BY THE CONTRACTOR SHALL BE DEMOLISHED TO A MINIMUM OF 5 FEET BELOW THE PROPOSED LANDFILL BOTTOM LINER GRADES.
4. CONTRACTOR SHALL ABANDON PIEZOMETERS IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. THE TIMING OF THE ABANDONMENT OF THESE PIEZOMTERS SHALL BE SPECIFIED IN THE DEWATERING PLAN SINCE THESE PIEZOMETERS SHALL BE USED TO MONITOR THE EFFECTIVENESS OF THE DEWATERING SYSTEM.
5. LIMITS OF ENVIRONMENTAL CUTOFF WALL SHOWN REPRESENT THE THE MINIMUM INSTALLATION REQUIRED. THE CONTRACTOR SHALL EVALUATE DEWATERING REQUIREMENTS. ANY ADDITIONAL ENVIRONMENTAL CUTOFF WALL REQUIRED SHALL BE INCLUDED IN THE CONTRACTOR'S BID PRICE FOR THIS BID ITEM. NO CHANGE IN CONTRACT TIME OR PRICE WILL BE CONSIDERED FOR ADDITIONAL ENVIRONMENTAL CUTOFF WALL DURING CONSTRUCTION.

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

DEWATERING MONITORING PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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INDEX NO:
DWG NO: C8

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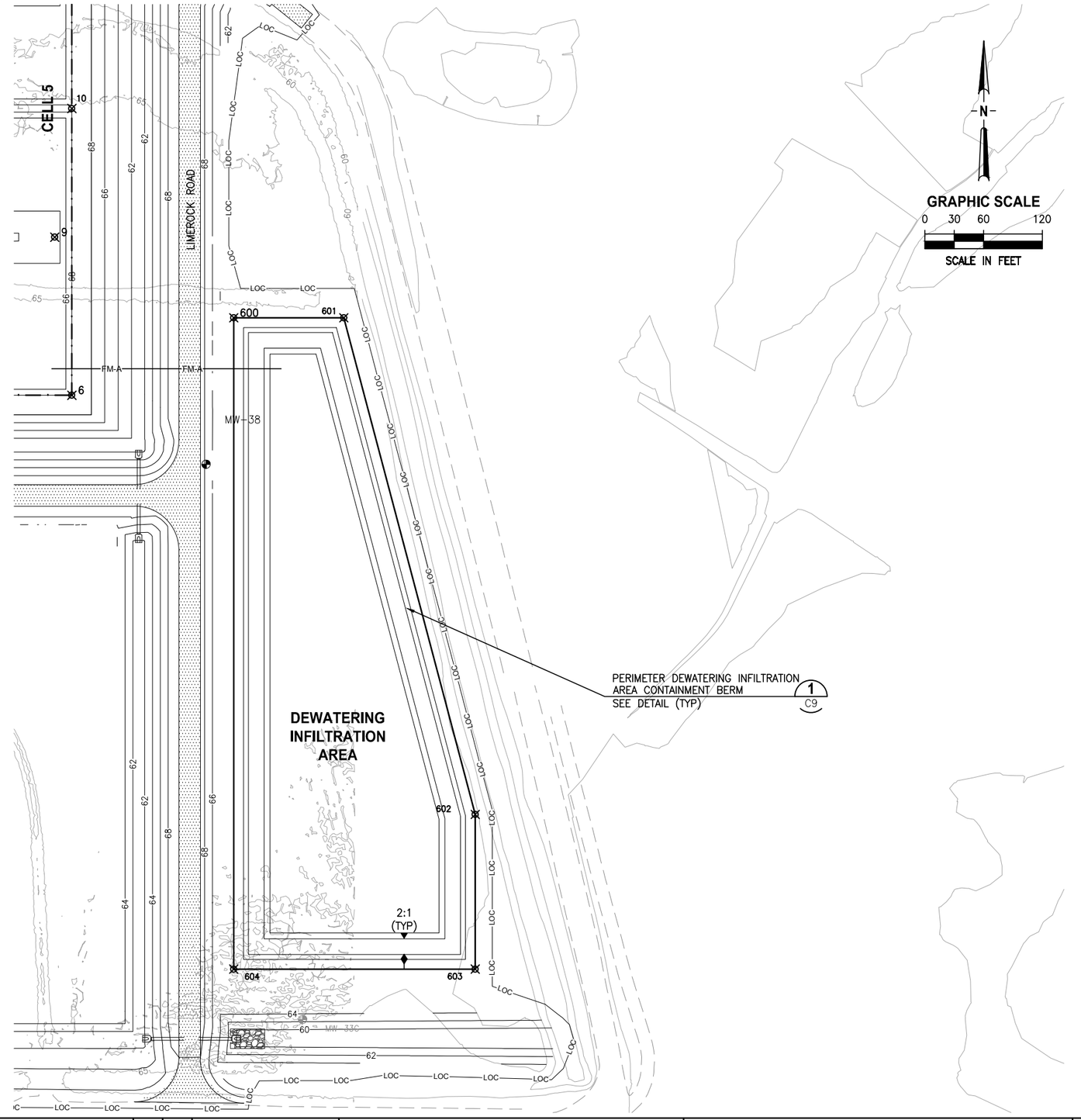

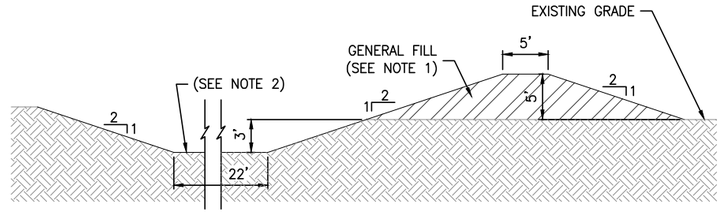

NOTES:
1. CONSTRUCT PERIMETER DEWATERING RECHARGE AREA BERM FROM MATERIAL EXCAVATED FROM THE INTERIOR OF THE DEWATERING RECHARGE AREA.
2. ONLY EXCAVATE FROM ABOVE WATER TABLE.

PERIMETER DEWATERING INFILTRATION AREA CONTAINMENT BERM DETAIL 1 C9

NTS

NOTES

1. CONTRACTOR SHALL COORDINATE WITH ENGINEERING AND MINIMUM OF 72 HOURS IN ADVANCE OF PLANNED ROAD CROSSING CONSTRUCTION.
2. CONTRACTOR SHALL CONSTRUCT ROAD CROSSING OUTSIDE LANDFILL OPERATING HOURS TO PREVENTS IMPACTS TO SITE AND EXISTING LANDFILL ACCESS.
3. UPON COMPLETION OF DEWATERING OPERATIONS, CONTRACTOR SHALL RESTORE DEWATERING INFILTRATION AREA TO ORIGINAL CONDITIONS, REMOVE ALL DEWATERING PIPING AND RESTORE ROAD AT ROAD CROSSING.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

DEWATERING INFILTRATION AREA PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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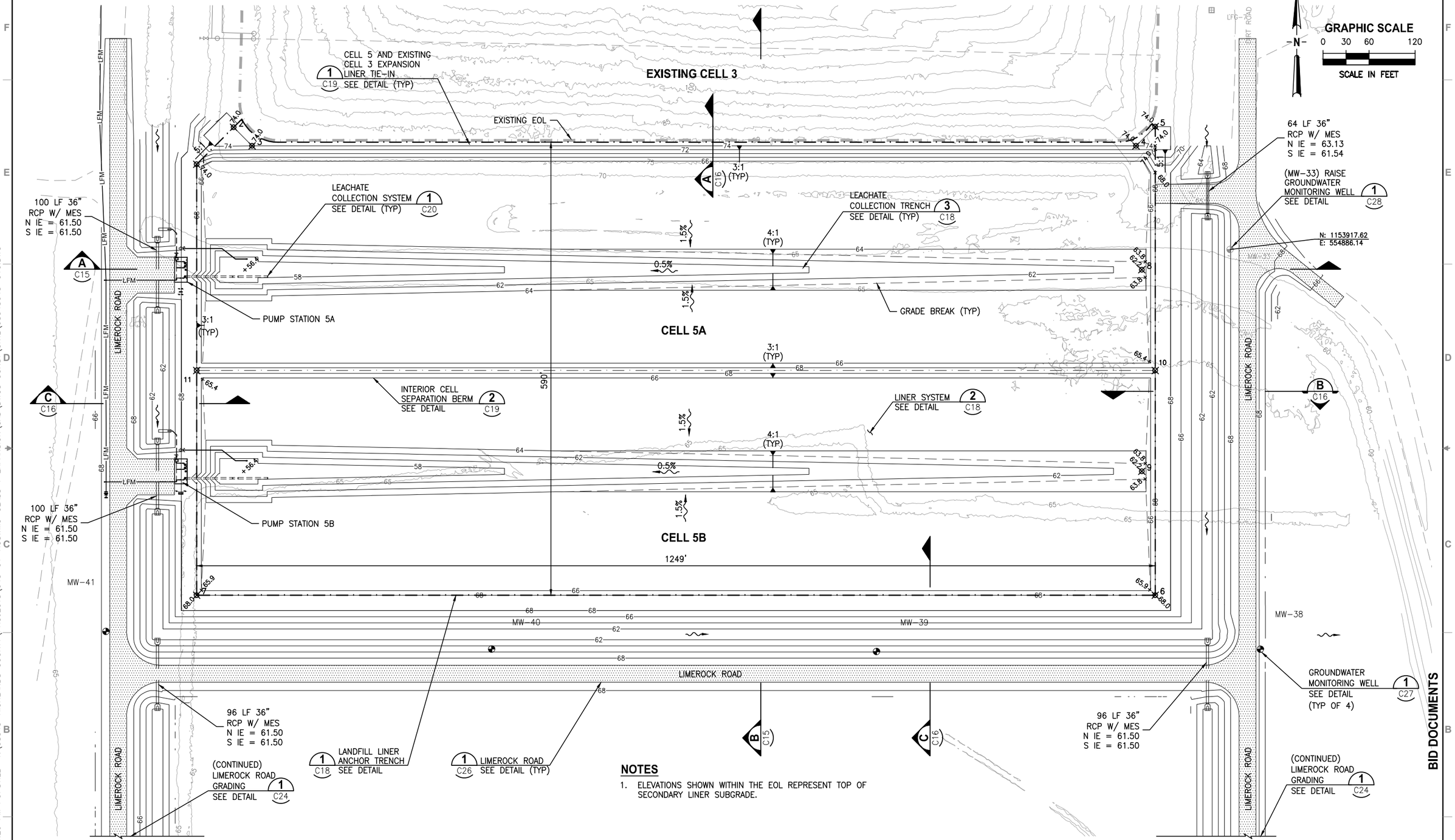
DWG NO: C9



NOTES

1. ELEVATIONS SHOWN WITHIN THE EOL REPRESENT TOP OF SECONDARY LINER SUBGRADE.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LEACHATE COLLECTION SYSTEM PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C10

CELL 5 AND EXISTING CELL 3 EXPANSION LINER TIE-IN 1 C19 SEE DETAIL (TYP)

EXISTING CELL 3

EXISTING EOL

LEACHATE COLLECTION SYSTEM 1 C20 SEE DETAIL (TYP)

LEACHATE COLLECTION TRENCH 3 C18 SEE DETAIL (TYP)

PUMP STATION 5A

PUMP STATION GRADING 1 C25 SEE DETAIL (TYP OF 2)

3 STORMWATER SEPARATION BERM C19 SEE DETAIL

NO RAIN TARP

CELL 5A

RAIN TARP (TYP)

INTERIOR CELL SEPARATION BERM 2 C19 SEE DETAIL

LINER SYSTEM 2 C18 SEE DETAIL

PUMP STATION 5B

GRADE BREAK (TYP)

CELL 5B

LEACHATE COLLECTION CLEANOUT 1 C23 SEE DETAIL (TYP)

EDGE OF LINER CROSSING A C26 SEE SECTION

LIMEROCK ROAD

(CONTINUED) LIMEROCK ROAD GRADING 1 C24 SEE DETAIL

1 C18 LANDFILL LINER ANCHOR TRENCH SEE DETAIL

BALLAST BLOCK 2 C19 SEE DETAIL (TYP)

FUTURE CELL 7 EXPANSION

MW-41 MW-40 MW-39 MW-38

501 502 503 504 505 506 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526

NOTES:

1. THE RAIN TARP SHALL BE BALLASTED WITH SAND-FILLED (30 LBS MINIMUM) DURABAG SANDBAGS (10,000-HOUR, 5-YEAR UV LIFESPAN) AT 10 FEET ON CENTER TIED LENGTHWISE AND CROSSWISE WITH 1/2-INCH-DIAMETER NYLON ROPE. SECURE THE NYLON ROPE TO CONCRETE BALLAST BLOCKS (MINIMUM WEIGHT 250 LBS) AT APPROXIMATELY 50-FOOT SPACING WHERE SHOWN ON THE DRAWINGS.

GRAPHIC SCALE
0 30 60 120
SCALE IN FEET

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

PROTECTIVE COVER SOIL SYSTEM PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C11

PLOTTED: 9/19/2023 01:33 PM PAUL E. UPSTILL

6" SDR 11 HDPE FORCE MAIN

SPRAYFIELD PIPING (TYP)

LEACHATE STORAGE POND DISCHARGE (TYP)

LEACHATE STORAGE PONDS
(SEE PLAN)

GRAPHIC SCALE
0 20 40 80
SCALE IN FEET

MATCH LINE - SEE BELOW

MATCH LINE - SEE ABOVE

NOTES

1. UTILITIES NORTH OF CELLS 1A AND 1B AND SOUTH OF DIRT ROAD NOT SHOWN FOR CLARITY.

6" SDR 11 HDPE FORCE MAIN

SPRAYFIELD MANIFOLD

SPRAYFIELD PIPING (TYP)

SPRAYFIELD MANIFOLD

1 M7 PIPE TRENCH SEE DETAIL (TYP)

DIRT ROAD

EXISTING 8" PVC FORCE MAIN

EXISTING 4" LEACHATE FM

UTILITY CONFLICT 3 M7 SEE DETAIL

UTILITY CONFLICT 3 M7 SEE DETAIL

MATCH LINE - SEE C13

CELL 1B

CELL 1A

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

FORCE MAIN ROUTING PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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INDEX NO:
DWG NO: C12

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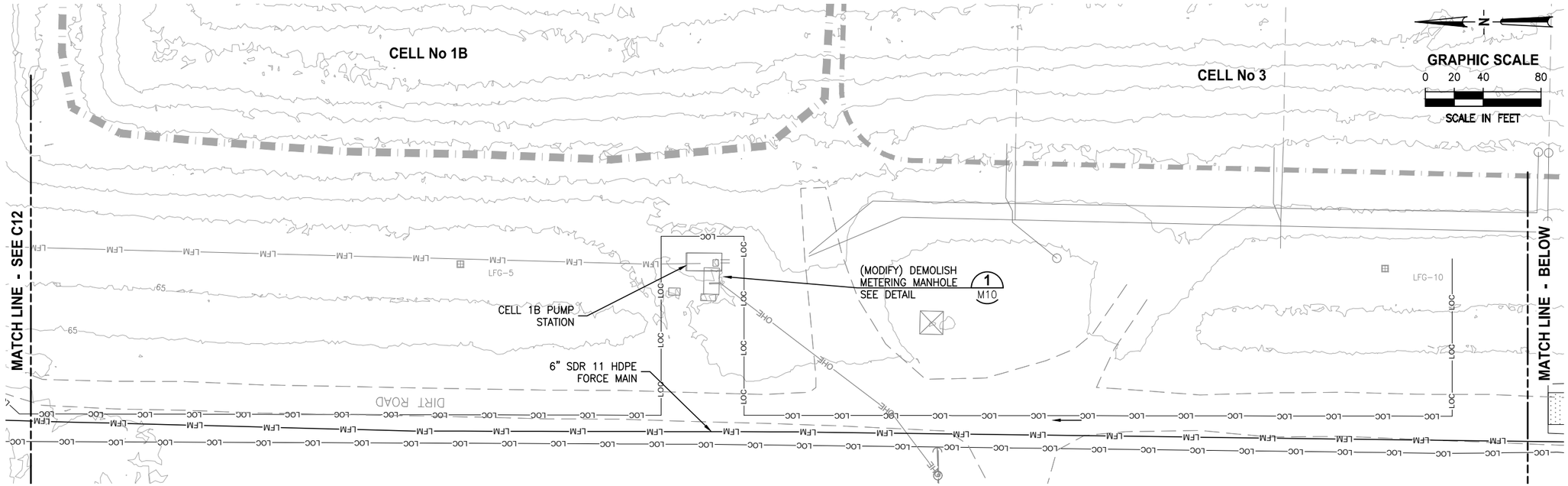

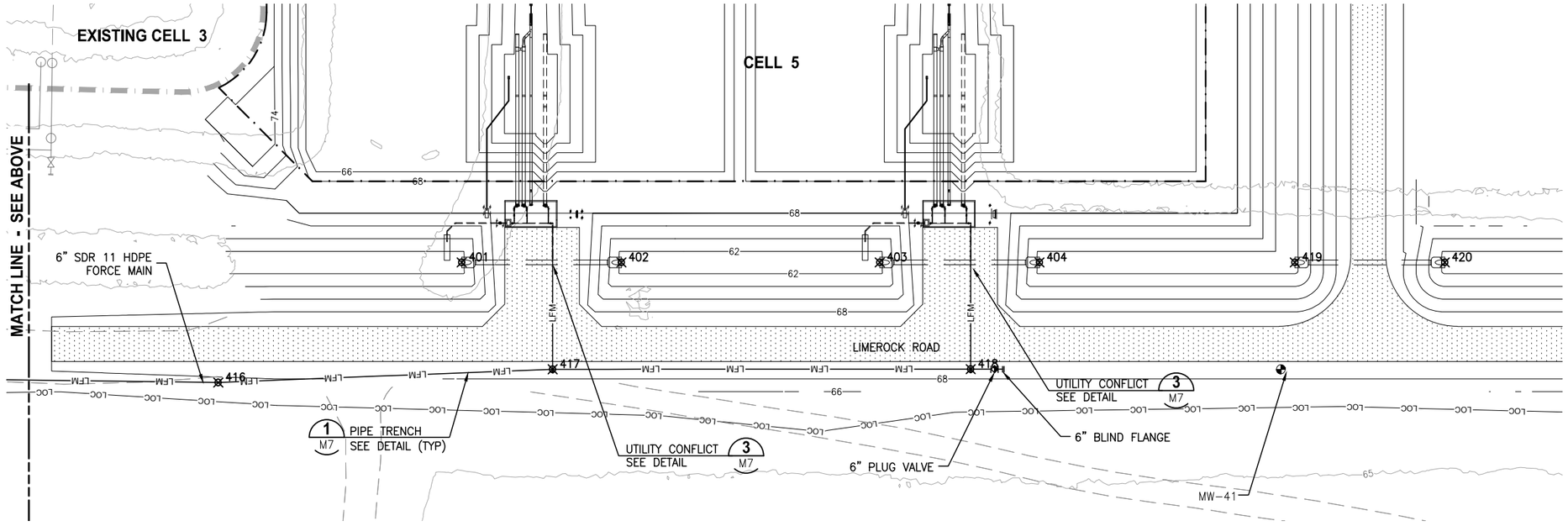

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DESIGNED GREINHART
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CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

FORCE MAIN ROUTING PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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REMOVE AND REPLACE EXISTING CHAINLINK FENCE AS NEEDED

REMOVE AND REPLACE EXISTING CHAINLINK FENCE AS NEEDED

1 M7 PIPE TRENCH SEE DETAIL (TYP)

LEACHATE STORAGE POND DISCHARGE SEE DETAIL (TYP OF 2) 3 M9

6" SDR 11 HDPE FORCE MAIN

SPRAYFIELD PIPING (TYP)

FROM CELL 5 PUMP STATION

LFM

76 80 82 78 80 70 78 82

N

GRAPHIC SCALE

0 10 20 40

SCALE IN FEET

BID DOCUMENTS

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LEACHATE STORAGE PONDS PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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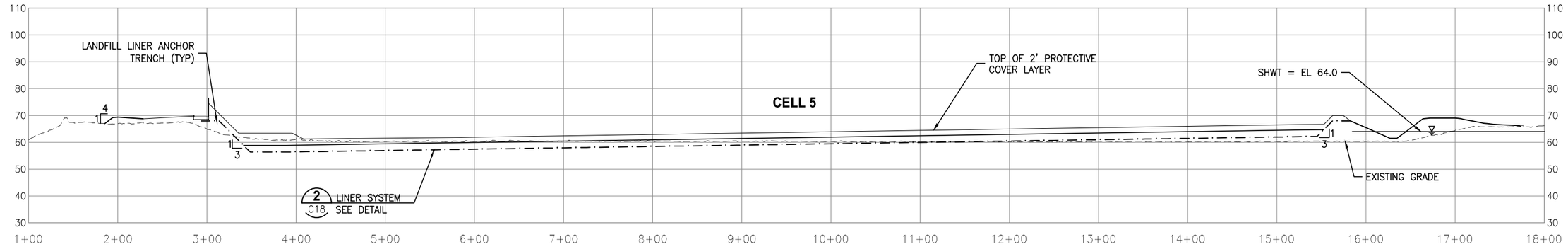
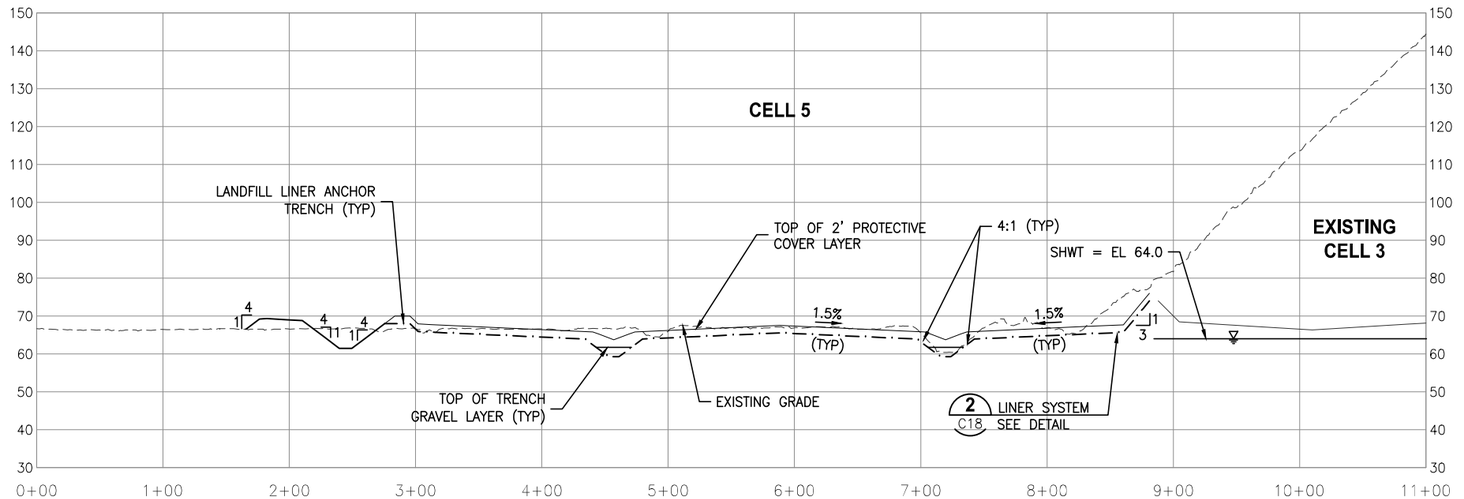


SECTION A
C10,C11



SECTION B
C10,C11

GRAPHIC SCALE
0 30 60 120
SCALE IN FEET
1"=60' H

GRAPHIC SCALE
0 10 20 40
SCALE IN FEET
1"=20' V

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LANDFILL SECTIONS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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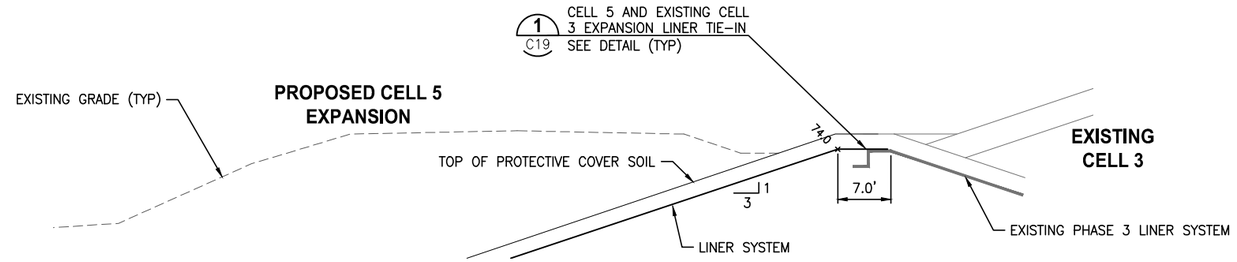
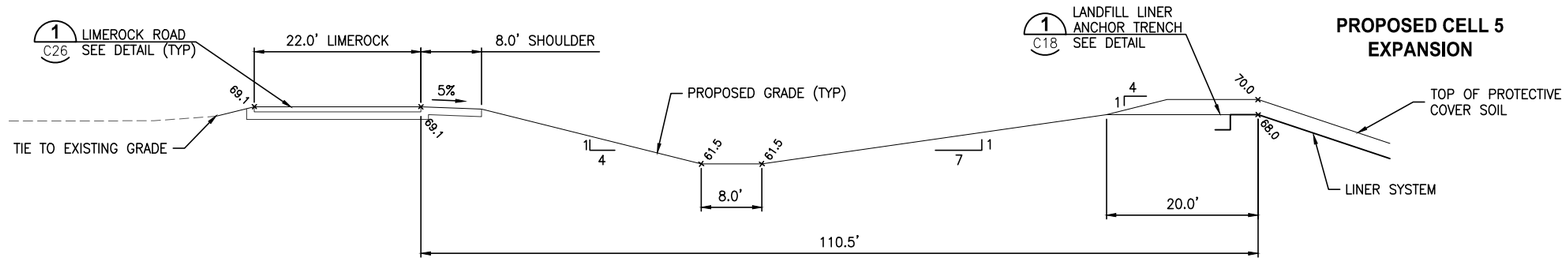


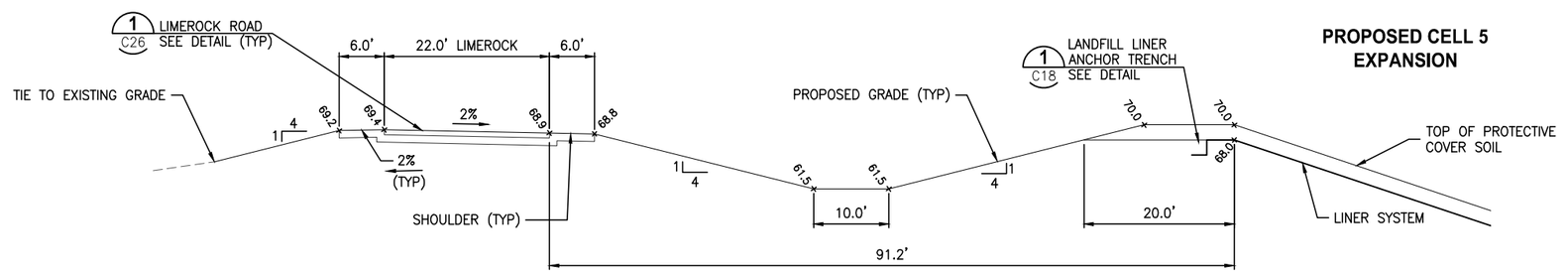
NORTH PERIMETER BERM SECTION (A)

NTS (C10,C11)



EAST PERIMETER BERM SECTION (B)

NTS (C10,C11)



WEST AND SOUTH PERIMETER BERM SECTION (C)

NTS (C10,C11)

BID DOCUMENTS

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HIGHLANDS COUNTY, FLORIDA

LANDFILL PERIMETER BERM AND SWALE SECTIONS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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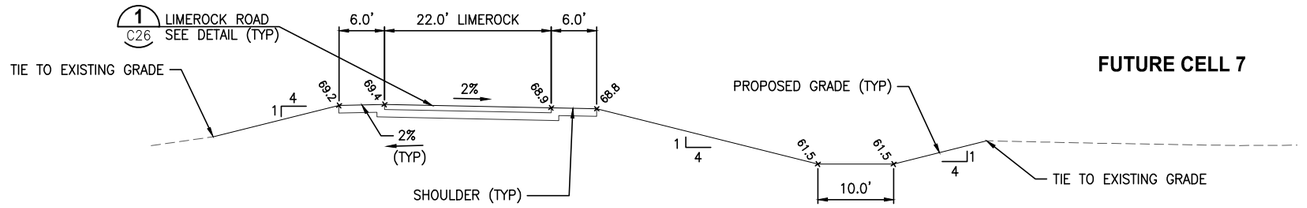
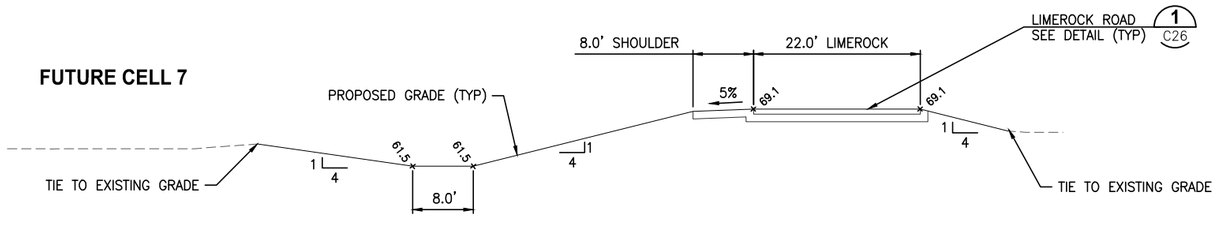
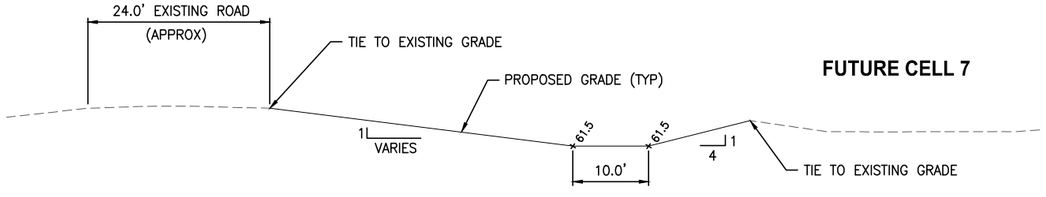


WEST ROAD AND SWALE SECTION A
NTS C24



EAST ROAD AND SWALE SECTION B
NTS C24



SOUTH SWALE SECTION C
NTS C24

BID DOCUMENTS

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HIGHLANDS COUNTY, FLORIDA

LANDFILL ROAD AND SWALE SECTIONS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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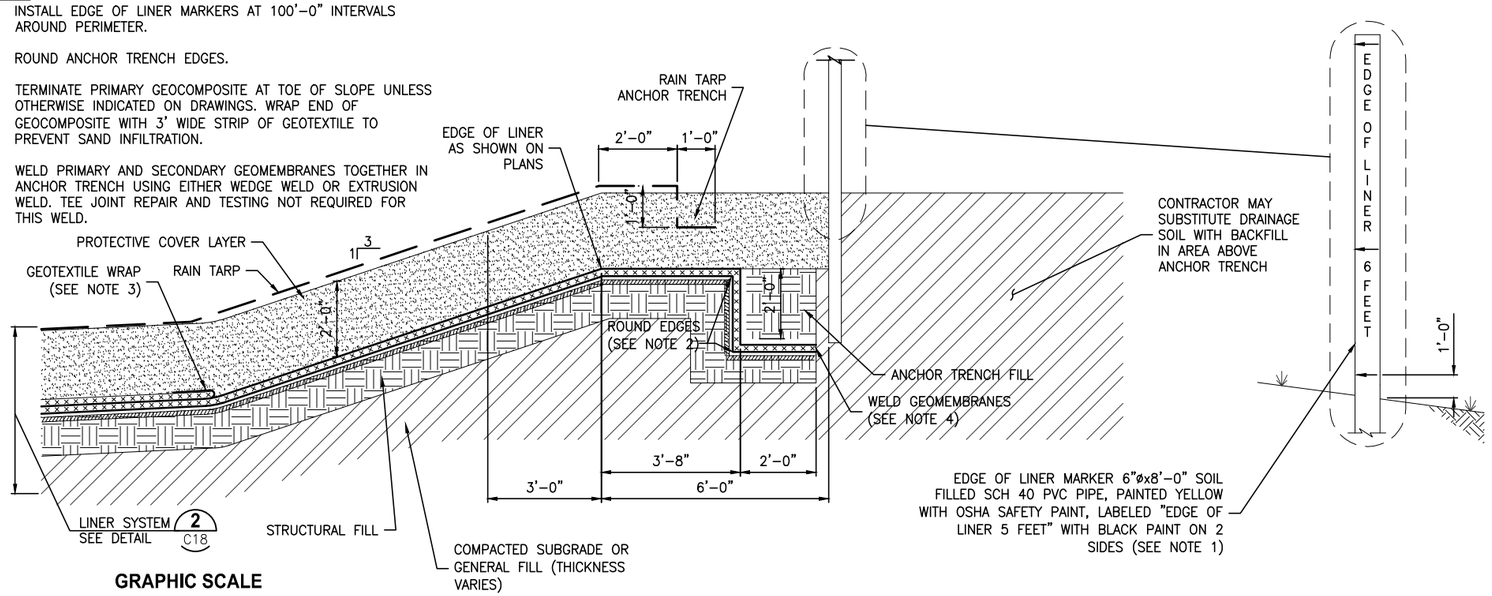
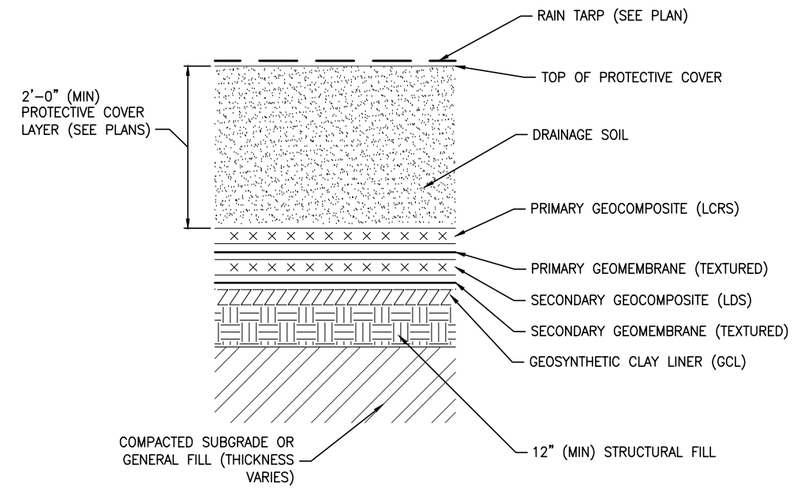
DWG NO: C17

NOTES:
1. INSTALL EDGE OF LINER MARKERS AT 100'–0" INTERVALS AROUND PERIMETER.
2. ROUND ANCHOR TRENCH EDGES.
3. TERMINATE PRIMARY GEOCOMPOSITE AT TOE OF SLOPE UNLESS OTHERWISE INDICATED ON DRAWINGS. WRAP END OF GEOCOMPOSITE WITH 3' WIDE STRIP OF GEOTEXTILE TO PREVENT SAND INFILTRATION.
4. WELD PRIMARY AND SECONDARY GEOMEMBRANES TOGETHER IN ANCHOR TRENCH USING EITHER WEDGE WELD OR EXTRUSION WELD. TEE JOINT REPAIR AND TESTING NOT REQUIRED FOR THIS WELD.

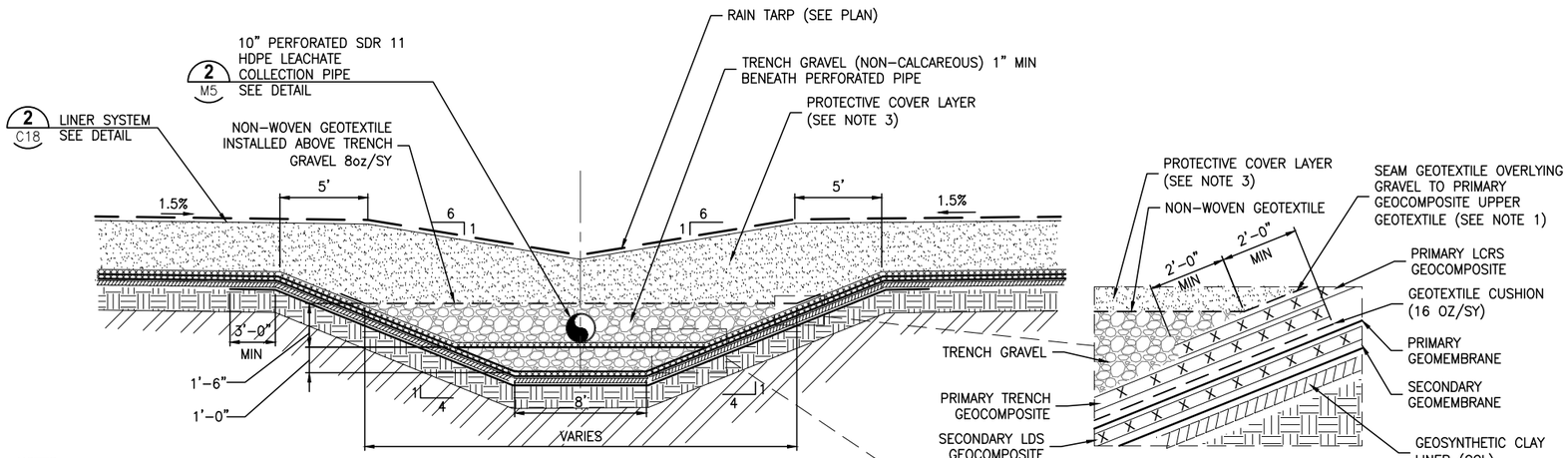


GRAPHIC SCALE
0 1 2 4
SCALE IN FEET

LANDFILL LINER ANCHOR TRENCH DETAIL 1
C10,C11,C16



LINER SYSTEM DETAIL 2
C10,C11,C15,C18,C19
NTS



NOTES:
1. SEAM GEOTEXTILE OVERLYING THE TRENCH GRAVEL TO THE PRIMARY LCRS GEOCOMPOSITE UPPER GEOTEXTILE ALONG THE LENGTH OF THE TRENCH (BOTH SIDES) TO CREATE CONTINUOUS GEOTEXTILE BARRIER SO THAT LEACHATE FLOWS FROM THE GEONET PORTION OF THE GEOCOMPOSITE TO TRENCH GRAVEL WITHOUT PASSING THROUGH A GEOTEXTILE.
2. CONTRACTOR SHALL FIELD ADJUST ELEVATIONS OF ALL PIPES CROSSING PERIMETER SWALE ABOVE ANCHOR TRENCH SO THAT THE PIPES ARE INSTALLED BELOW THE SWALE BOTTOM.
3. PROTECTIVE COVER LAYER EXCEEDS 2 FEET IN THICKNESS IN THE LEACHATE COLLECTION TRENCHES (SEE PLANS).

LEACHATE COLLECTION TRENCH DETAIL 3
C10,C11,C23
NTS

BID DOCUMENTS

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LINER DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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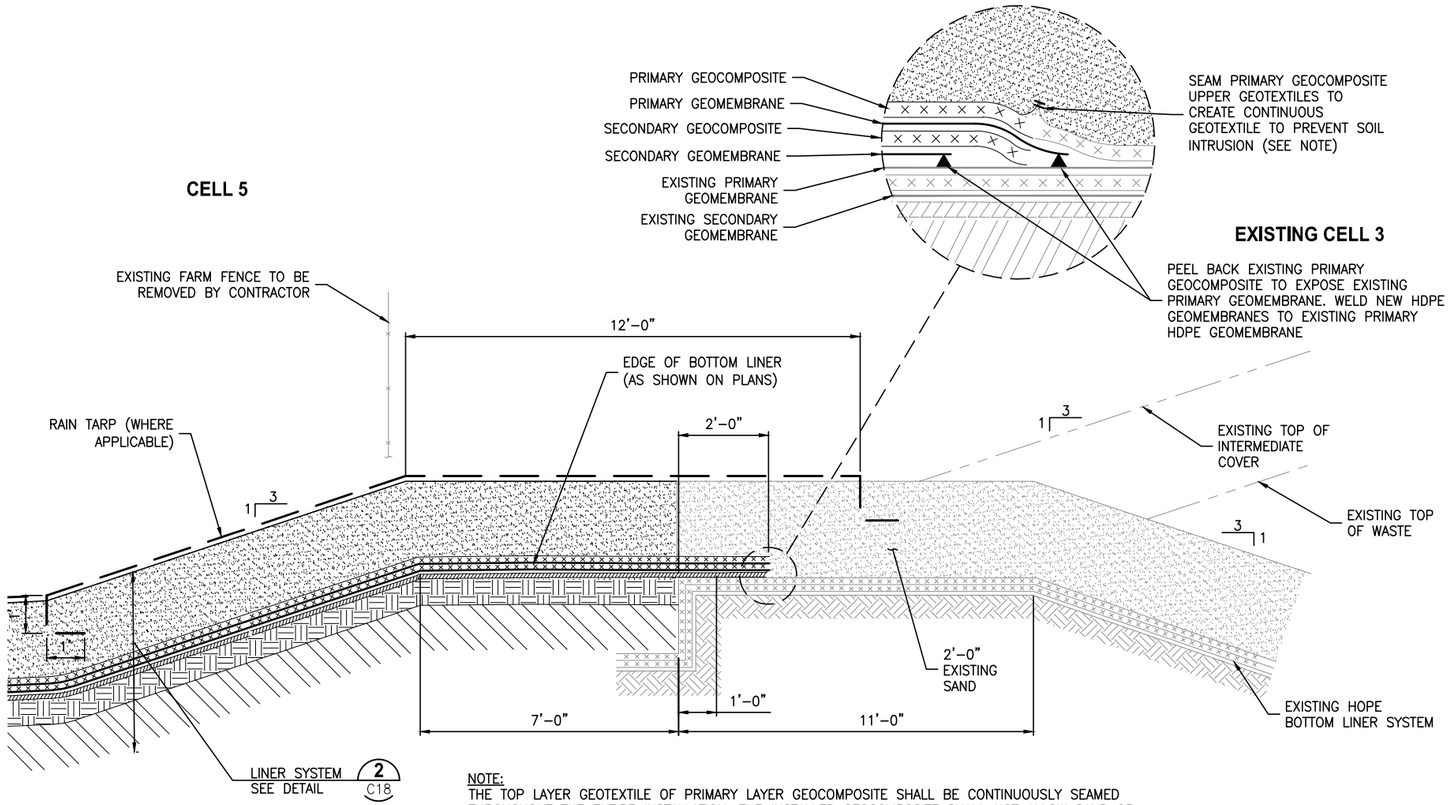
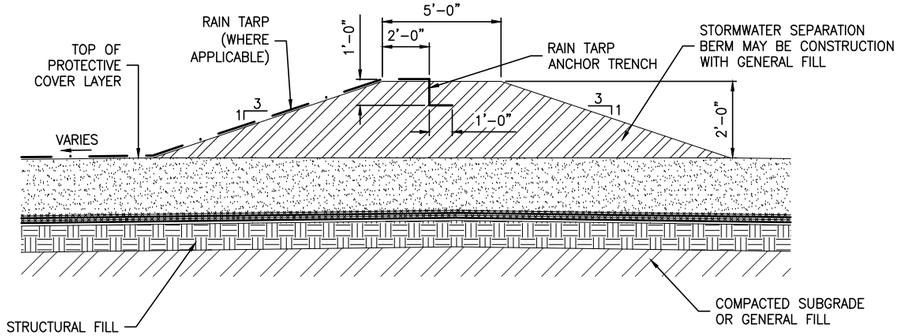
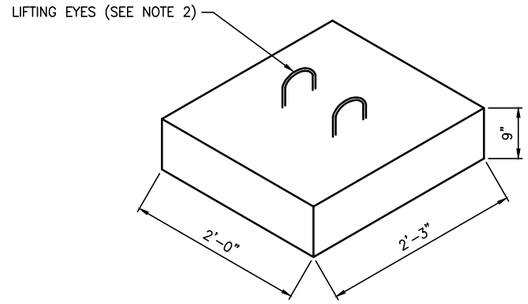


NOTE:
THE TOP LAYER GEOTEXTILE OF PRIMARY LAYER GEOCOMPOSITE SHALL BE CONTINUOUSLY SEAMED THROUGHOUT THE ENTIRE INSTALLATION. THE INSTALLED GEOCOMPOSITE SHALL NOT ALLOW SAND OR SEDIMENT TO MIGRATE INTO THE GEONET.

CELL 5 AND EXISTING CELL 3 LINER TIE-IN DETAIL 1
NTS
C10,C11,C16

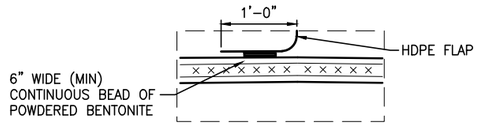


STORMWATER SEPARATION BERM 3
NTS
C11

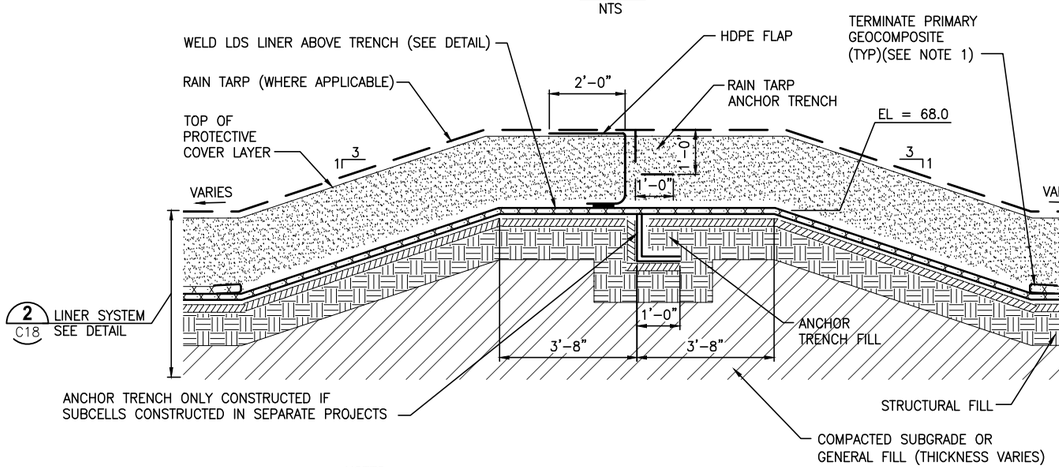


NOTES:
1. 5 #5 BARS AT MID DEPTH EACH WAY WITH 1 1/2 INCHES EDGE CLEARANCE.
2. LIFTING EYES SHALL BE #4 STIRRUP CENTERED ON LONG AXIS SPACED 1 FOOT APART AND 6-INCHES FROM ENDS WITH 6-INCH 90 DEGREE HOOKS.

BALLAST BLOCK DETAIL 2
C11



DETAIL
NTS



NOTES:
1. TERMINATE PRIMARY GEOCOMPOSITE AT TOE OF SLOPE. WRAP END OF GEOCOMPOSITE WITH 3' WIDE STRIP OF GEOTEXTILE TO PREVENT SAND INFILTRATION.

INTERIOR CELL SEPARATION BERM DETAIL 4
NTS
C10,C11

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CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LINER DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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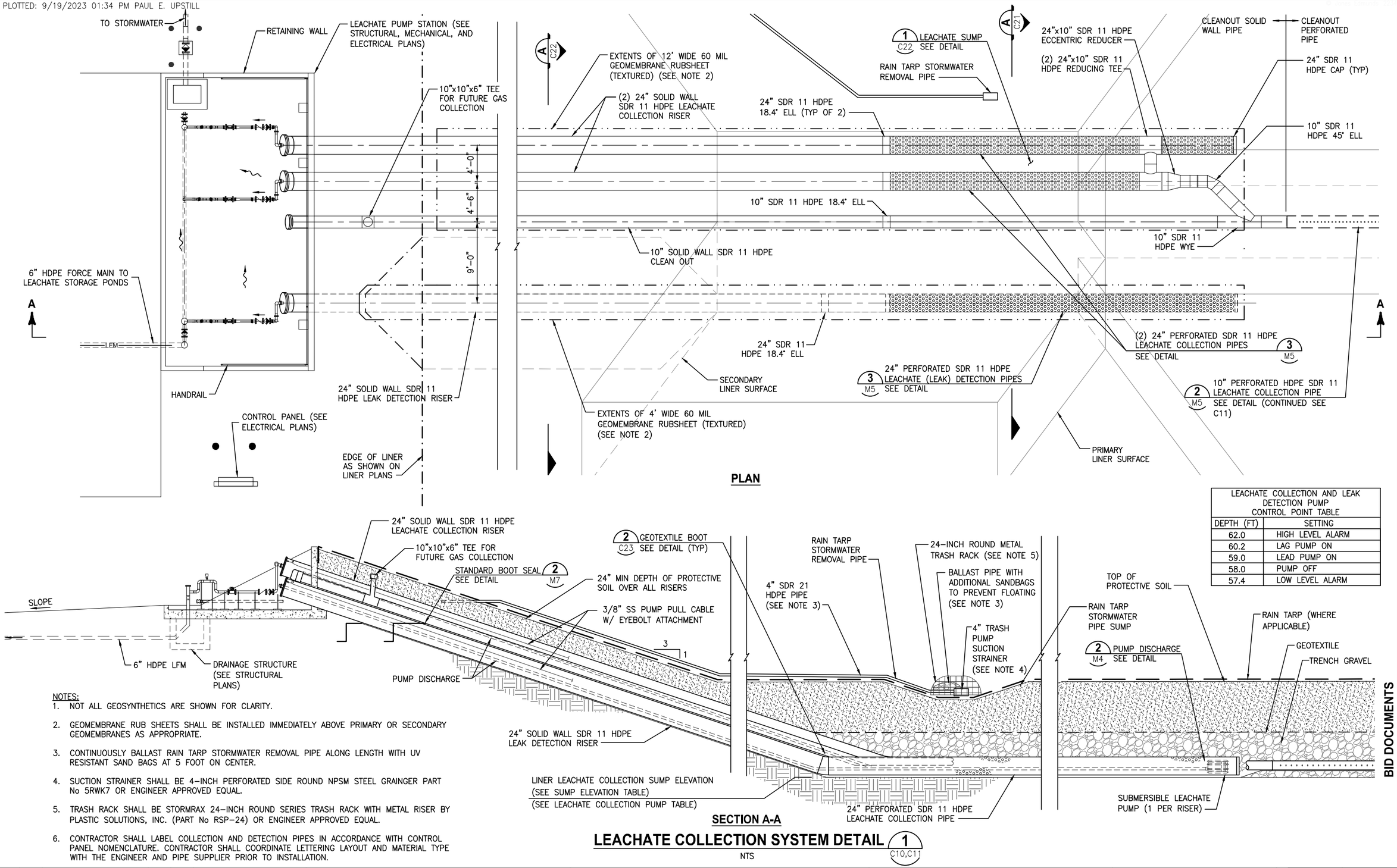

PLAN

LEACHATE COLLECTION AND LEAK DETECTION PUMP CONTROL POINT TABLE	
DEPTH (FT)	SETTING
62.0	HIGH LEVEL ALARM
60.2	LAG PUMP ON
59.0	LEAD PUMP ON
58.0	PUMP OFF
57.4	LOW LEVEL ALARM

SECTION A-A

NOTES:

1. NOT ALL GEOSYNTHETICS ARE SHOWN FOR CLARITY.
2. GEOMEMBRANE RUB SHEETS SHALL BE INSTALLED IMMEDIATELY ABOVE PRIMARY OR SECONDARY GEOMEMBRANES AS APPROPRIATE.
3. CONTINUOUSLY BALLAST RAIN TARP STORMWATER REMOVAL PIPE ALONG LENGTH WITH UV RESISTANT SAND BAGS AT 5 FOOT ON CENTER.
4. SUCTION STRAINER SHALL BE 4-INCH PERFORATED SIDE ROUND NPSM STEEL GRAINGER PART No 5RWK7 OR ENGINEER APPROVED EQUAL.
5. TRASH RACK SHALL BE STORMRAX 24-INCH ROUND SERIES TRASH RACK WITH METAL RISER BY PLASTIC SOLUTIONS, INC. (PART No RSP-24) OR ENGINEER APPROVED EQUAL.
6. CONTRACTOR SHALL LABEL COLLECTION AND DETECTION PIPES IN ACCORDANCE WITH CONTROL PANEL NOMENCLATURE. CONTRACTOR SHALL COORDINATE LETTERING LAYOUT AND MATERIAL TYPE WITH THE ENGINEER AND PIPE SUPPLIER PRIOR TO INSTALLATION.

LEACHATE COLLECTION SYSTEM DETAIL 1

NTS C10,C11

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LEACHATE SUMP DETAIL

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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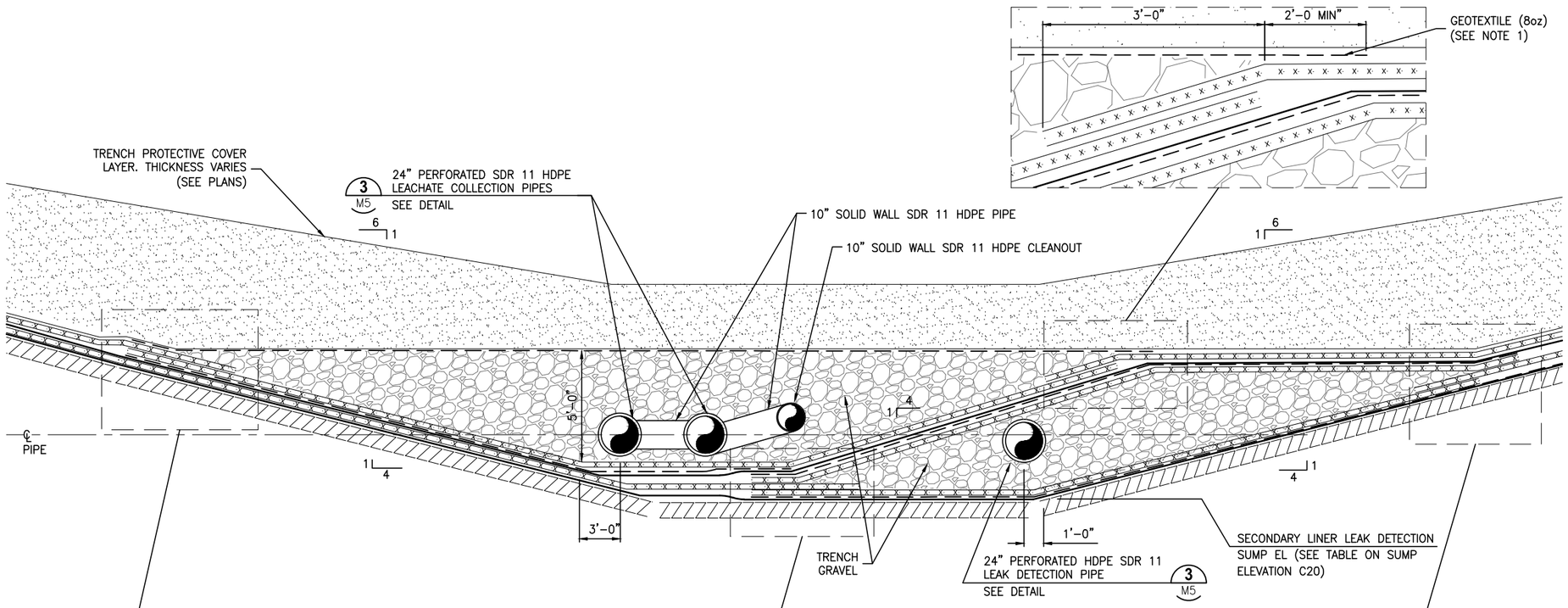

LEACHATE SUMP NOTES:

1. GEOTEXTILE OVERLYING TRENCH GRAVEL SHALL BE SEAMED TO PRIMARY GEOCOMPOSITE UPPER GEOTEXTILE.
2. ONE LAYER OF GEOCOMPOSITE SHALL BE INSTALLED ON THE SUMP BOTTOM FOR THE LCRS. TWO LAYERS OF GEOCOMPOSITE SHALL BE INSTALLED IN THE LDS SUMP, ONE ABOVE THE GRAVEL AND ONE BELOW THE GRAVEL.
3. GEOMEMBRANE RUBSHEET NOT SHOWN.

LEACHATE COLLECTION SUMP SECTION A

NTS

C20,C22

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HIGHLANDS COUNTY, FLORIDA

LEACHATE SUMP DETAILS

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DWG NO: C21

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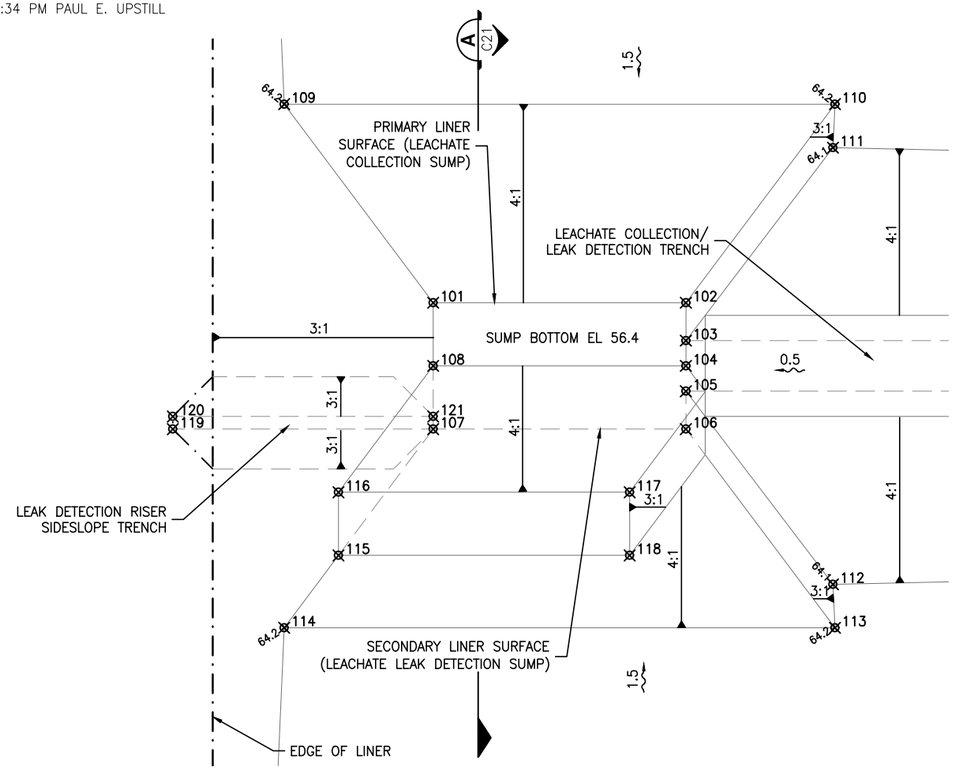
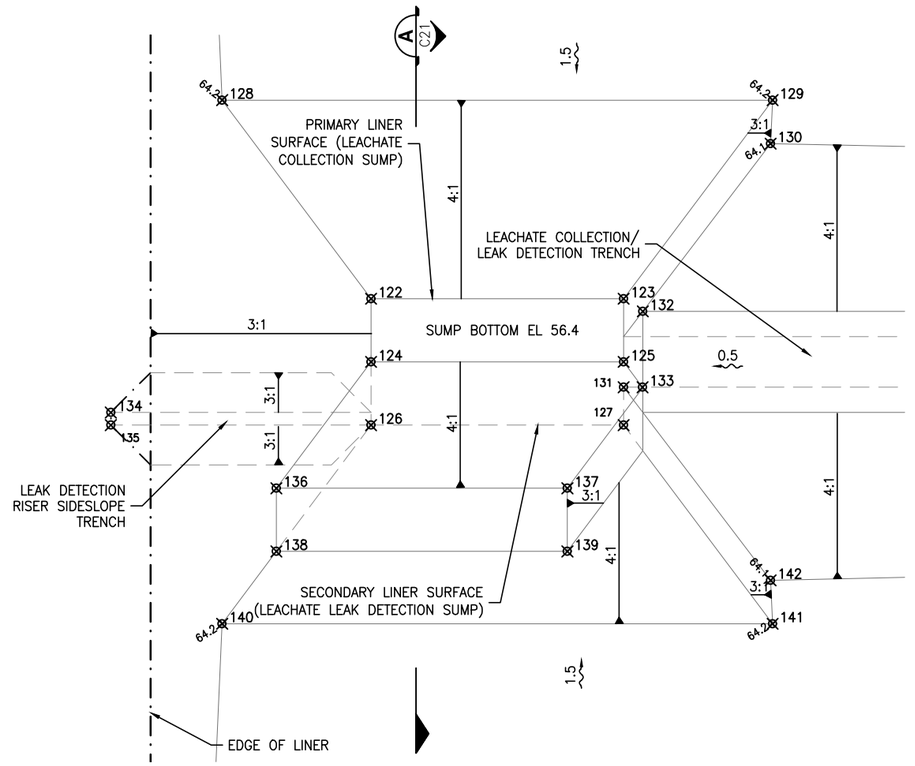


PUMP STATION 5A

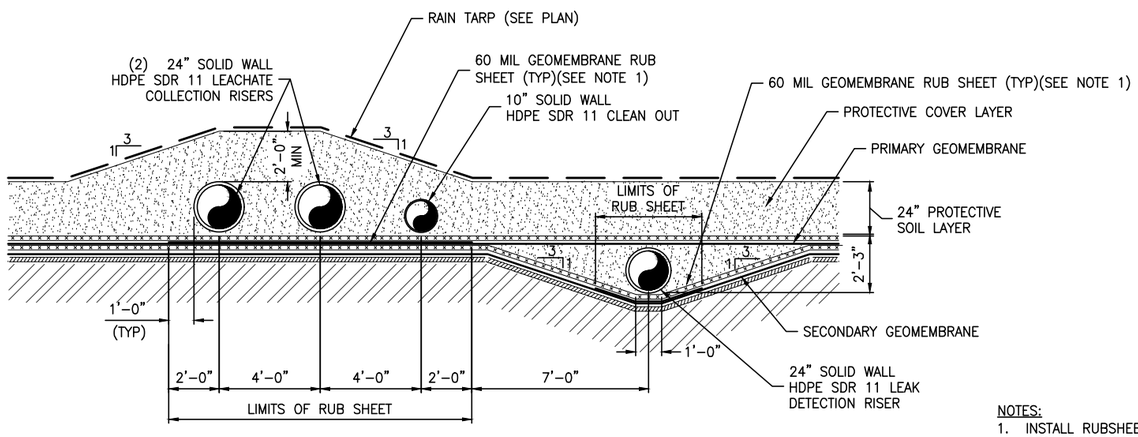


PUMP STATION 5B

NOTE:
LEACHATE COLLECTION PIPES NOT SHOWN FOR CLARITY.

LEACHATE SUMP DETAIL 1 / C20

NTS



LEACHATE COLLECTION RISER SECTION A / C20

NTS

NOTES:
1. INSTALL RUBSHEET BETWEEN LCRS/LDS GEOMEMBRANES AND OVERLYING GEOCOMPOSITE.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LEACHATE SUMP DETAILS

GEORGE A. REINHART, III, PHD, PE. STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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DWG NO: C22

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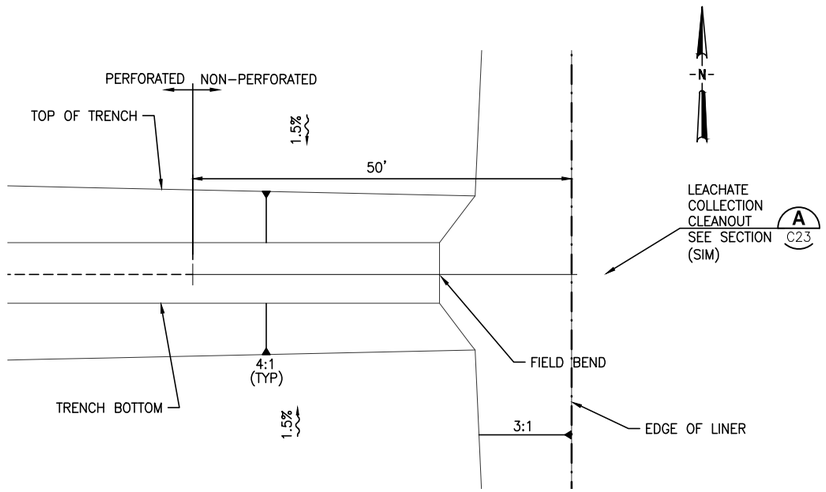
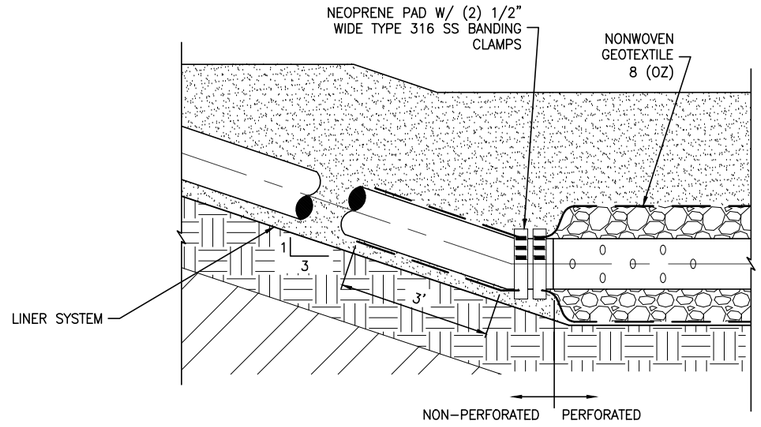
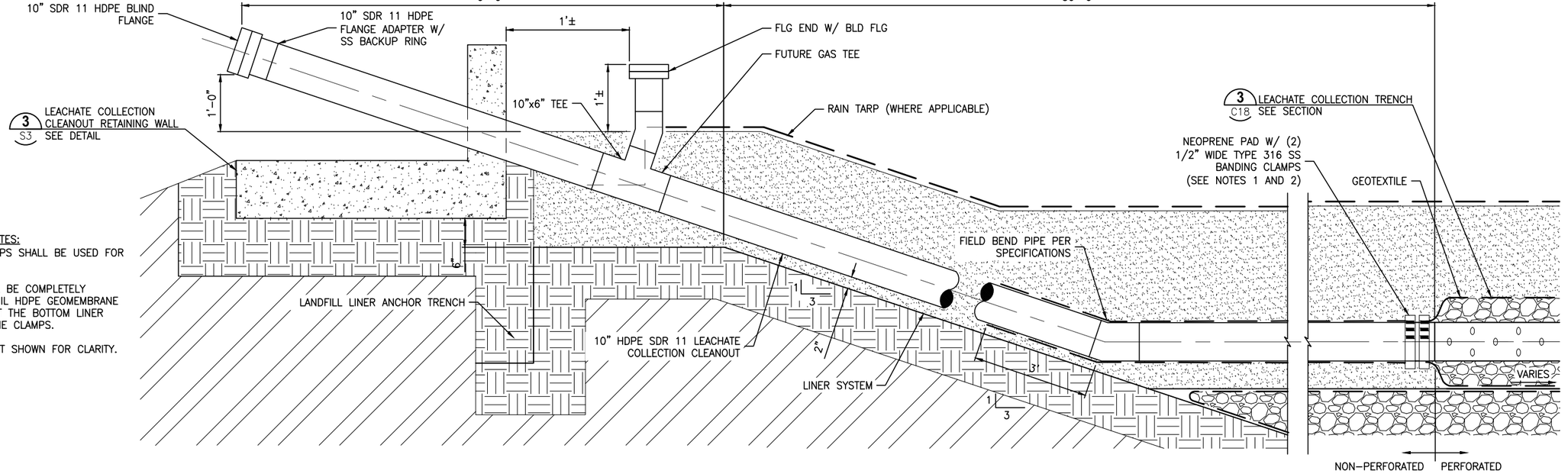


LEACHATE COLLECTION CLEANOUT DETAIL 1
NTS C11



NOTES:
1. STAINLESS STEEL CLAMPS SHALL BE COMPLETELY WRAPPED WITH STRIPS OF 60 MIL HDPE GEOMEMBRANE AFTER INSTALLATION TO PROTECT THE BOTTOM LINER MATERIALS FROM CONTACTING THE CLAMPS.

GEOTEXTILE BOOT DETAIL 2
NTS C20



LEACHATE COLLECTION CLEANOUT NOTES:
1. TWO (2) STAINLESS STEEL CLAMPS SHALL BE USED FOR THE GEOTEXTILE BOOT.
2. STAINLESS STEEL CLAMPS SHALL BE COMPLETELY WRAPPED WITH STRIPS OF 60 MIL HDPE GEOMEMBRANE AFTER INSTALLATION TO PROTECT THE BOTTOM LINER MATERIALS FROM CONTACTING THE CLAMPS.
3. SOME GEOSYNTHETIC LAYERS NOT SHOWN FOR CLARITY.

LEACHATE COLLECTION CLEANOUT SECTION A
NTS C23

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

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HIGHLANDS COUNTY, FLORIDA

LINER SYSTEM DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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DWG NO: C23

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CELL 5B

MW-41 MW-40 MW-39 MW-38

503 504 505 506 507 508 509 510 511 512

LIMEROCK ROAD

FUTURE CELL 7
EXPANSION

A C17 B C17

6' SHOULDER @ 2%

6' SHOULDER @ 2%

2%

4:1 (TYP)

(22' WIDE) LIMEROCK ROAD 1 C26 SEE DETAIL

(22' WIDE) LIMEROCK ROAD 1 C26 SEE DETAIL

1 C28 (MW-32G) RAISE GROUNDWATER MONITORING WELL SEE DETAIL

N: 1152833.08
E: 553690.01

N: 1152795.10
E: 554362.65

100 LF 36" RCP W/ MES
E IE = 59.10
W IE = 61.50

R45.0' R45.0' R45.0' R45.0'

MW-31G MW-32G

LFG-11 LFG-12

PROTECT WELL MW-31G

PROTECT WELL MW-32G

DIRT ROAD

(CONTINUED THIS DWG)

(CONTINUED THIS DWG)

C C17

B C26 (20'x35') RIPRAP APRON SEE SECTION

N: 1152830.19
E: 555024.21

4:1 (TYP)

MW-33G

58.6±

PROTECT WELL MW-33G

1 C28 (MW-33G) RAISE GROUNDWATER MONITORING WELL SEE DETAIL

GRAPHIC SCALE
0 30 60 120
SCALE IN FEET

N

BID DOCUMENTS

LIMEROCK ROAD GRADING DETAIL 1 C10,C11

LTR.	DATE	REVISIONS	BY	APPRD.

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LANDFILL DETAILS

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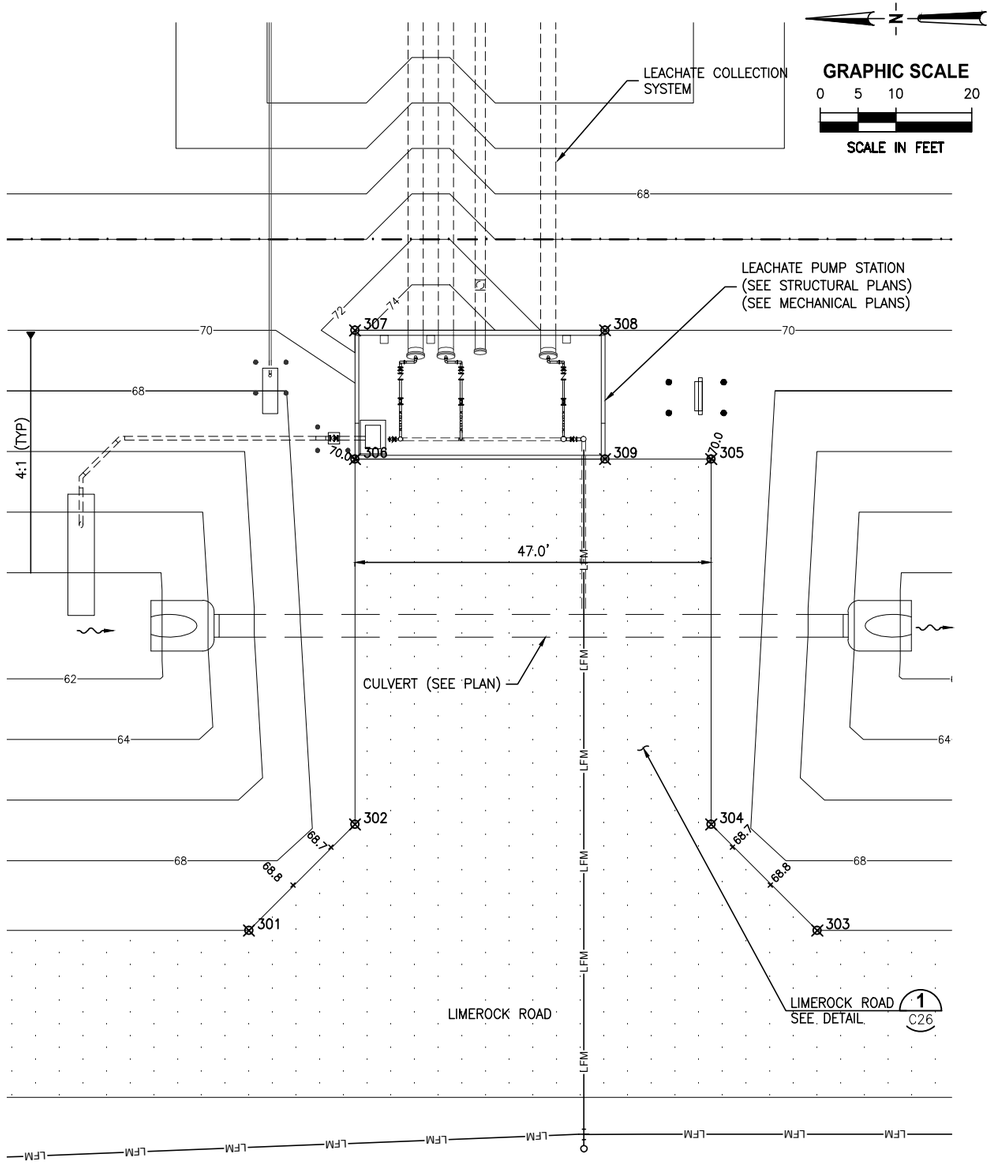
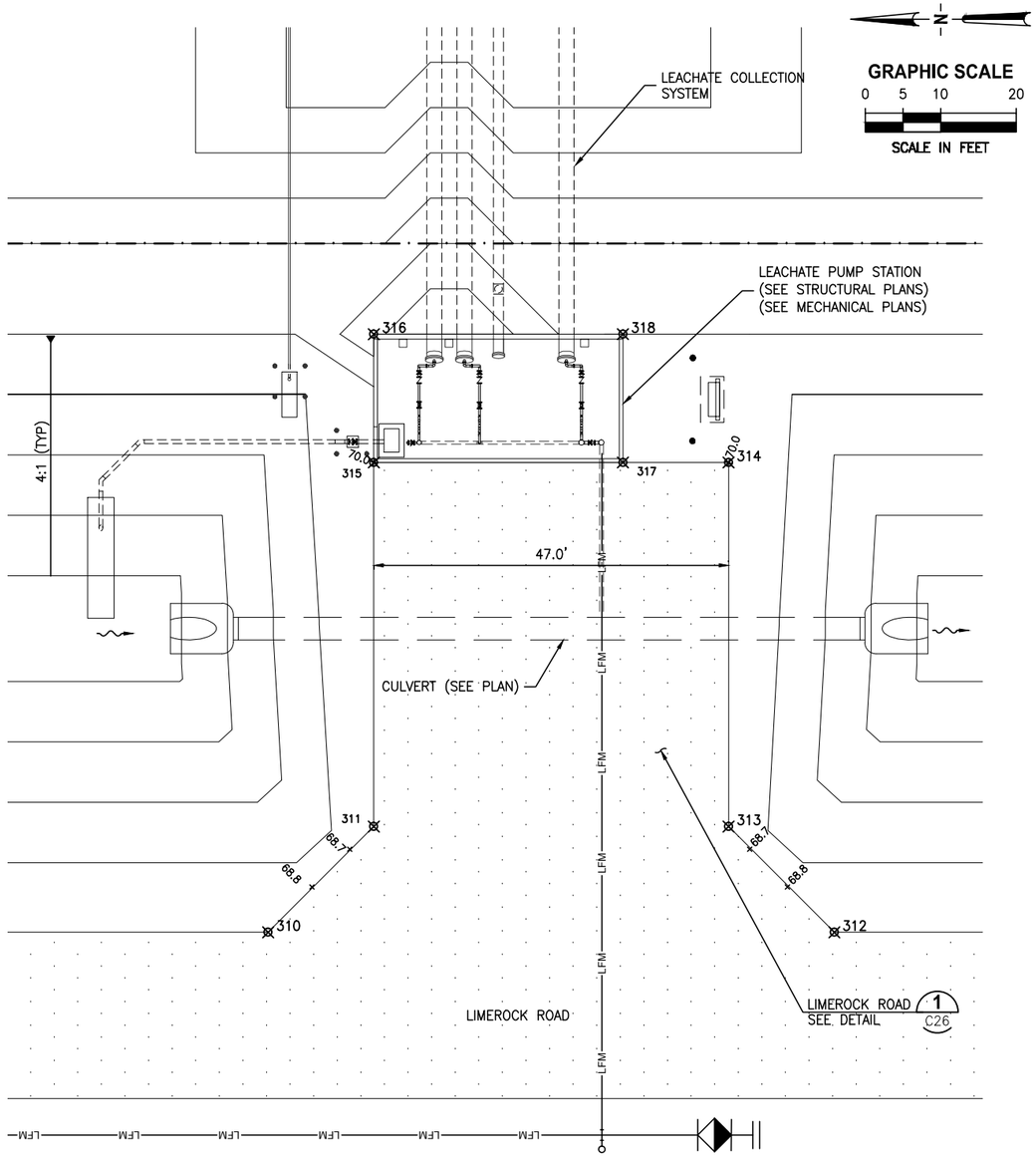
INDEX NO:
DWG NO: C24



PUMP STATION 5A



PUMP STATION 5B

PUMP STATION GRADING DETAIL 1 (C11)

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LANDFILL DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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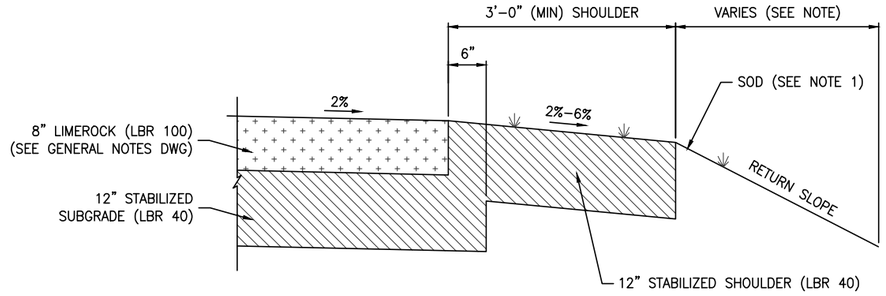
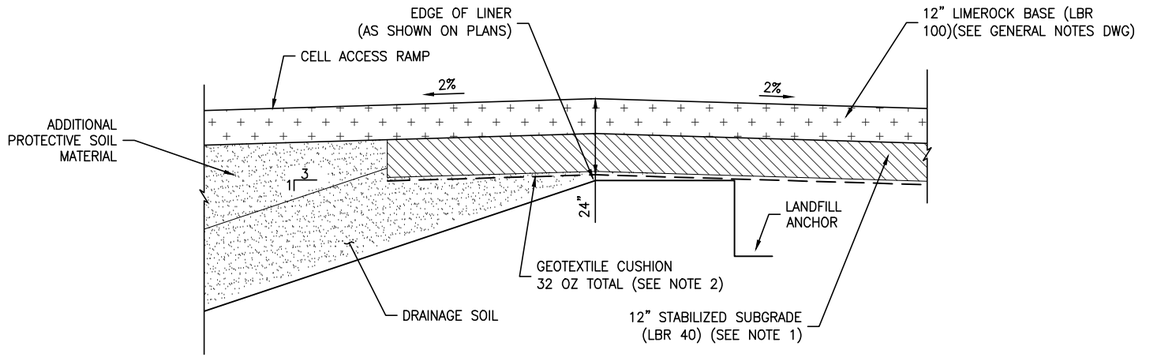
PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C25



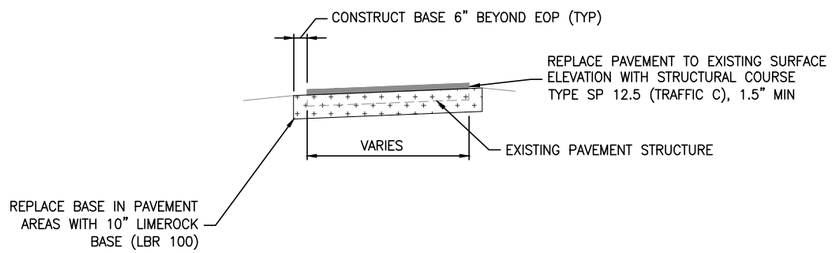
NOTES:
1. SOD REQUIRED WHERE RETURN SLOPE IS STEEPER THAN 6:1 (OTHERWISE, SEED & MULCH).

TYPICAL LIMEROCK ROAD DETAIL (1)
NTS — C10,C16,C17,C24,C25



NOTES:
1. STABILIZED SUBGRADE INSTALLED WITHIN 12" OF PRIMARY GEOMEMBRANE SHALL BE FIRM AND UNYIELDING. THE MEASURE OF FIRM AND UNYIELDING SHALL BE AS FOLLOWS: CONSTRUCTION EQUIPMENT SHALL NOT MAKE DEPRESSIONS IN THE FINISHED SUBBASE SURFACE GREATER THAN 1/8" WHEN USING REASONABLE AND INDUSTRY STANDARD EQUIPMENT AND METHODS.
2. INSTALL 32 OZ/SY GEOTEXTILE BETWEEN STABILIZED SUBGRADE AND GEOMEMBRANE IN LOCATION OF LINER CROSSING.

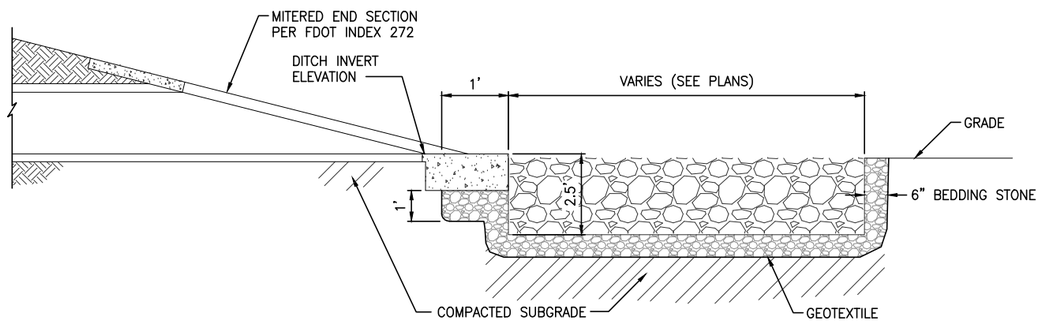
EDGE OF LINER CROSSING SECTION (A)
NTS — C11



PAVEMENT REPLACEMENT NOTES:
1. SAWCUT REMOVAL LIMITS OF ALL PAVEMENT REPLACEMENT AREAS.
2. PLEASE NOTE THAT NOT ALL PAVEMENT REPAIR LOCATIONS MAY BE CALLED OUT OR OTHERWISE IDENTIFIED IN THE DRAWINGS. CONTRACTOR SHALL REPAIR ALL PAVEMENT DAMAGED BY THEIR CONSTRUCTION ACTIVITIES WHETHER OR NOT IT IS IDENTIFIED FOR REPAIR.

REPLACE PAVEMENT DETAIL
NTS

NOTES
1. BANK AND SHORE RIPRAP RUBBLE, BEDDING STONE, AND GEOTEXTILE WRAP PER FDOT 530 RIPRAP.
2. GEOTEXTILE PER FDOT 514 AND 985.
3. EXTEND BEDDING STONE AND GEOTEXTILE WRAP 2.5' MINIMUM UNDER STRUCTURE.
4. CONFIGURATION OF RIPRAP APRON SECTION WILL VARY BASED ON CHANNEL CONFIGURATION.



RIPRAP APRON SECTION (B)
NTS — C24

BID DOCUMENTS

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DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LANDFILL DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C26

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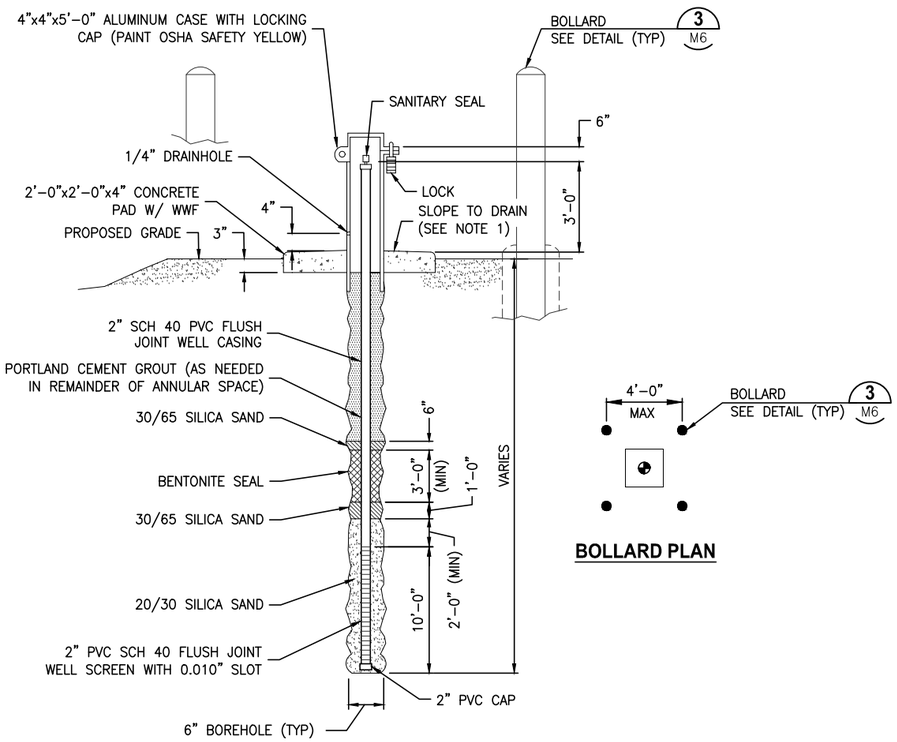
GROUNDWATER MONITORING WELLS TO BE INSTALLED TABLE

GWM WELL ID	APPROXIMATE LOCATION		APPROX PROPOSED GRADE EL	SCREEN ELEVATIONS		LENGTH OF SCREEN FEET	APPROXIMATE TOTAL DEPTH		APPROX TOP OF CASING ELEVATION FEET NGVD
	NORTHING	EASTING		TOP OF SCREEN FEET NGVD	BASE OF SCREEN FEET NGVD		FEET BLS	BOTTOM FEET NGVD	
MW-38	1153396.90	554925.58	68	62	52	10	16.00	52	71.00
MW-39	1153393.94	554425.41	66	62	52	10	14.00	52	69.00
MW-40	1153397.07	553923.97	65	62	52	10	13.00	52	68.00
MW-41	1153420.01	553421.28	69	62	52	10	17.00	52	72.00

NOTES:
1. ALL ELEVATIONS AND LOCATIONS ARE ESTIMATED. VALUES TO BE UPDATED AFTER CONSTRUCTION AND SURVEY. FINAL ELEVATIONS OF SCREEN SHALL BE DETERMINED BY A GEOLOGIST (PROVIDED BY THE OWNER) IN THE FIELD. NGVD = NATIONAL GEODETIC VERTICAL DATUM (1929)
   BLS = BELOW LAND SURFACE
2. CONTRACTOR SHALL ABANDON WELLS IN ACCORDANCE WITH WATER MANAGEMENT DISTRICT REQUIREMENTS.



BOLLARD PLAN

NOTES:
1. WHEN INSTALLED ON GROUND SLOPES OF 5% OR LESS, SLOPE PAD TO DRAIN. IF GROUND SLOPE EXCEEDS 5%, INSTALL PAD AT SLOPE GRADE.
2. INSTALL 2 BOLLARDS AT EVERY MONITORING WELL AS NEEDED.
3. GROUNDWATER MONITORING WELL ID SHALL BE PERMANENTLY PUNCHED IN ALUMINUM CASE.

GROUNDWATER MONITORING WELL DETAIL 1 C10

NTS

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DESIGNED GREINHART
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JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LANDFILL DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
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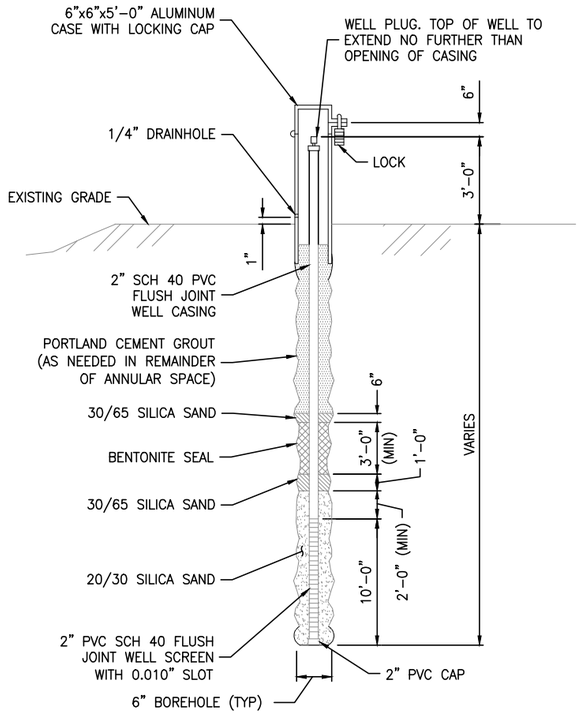
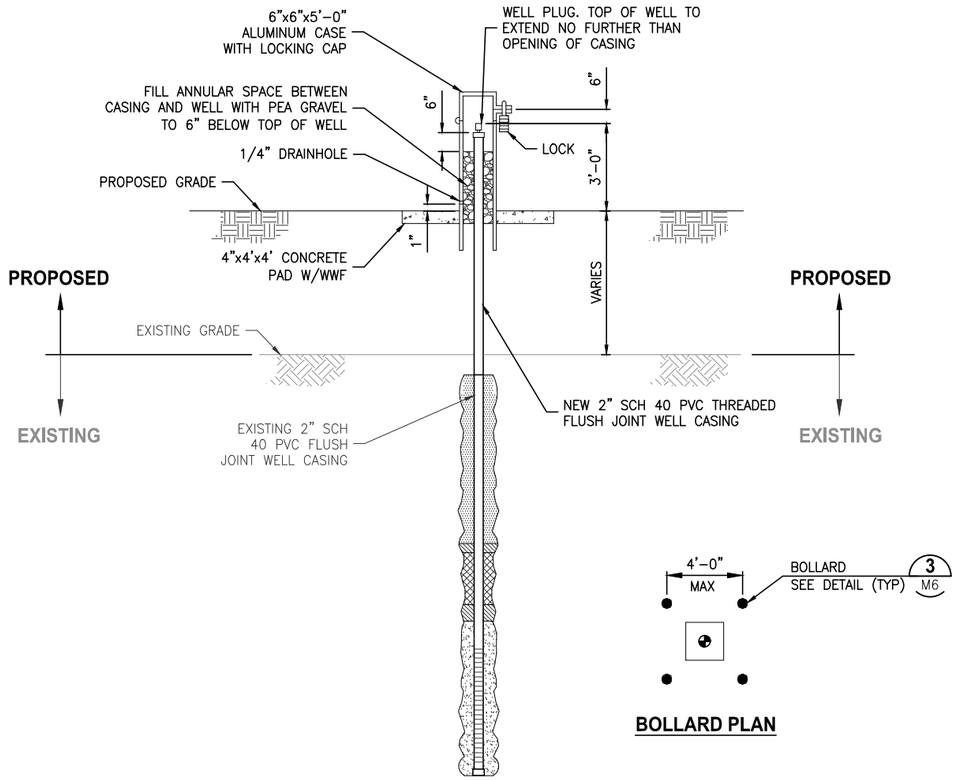
INDEX NO:
DWG NO: C27



EXISTING GROUNDWATER MONITORING WELLS



BOLLARD PLAN

NOTES:
1. WHEN INSTALLED ON GROUND SLOPES OF 5% OR LESS, SLOPE PAD TO DRAIN. IF GROUND SLOPE EXCEEDS 5%, INSTALL PAD AT SLOPE GRADE.
2. INSTALL 4 BOLLARDS AT EVERY MONITORING WELL (SEE BOLLARD PLAN).
3. CONTRACTOR SHALL REUSE EXISTING ALUMINUM CASE.

RAISED GROUNDWATER MONITORING WELLS

RAISE GROUNDWATER MONITORING WELL DETAIL 1

NTS — C10,C24

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730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

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LANDFILL DETAILS

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PROJECT NO: 08345-045-01
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DWG NO: C28

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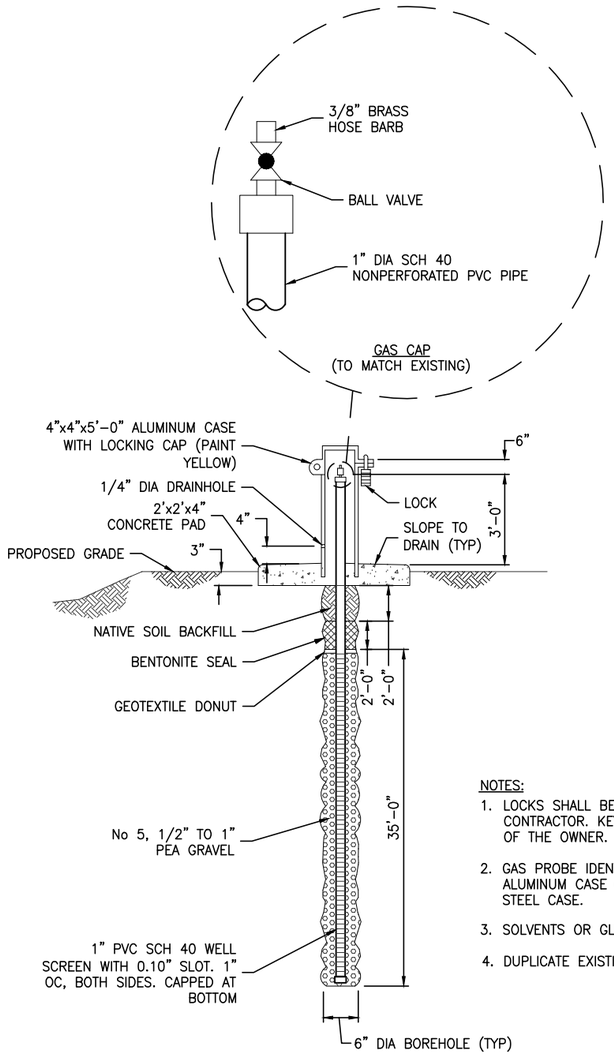

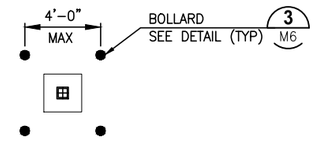

BOLLARD PLAN

NOTES:

1. LOCKS SHALL BE KEYED ALIKE AND SHALL BE PROVIDED BY THE CONTRACTOR. KEYS SHALL BE DELIVERED TO AND BECOME THE PROPERTY OF THE OWNER.
2. GAS PROBE IDENTIFICATION LABEL SHALL BE PERMANENTLY PUNCHED IN ALUMINUM CASE CAP AND PAINTED IN BLACK ON THE SIDE OF YELLOW STEEL CASE.
3. SOLVENTS OR GLUE OF ANY TYPE SHALL NOT BE USED.
4. DUPLICATE EXISTING CAP.

GAS PROBE TABLE

GAS PROBE ID	APPROXIMATE LOCATION		APPROX PROPOSED GRADE EL	TOP OF SCREEN OR OPEN HOLE		LENGTH OF SCREEN	APPROXIMATE TOTAL DEPTH	
	NORTHING	EASTING		FEET BLS	FEET NAD 88		FEET BLS	BOTTOM FEET NGVD
LFG-11	1152765	553797	67	0.5	66.5	4.5	5	62
LFG-12	1152756	554478	67	0.5	66.5	4.5	5	62

GAS PROBE DETAIL 1 / C3

NTS

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

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730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

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HIGHLANDS COUNTY, FLORIDA

LANDFILL DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: C29

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ABBREVIATIONS

AA STD	ALUMINUM ASSOCIATION STANDARD
ACI	AMERICAN CONCRETE INSTITUTE
AISI	AMERICAN IRON AND STEEL INSTITUTE
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ALUM	ALUMINUM
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWS	AMERICAN WELDING SOCIETY
L	ANGLE
BLDG	BUILDING
℄	CENTERLINE
CC	CENTER TO CENTER
CJ	CONTROL JOINT
CLR	CLEAR
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUOUS
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
DET	DETAIL
DIA ø	DIAMETER
DWG	DRAWING
EA	EACH
EL	ELEVATION
EQ	EQUAL, EQUALLY
EW	EACH WAY
EXIST	EXISTING
FBC	FLORIDA BUILDING CODE
FT	FOOT
GALV	GALVANIZED
LF	LINEAR FEET
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
MAX	MAXIMUM
MECH	MECHANICAL
MFG	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
No	NUMBER
OC	ON CENTER(S)
PCF	POUNDS PER CUBIC FOOT
ℙ	PLATE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
R	RADIUS
REINF	REINFORCEMENT, REINFORCING
SCJ	SAW CUT CONTROL JOINT
SIM	SIMILAR
SS	STAINLESS STEEL
STD	STANDARD
STL	STEEL
T&B	TOP AND BOTTOM
THK	THICK
T/	TOP OF
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
VIF	VERIFY IN FIELD
W/	WITH

STRUCTURAL NOTES

DESIGN CRITERIA AND LOADS

1. DESIGN CRITERIA
   - 1.1. FBC 2010
   - 1.2. ACI 318-08

2. LIVE LOAD

2.1.	PUMP STATION SLAB-ON-GRADE	16,000 LB (CONCENTRATED) 250 PSF (UNIFORM)
2.2.	CONCRETE PAVEMENT	16,000 LB (CONCENTRATED) 250 PSF (UNIFORM)
2.3.	EQUIPMENT CROSSING	60,000 LB (CONCENTRATED) 500 PSF (UNIFORM)

GENERAL

1. VERIFY ALL DIMENSIONS, ELEVATIONS, AND EXISTING CONDITIONS SHOWN PRIOR TO CONSTRUCTION. NOTIFY ENGINEER OF ANY DISCREPANCIES.

SUBGRADE PREPARATION FOR SLABS ON GRADE

1. EXCAVATE BELOW BOTTOM OF FOUNDATIONS AND SLABS ON GRADE AND PLACE AND COMPACT SATISFACTORY SOIL TO AT LEAST 95 PERCENT OF THE SOIL'S MAXIMUM DRY UNIT WEIGHT AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D1557 FOR AT LEAST 2 FEET BELOW THE BOTTOM OF STRUCTURE.

2. SATISFACTORY SOIL SHALL BE DEFINED AS EXISTING SUBGRADE OR BORROW SOILS CLASSIFIED AS GW, GP, SW, SP, SM, OR ANY COMBINATION OF THESE CLASSIFICATIONS, AS DETERMINED BY ASTM D2487, WHICH ARE WITHIN 2% OF OPTIMUM MOISTURE CONTENT AT TIME OF COMPACTION, HAVE LESS THAN 12% SOIL FINES, AND ARE FREE OF ROCK OR GRAVEL LARGER THAN 2 INCHES IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, ORGANICS, ROOTS, AND OTHER DELETERIOUS MATTER.

3. DEWATER, AS REQUIRED, SUCH THAT SPECIFIED DEGREES OF COMPACTION ARE ATTAINED AND THE EXCAVATIONS ARE DRY AT THE TIME OF CONCRETE PLACEMENT.

4. THE TESTING AGENCY SHALL TEST COMPACTION OF SOILS IN PLACE AS SPECIFIED IN SPECIFICATION SECTION 02301, EARTHWORK FOR LANDFILL CONSTRUCTION, AT A FREQUENCY OF ONE TEST PER 500 SQUARE FEET OR LESS OF COMPACTED PREPARED SUBGRADE AREA, BUT IN NO CASE FEWER THAN FIVE TESTS PER A PREPARED SUBGRADE AREA.

5. DESIGN ALLOWABLE SOIL BEARING STRENGTH: 2000 PSF

CAST-IN-PLACE REINFORCED CONCRETE

1. WORK SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301-10 SPECIFICATIONS FOR STRUCTURAL CONCRETE, EXCEPT AS MODIFIED BY THESE CONTRACT DOCUMENTS.

2. CONCRETE SHALL BE UNIFORM IN COLOR AND APPEARANCE.

3. LIKE ITEMS OF MATERIALS SHALL BE THE END PRODUCTS OF ONE MANUFACTURER.

4. CONCRETE SHALL COMPLY WITH ACI 301 AND THE FOLLOWING CONCRETE MIX REQUIREMENTS:
   - 4.1. EXPOSURE CLASSES: S1, F0, P1, C1.
   - 4.2. NOMINAL MAXIMUM AGGREGATE SIZE: 1 INCH OR 1-1/2 INCH
   - 4.3. CONCRETE COMPRESSIVE STRENGTH 4,000 PSI AT 28 DAYS.
   - 4.4. CEMENT: DOMESTIC PORTLAND CEMENT COMPLYING WITH ASTM C150.
   - 4.5. ADMIXTURES SHALL BE FREE OF CHLORIDES AND ALKALIS (EXCEPT FOR THOSE ATTRIBUTABLE TO WATER). WHEN MORE THAN ONE ADMIXTURE IS REQUIRED TO BE USED IN A CONCRETE MIX, THE ADMIXTURES SHALL BE FROM THE SAME MANUFACTURER. ADMIXTURES SHALL BE COMPATIBLE WITH THE CONCRETE MIX.
   - 4.6. FLY ASH: ASTM C618, CLASS F EXCEPT THAT THE LOSS ON IGNITION SHALL BE LIMITED TO 3% MAXIMUM.
   - 4.7. MINIMUM SYNTHETIC FIBER REINFORCEMENT CONTENT: WHERE SPECIFIED, PROVIDE 10 POUNDS PER CUBIC YARD.

5. REINFORCING BARS SHALL BE UNCOATED DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.

6. SYNTHETIC FIBER REINFORCEMENT SHALL BE FORTA-FERRO MANUFACTURED BY THE FORTA CORPORATION, OR ENGINEER APPROVED EQUIVALENT. ADD FIBERS AT THE BATCH PLANT.

7. REINFORCEMENT LAP SPLICES AND HOOKS SHALL BE PER THE REBAR SPLICE AND HOOK SCHEDULE

8. CONCRETE COVER FOR REINFORCEMENT, UNLESS NOTED OTHERWISE, SHALL BE:

8.1.	CAST AGAINST GROUND	3"
8.2.	ALL OTHER CASES	2"

9. TOLERANCE FOR CONCRETE COVER FOR REINFORCEMENT SHALL BE +/- 1/2".

10. PROVIDE 3/4" CHAMFER ON EXPOSED EDGES OF CONCRETE.

11. CONCRETE SHALL BE READY-MIXED CONCRETE IN ACCORDANCE WITH ASTM C94. SUBMIT DELIVERY TICKETS FOR ALL CAST-IN-PLACE CONCRETE FOR REVIEW.

12. CURE ALL CAST-IN-PLACE CONCRETE IN ACCORDANCE WITH ACI 308.1-2011.

13. CONCRETE FOR THE FOLLOWING CONDITIONS SHALL BE FINISHED IN ACCORDANCE WITH ACI 301 AS FOLLOWS:
   - 13.1. SLAB ON GRADE: BROOM FINISH.
   - 13.2. CONCRETE PAVEMENT: BROOM FINISH.
   - 13.3. EQUIPMENT CROSSING: BROOM FINISH.

CAST-IN-PLACE CONCRETE QUALITY CONTROL TESTING

1. THE CONTRACTOR SHALL HIRE A TESTING AGENCY MEETING THE REQUIREMENTS OF ASTM E329 TO PERFORM FIELD AND LABORATORY TESTS.

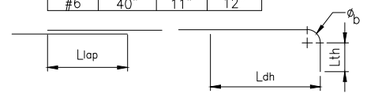
2. THE TESTING AGENCY SHALL TAKE SETS OF THREE CONCRETE TEST CYLINDERS DURING THE PROGRESS OF THE WORK IN ACCORDANCE WITH ASTM C31. THE NUMBER OF SETS OF CONCRETE TEST CYLINDERS TAKEN EACH DAY SHALL NOT BE FEWER THAN THREE SETS OR LESS THAN ONE SET FOR EACH 25 CUBIC YARDS OF CONCRETE.

3. THE TESTING AGENCY SHALL TEST EACH SET OF CONCRETE TEST CYLINDERS IN ACCORDANCE WITH ASTM C39. ONE CYLINDER SHALL BE TESTED AT 7 DAYS AND TWO CYLINDERS SHALL BE TESTED AT 28 DAYS FOR EACH SET OF CONCRETE TEST CYLINDERS. SUBMIT TEST REPORTS TO THE ENGINEER FOR APPROVAL.

4. THE TESTING AGENCY SHALL PERFORM SLUMP TESTS OF CONCRETE IN ACCORDANCE WITH ASTM C143. THE NUMBER OF SLUMP TESTS SHALL BE 1 FOR EACH REQUIRED SET OF CONCRETE STRENGTH TEST CYLINDERS. SUBMIT TEST REPORTS TO THE ENGINEER FOR APPROVAL.

REBAR SPLICE AND HOOK SCHEDULE (UNO)

REBAR SIZE	MINIMUM SPLICE AND HOOK LENGTHS		
	Llap	Ldh	Lth
#3	19"	6"	6"
#4	30"	7"	8"
#5	36"	9"	10"
#6	40"	11"	12"



1. BEND DIAMETER (øb) SHALL BE 6 TIMES THE BAR DIAMETER.

2. Llap - LAP SPLICE DEVELOPMENT LENGTH
   Ldh - HOOK DEVELOPMENT LENGTH
   Lth - HOOK TAIL LENGTH

BID DOCUMENTS

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LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED MTHUE
DRAWN PUPSTILL
CHECKED MHADLOCK

GSE Engineering & Consulting, Inc.
5590 SW 64th Street, Suite B
Telephone: (352)377-3233
Fax: (352)377-0335
Certificate of Authorization - 27430

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

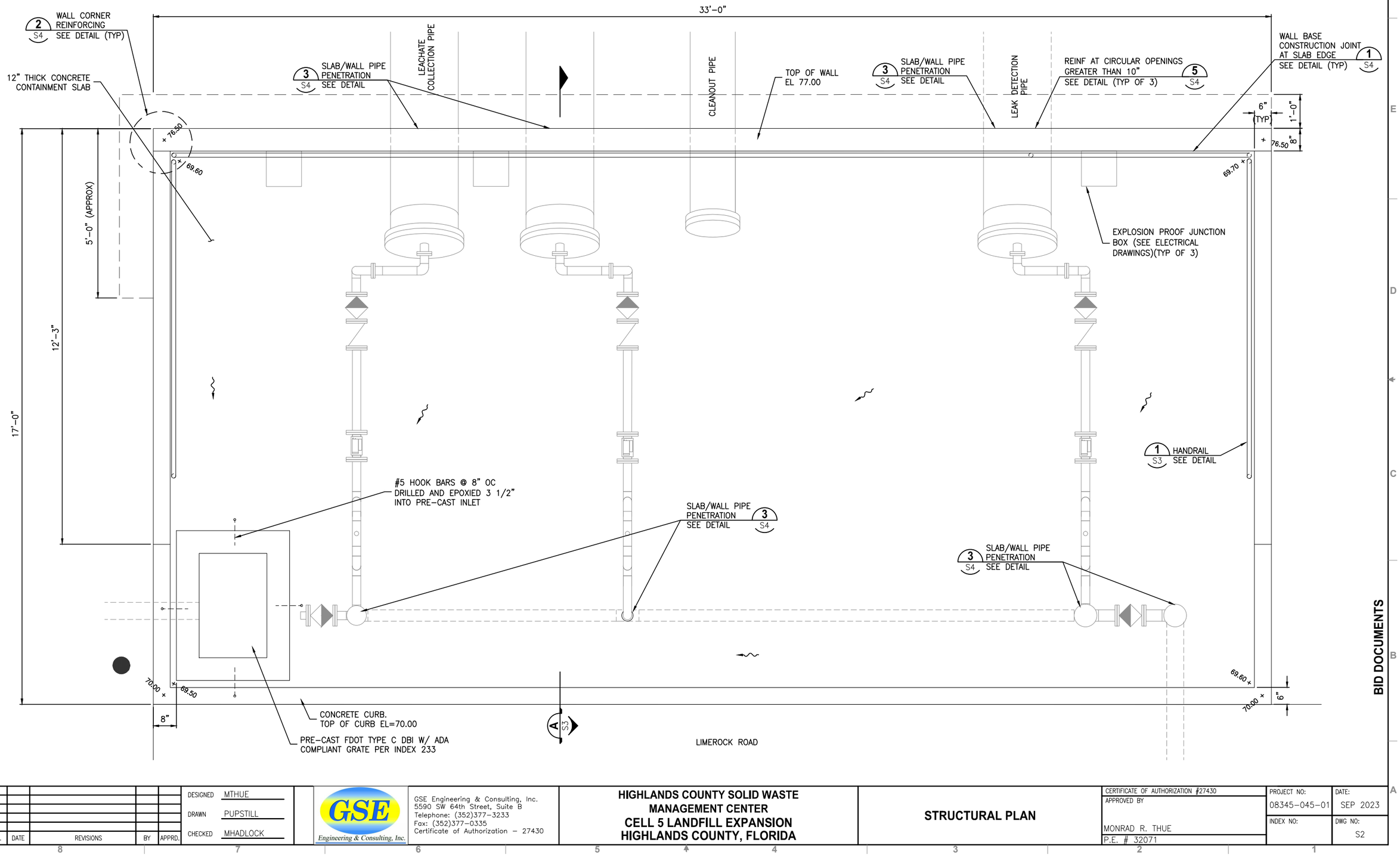
STRUCTURAL NOTES AND ABBREVIATIONS

CERTIFICATE OF AUTHORIZATION #27430
APPROVED BY
MONRAD R. THUE
P.E. # 32071

PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: S1

NOTE:
COAT PORTIONS OF 24" RISER PIPE IN CONTACT W/ CONCRETE WALL W/ FORM RELEASE PRIOR TO CASTING.

GRAPHIC SCALE
0 0.5 1 2
SCALE IN FEET



BID DOCUMENTS

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

STRUCTURAL PLAN

CERTIFICATE OF AUTHORIZATION #27430
APPROVED BY
MONRAD R. THUE
P.E. # 32071

PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: S2

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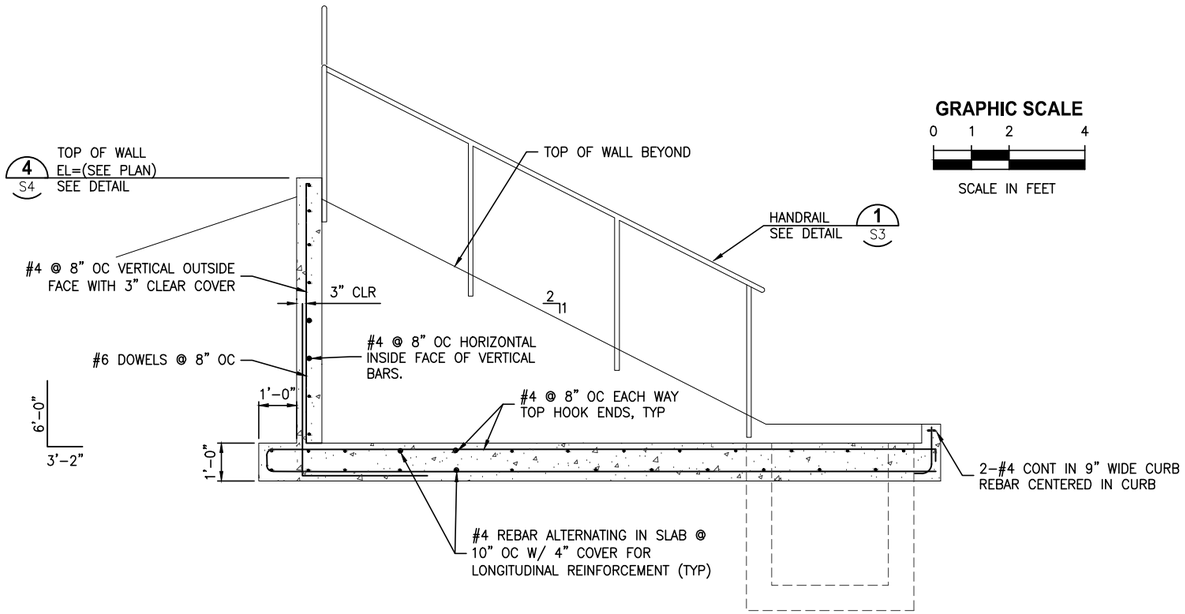
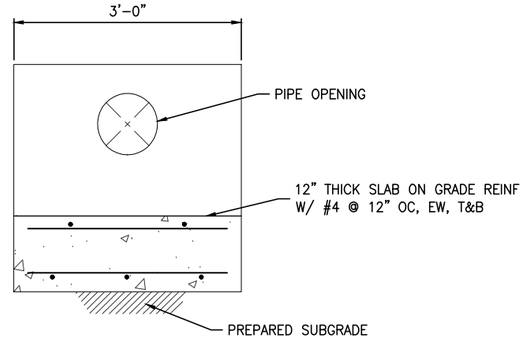


GRAPHIC SCALE

0 1 2 4

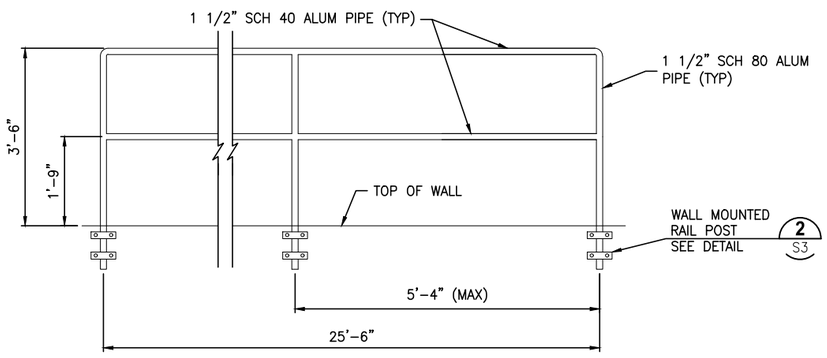
SCALE IN FEET

NOTE:
PIPING AND ELECTRICAL NOT SHOWN FOR CLARITY.



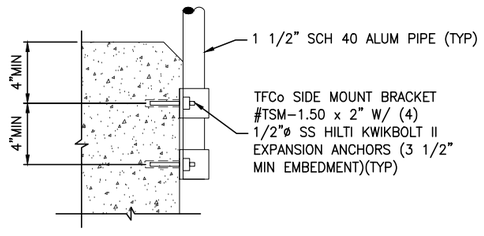
SECTION A-A

SECTION A S2



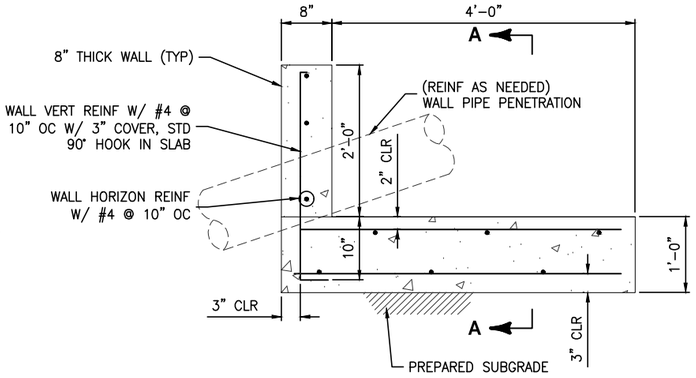
HANDRAIL DETAIL 1 S2,S3

NTS



WALL MOUNTED RAIL POST DETAIL 2 S3

NTS



NOTE:
COAT PORTIONS OF 24" RISER PIPE IN CONTACT W/ CONCRETE WALL W/ FORM RELEASE PRIOR TO CASTING.

LEACHATE COLLECTION CLEANOUT RETAINING WALL DETAIL 3 C23

NTS

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED MTHUE
DRAWN PUPSTILL
CHECKED MHADLOCK

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

STRUCTURAL SECTION AND DETAILS

CERTIFICATE OF AUTHORIZATION #27430
APPROVED BY
MONRAD R. THUE
P.E. # 32071

PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: S3

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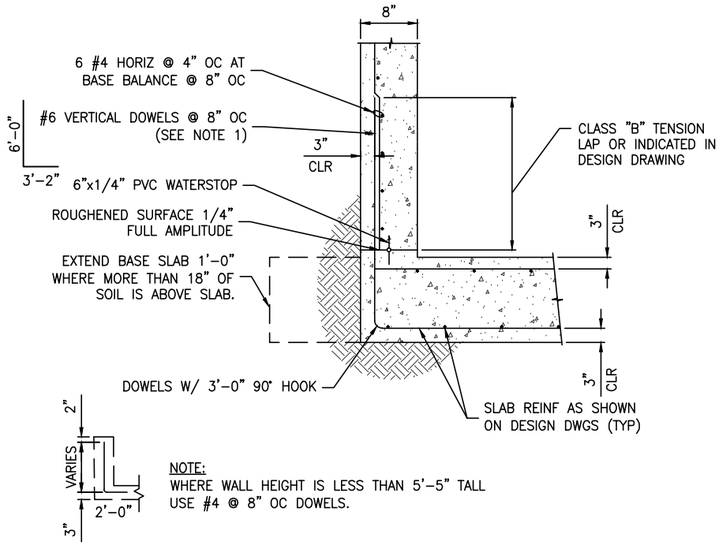
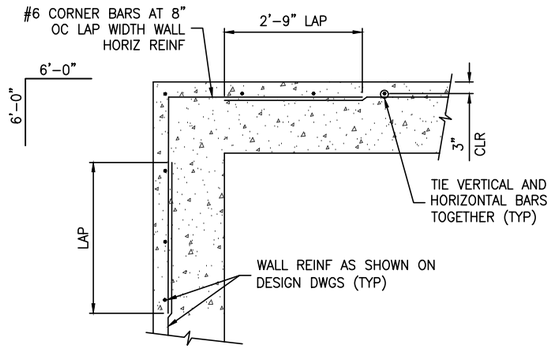
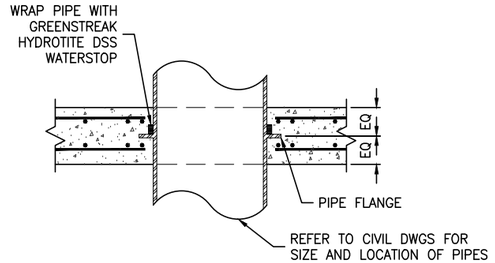


NOTE:
WHERE WALL HEIGHT IS LESS THAN 5'-5" TALL USE #4 @ 8" OC DOWELS.

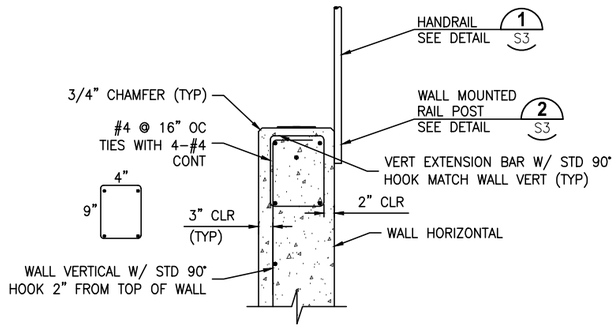
WALL BASE CONSTRUCTION JOINT AT SLAB EDGE DETAIL 1
NTS — S2



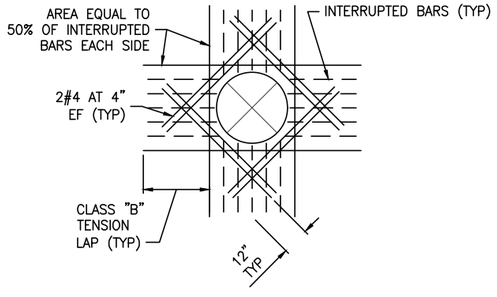
WALL CORNER REINFORCING DETAIL 2
NTS — S2



SLAB/WALL PIPE PENETRATION DETAIL 3
NTS — S2

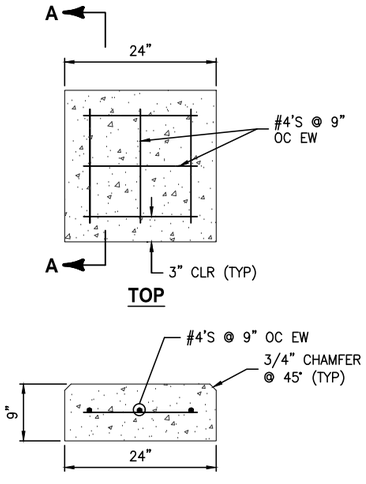


TOP OF WALL DETAIL 4
NTS — S3



NOTE:
WHERE OPENING IS WITHIN 4'-0" OF BASE SLAB
PROVIDE MATCHING DOWELS FOR ADD BARS

REINF AT CIRCULAR OPENINGS GREATER THAN 10" DETAIL 5
NTS — S2



SECTION A-A

PIPE SUPPORT PAD DETAIL 6
NTS — M6

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

STRUCTURAL DETAILS

CERTIFICATE OF AUTHORIZATION #27430
APPROVED BY
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P.E. # 32071

PROJECT NO: 08345-045-01
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MECHANICAL ABBREVIATIONS

ARV	AIR RELEASE VALVE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
BCCMP	BITUMINOUS COATED CORRUGATED METAL PIPE
BLD	BLIND
BV	BALL VALVE
BWJ	BUTT–WELDED JOINT
CI	CORRUGATED METAL PIPE
CMP	CAST IRON
CONC	CONCRETE
DI	DUCTILE IRON
DIP	DUCTILE IRON PIPE
ELL	ELBOW
FJ	FLANGED JOINT
FLG	FLANGE
FNPT	FEMALE NATIONAL PIPE THREAD
FRP	FIBERGLASS REINFORCED PLASTIC
GALV	GALVANIZED
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
IE	INVERT ELEVATION
LFM	LEACHATE FORCE MAIN
LR	LONG RADIUS
MJ	MECHANICAL JOINT
MNPT	MALE NATIONAL PIPE THREAD
NPT	AMER. STD. TAPER PIPE THREAD
OC	ON CENTER(S), OPEN–CLOSE(D)
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PE	PLAIN END
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RED	REDUCER
REQ, REQ'D	REQUIRED
RTR	REINFORCED THERMOSETTING RESIN
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SOF	SLIP–ON FLANGE
SS	STAINLESS STEEL
THRD	THREADED
WJ	WELDED JOINT
WWF	WELDED WIRE FABRIC
XLPE	CROSS–LINKED POLYETHYLENE

MECHANICAL NOTES

1. ALL PIPING SHALL HAVE A MINIMUM COVER OF 36" BELOW FINAL GRADE UNLESS OTHERWISE NOTED.
2. WHERE IT IS NECESSARY TO DEFLECT PRESSURE PIPE EITHER HORIZONTALLY OR VERTICALLY, PIPE DEFLECTION SHALL NOT EXCEED 75% OF THE MANUFACTURER'S RECOMMENDED DEFLECTION ANGLE OR A MINIMUM BENDING RADIUS OF 25 TIMES THE OUTSIDE DIAMETER OF THE PIPE.
3. ALL PIPING SHALL BE PROPERLY SUPPORTED. ALL PIPING WHICH WILL BE PRESSURIZED DURING OPERATION SHALL BE PROPERLY RESTRAINED.
4. ALL PIPING AND FITTINGS SHALL BE FUSION WELDED HDPE SDR 11 UNLESS OTHERWISE NOTED IN THE CONTRACT DOCUMENTS.
5. NOT ALL FLANGE AND MECHANICAL JOINT CONNECTIONS ARE SHOWN FOR CLARITY. ALL ABOVE GRADE DUCTILE IRON FITTINGS SHALL BE FLANGED. ALL BELOW GRADE DUCTILE IRON FITTINGS SHALL BE MECHANICAL JOINT.
6. CONTRACTOR SHALL RESTRAIN ALL BELOW GRADE PIPE.

MECHANICAL LEGEND

DOUBLE LINE	SINGLE LINE	
		PIPE
		WELDED PIPE
		FLANGED JOINT
		MECHANICAL JOINT OR RESTRAINED PUSH–ON JOINT
		FLEXIBLE COUPLING ADAPTER
		EXPANSION JOINT
		HUB & SPIGOT JOINT
		BALL JOINT
		FLANGED COUPLING ADAPTER W/ THRUST TIES
		FLEXIBLE COUPLING WITH THRUST TIES
		BLIND FLANGE
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		FEMALE QUICK DISCONNECT FITTING
		MALE QUICK DISCONNECT FITTING
	$\triangle_1$	PIPE SUPPORT AND TYPE

PIPING SYMBOLS

DOUBLE LINE	SINGLE LINE	
		LATERAL UP
		LATERAL DOWN
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER
		UNION
		CAP
		ANCHOR
		WYE
		TEE
		CROSS
		ELBOW, 90 DEGREE
		ELBOW, 45 DEGREE
		ELBOW, 22.5 DEGREE
		ABANDON IN PLACE
		DEMOLISH AND REMOVE

VALVE SYMBOLS

- GATE
- BUTTERFLY
- BALL
- CHECK
- DIAPHRAGM
- NEEDLE
- PLUG
- PRESSURE RELIEF
- AIR RELEASE AND/OR VACUUM RELIEF
- REGULATED SIDE
- HYDRAULIC CONTROL VALVE
- UNION
- BALL CHECK

ACTUATOR SYMBOLS

- M XX — ELECTRIC MOTOR
- EH XX — ELECTROHYDRAULIC
- P XX — PNEUMATIC
- H XX — HYDRAULIC
- S — SOLENOID
- MANUAL

NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL OR HYDRAULIC)
XX: FO = FAIL OPEN
FC = FAIL CLOSED
FLP = FAIL TO LAST POSITION

EXAMPLE:

16V200
- SPECIFIED VALVE TYPE
- VALVE DESIGNATOR
- NOMINAL VALVE DIAMETER

VALVE TYPES
902 – ECCENTRIC PLUG VALVE
456 – DUCKBILL–SHAPED IN–LINE CHECK VALVE
140 – AIR RELEASE VALVE

VALVE DESIGNATION

NOTE:
EXISTING PIPE AND EQUIPMENT IS SHOWN IN THE DRAWINGS AS LIGHT–LINED AND/OR SCREENED. PROPOSED PIPE AND EQUIPMENT IS SHOWN IN THE DRAWINGS AS HEAVY–LINED. ABOVE GRADE PIPE AND EQUIPMENT IS SHOWN IN DRAWINGS AS SOLID–LINED. BELOW GRADE PIPE AND EQUIPMENT IS SHOWN IN DRAWINGS AS DASHED–LINED. SEE BELOW EXAMPLES:

- EXISTING PIPE (ABOVE GRADE)
- NEW PIPE (BELOW GRADE)

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

MECHANICAL NOTES AND LEGENDS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY GEORGE A. REINHART III, PHD, PE, ON THE DATE INDICATED ON COVER PAGE (G1).
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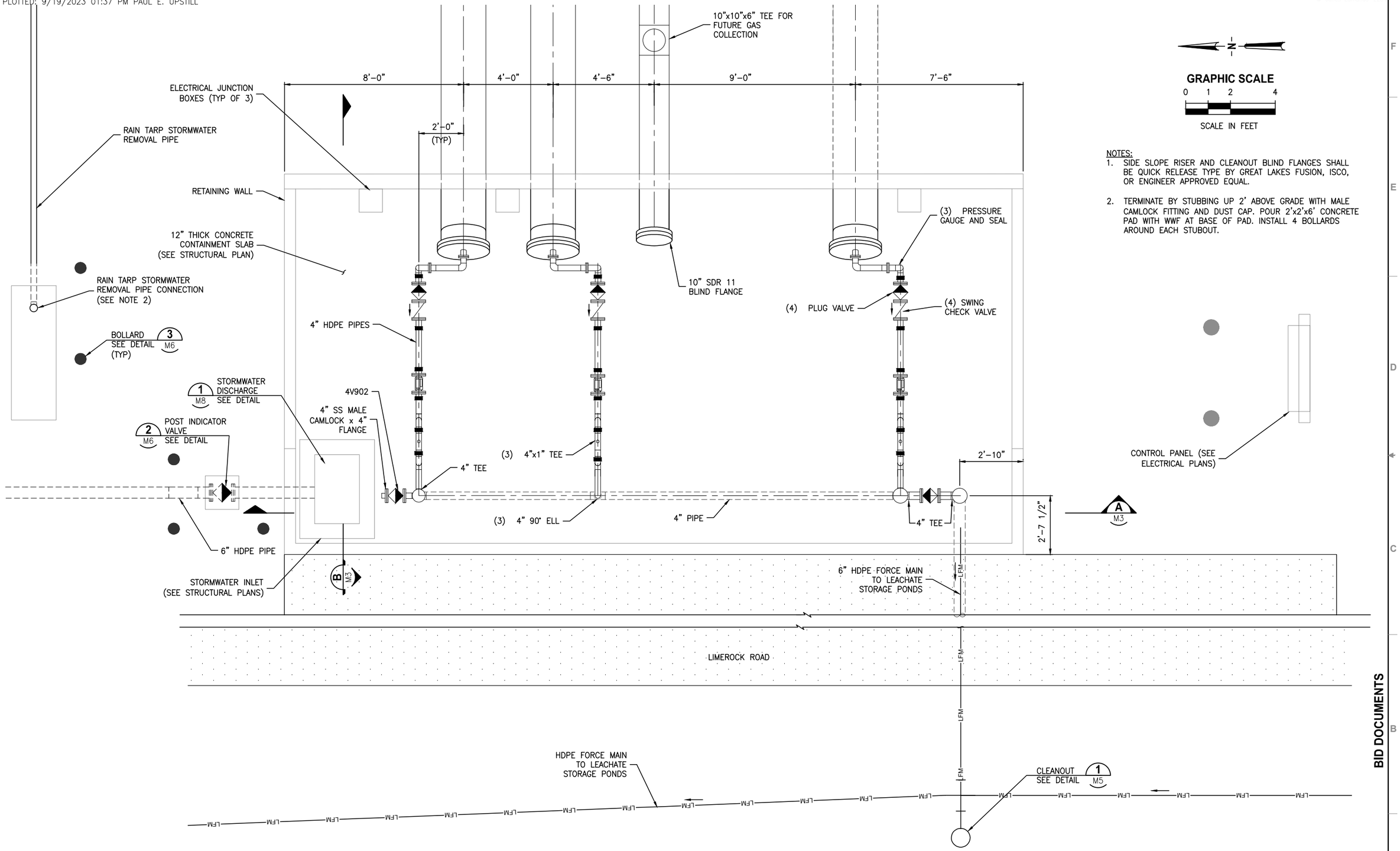

N

GRAPHIC SCALE

0 1 2 4

SCALE IN FEET

NOTES:

1. SIDE SLOPE RISER AND CLEANOUT BLIND FLANGES SHALL BE QUICK RELEASE TYPE BY GREAT LAKES FUSION, ISCO, OR ENGINEER APPROVED EQUAL.
2. TERMINATE BY STUBBING UP 2' ABOVE GRADE WITH MALE CAMLOCK FITTING AND DUST CAP. POUR 2'x2'x6' CONCRETE PAD WITH WWF AT BASE OF PAD. INSTALL 4 BOLLARDS AROUND EACH STUBOUT.

BID DOCUMENTS

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DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

LEACHATE PUMP STATION MECHANICAL PLAN

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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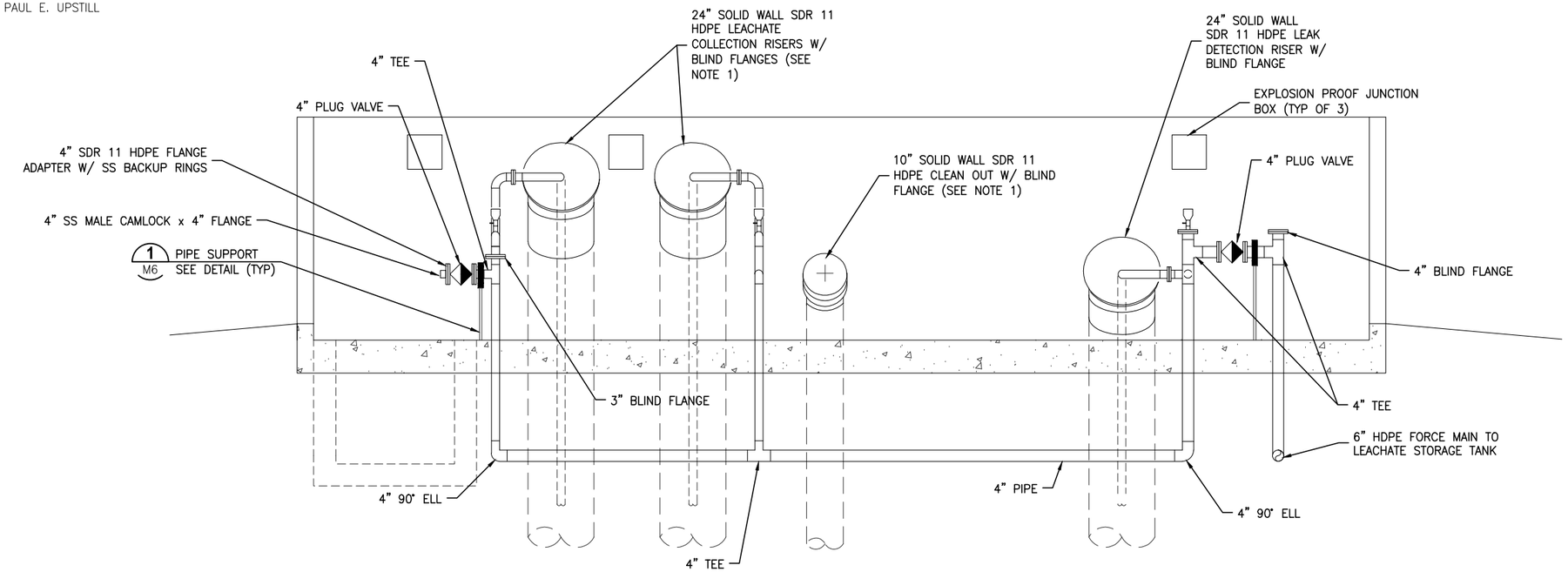
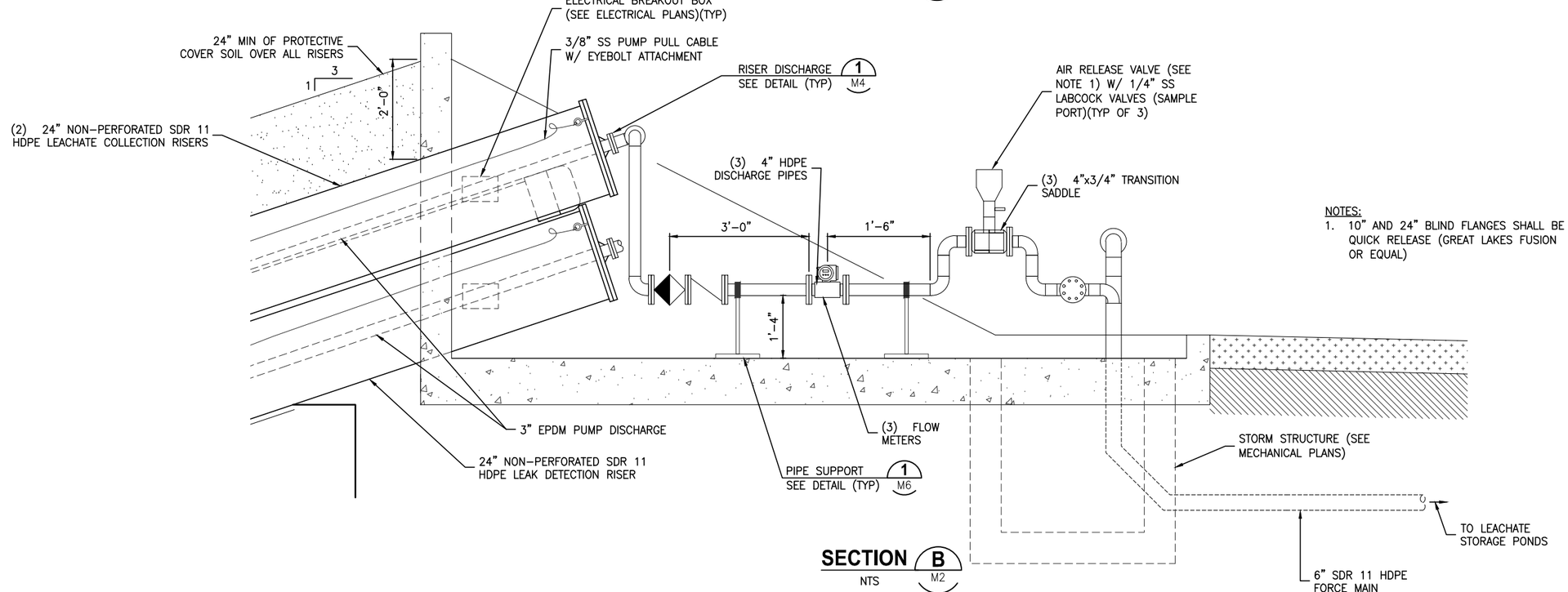
08345-045-01	SEP 2023
INDEX NO:	DWG NO: M2



SECTION A (M2)
NTS



SECTION B (M2)
NTS

NOTES:
1. 10" AND 24" BLIND FLANGES SHALL BE QUICK RELEASE (GREAT LAKES FUSION OR EQUAL)

BID DOCUMENTS

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DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

MECHANICAL SECTIONS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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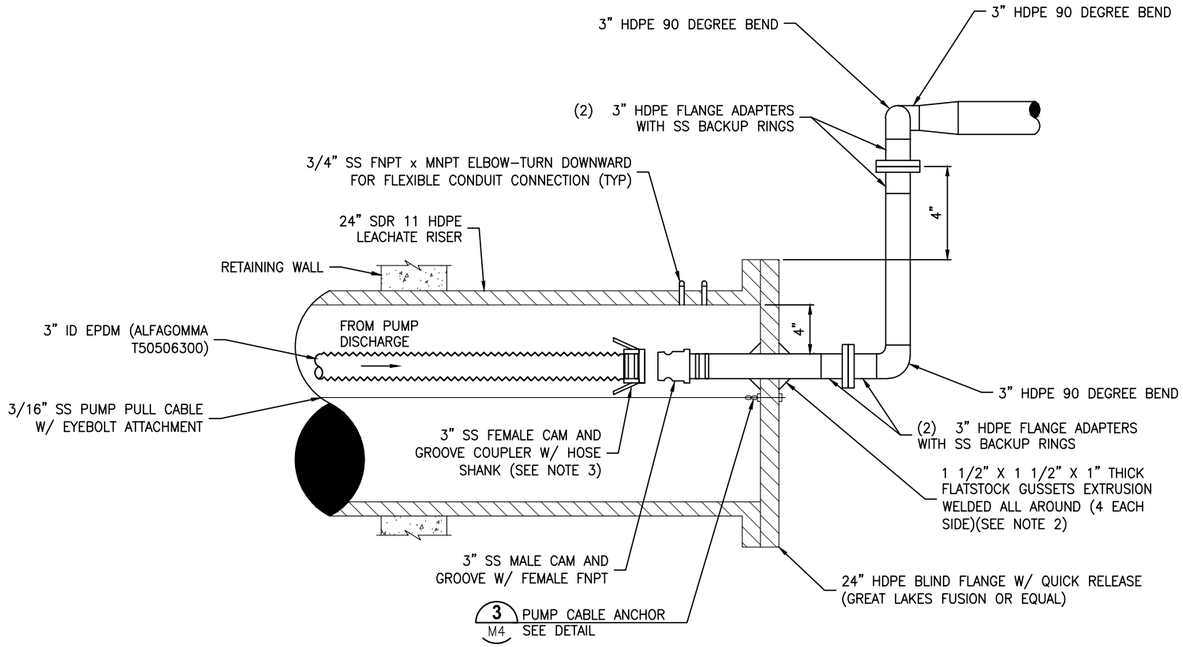
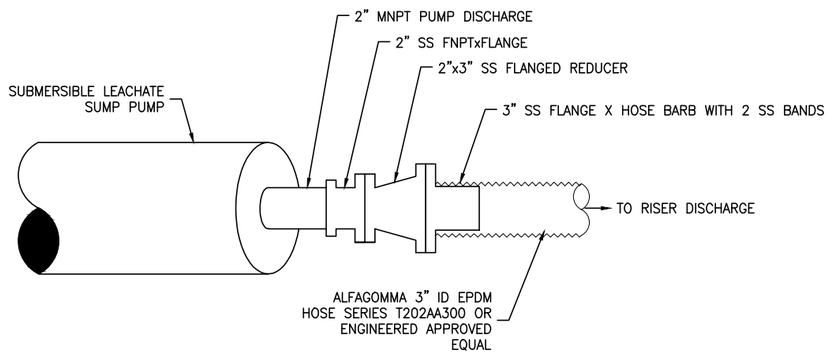
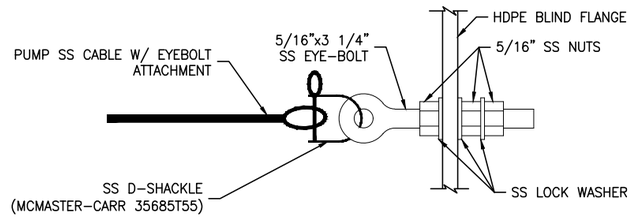


NOTES:
1. PIPE AND FITTING PENETRATIONS THROUGH HDPE FLANGE SHALL BE GAS TIGHT.
2. LOCATE GUSSETS TO AVOID CONFLICTS WITH FLEXIBLE CONDUIT PENETRATIONS AND FLANGE BOLTS.
3. ATTACH HOSE TO HOSE SHANK IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS FOR USE IN CORROSIVE ENVIRONMENTS.

RISER DISCHARGE DETAIL 1 (M3)
NTS



PUMP DISCHARGE DETAIL 2 (C20)
NTS



PUMP CABLE ANCHOR DETAIL 3 (M4)
NTS

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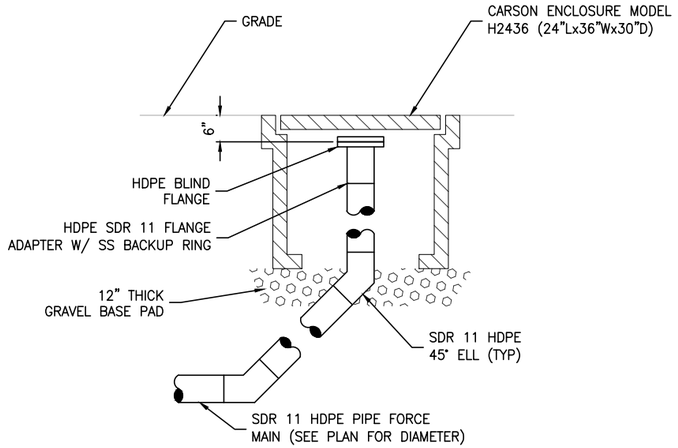
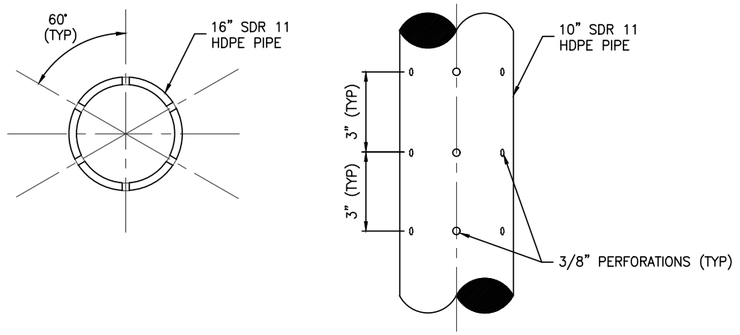


CLEANOUT DETAIL 1

NTS

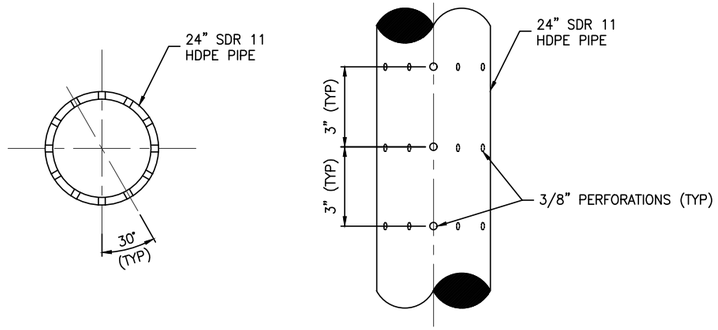
M2



10" PERFORATED SDR 11 HDPE LEACHATE COLLECTION PIPE DETAIL 2

NTS

C18,C20



24" PERFORATED SDR 11 HDPE LEACHATE COLLECTION/DETECTION PIPE DETAIL 3

NTS

C20,C21

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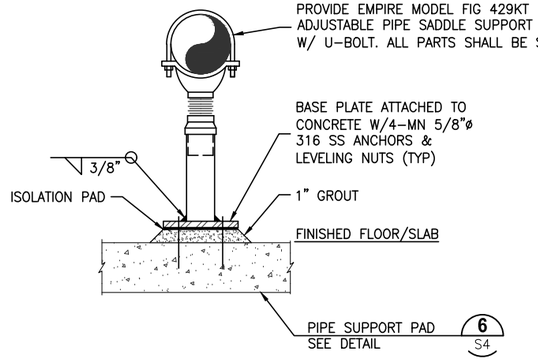
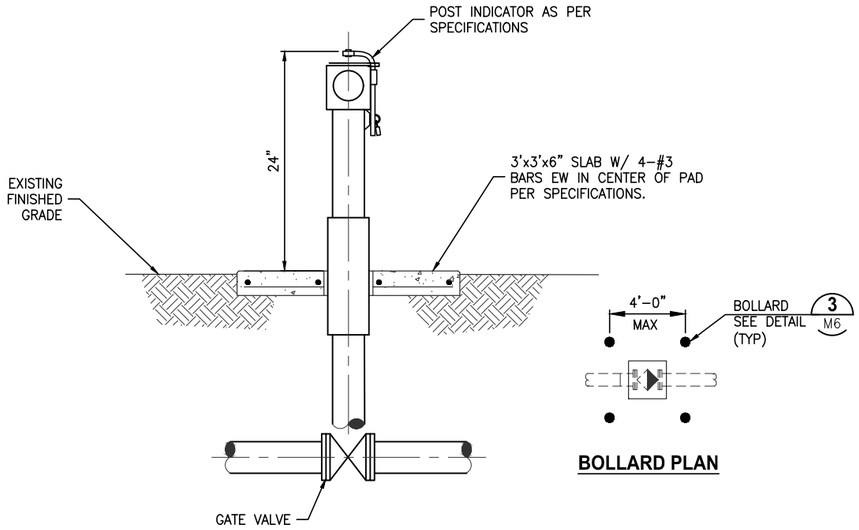
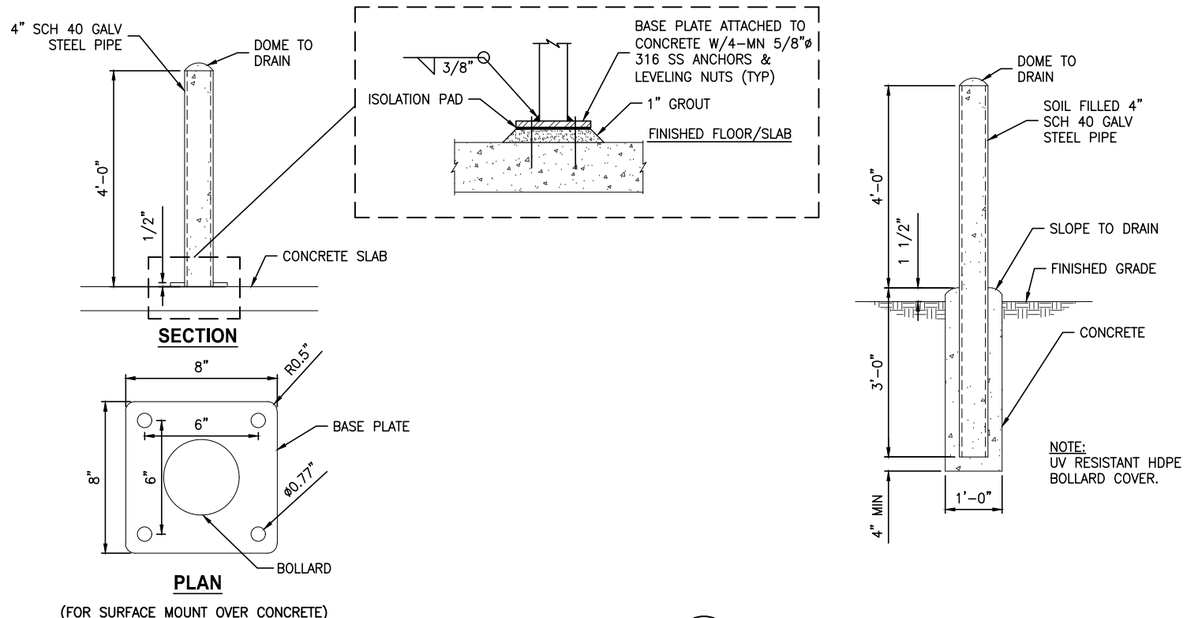


PIPE SUPPORT DETAIL 1
NTS M3

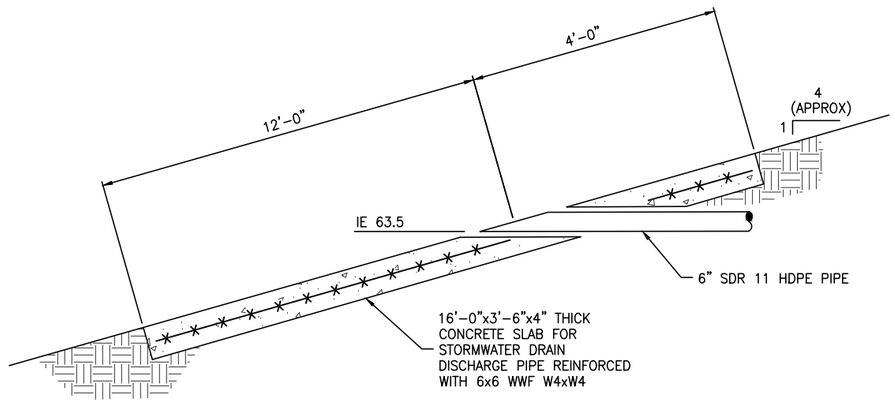


BOLLARD PLAN

POST INDICATOR VALVE DETAIL 2
NTS M2,M8



BOLLARD DETAIL 3
NTS C27,C28,C29,M2,M6,M8,E3



6" MITERED END DETAIL 4
NTS M8

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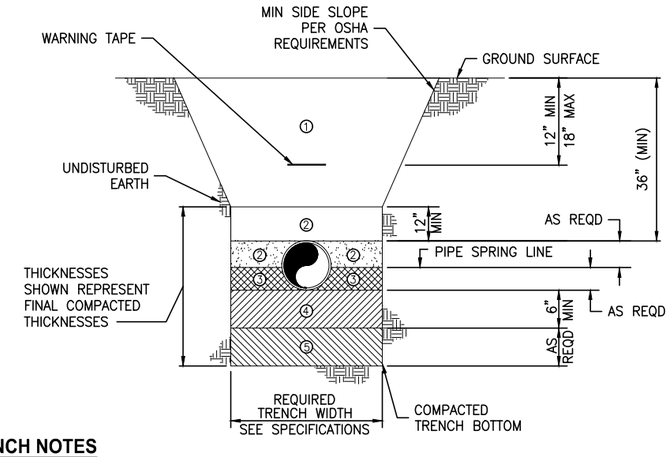


PIPE TRENCH NOTES

① FINAL BACKFILL – CLEAN, WELL GRADED MATERIAL IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT SPECIFICATIONS. FINAL BACKFILL SHALL BE INSTALLED IN LIFTS NOT EXCEEDING 8 INCHES, LOOSE MEASUREMENT, AND SHALL BE COMPACTED, AS SPECIFIED.

② INITIAL BACKFILL – CLEAN, WELL GRADED MATERIAL IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT SPECIFICATIONS. BACKFILL SHALL BE INSTALLED IN LIFTS NOT EXCEEDING 6 INCHES, LOOSE MEASUREMENT, AND SHALL BE COMPACTED, AS SPECIFIED. BACKFILL SHALL EXTEND TO THE TOP OF THE PIPE AFTER COMPACTION. ALL LIFTS SHALL BE COMPACTED BY HAND TAMPING OR AN APPROVED METHOD OF MECHANICAL TAMPING.

③ HAUNCHING – CLEAN, WELL GRADED MATERIAL IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT SPECIFICATIONS. HAUNCHING SHALL BE INSTALLED IN COMPLETELY DEWATERED TRENCHES IN LIFTS NOT EXCEEDING 4 INCHES, LOOSE MEASUREMENT, AND SHALL BE COMPACTED, AS SPECIFIED, ASTM D–1557, BY HAND TAMPING. HAUNCHING SHALL BE BROUGHT UP EQUALLY ON BOTH SIDES OF THE PIPE.

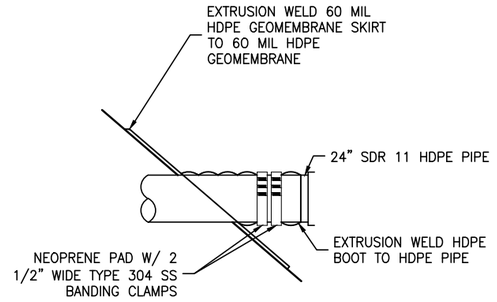
④ BEDDING – CLEAN, WELL GRADED MATERIAL IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT SPECIFICATIONS. BEDDING SHALL BE INSTALLED IN COMPLETELY DEWATERED TRENCHES IN LIFTS NOT EXCEEDING 6 INCHES, LOOSE MEASUREMENT, AND SHALL BE COMPACTED TO AT LEAST 95% MODIFIED PROCTOR MAXIMUM DRY DENSITY, ASTM D–1557, BY HAND OR MECHANICAL TAMPING. PROPERLY SHAPED BELL HOLES SHALL BE EXCAVATED IN THE COMPACTED BEDDING TO PERMIT ASSEMBLY OF THE PIPE.

NOTE: NATIVE, UNDISTURBED MATERIAL IN COMPLETELY DEWATERED TRENCHES MEETING THE REQUIREMENTS FOR COMPACTED BEDDING MATERIAL NEED NOT BE REPLACED OR REWORKED, EXCEPT FOR SHAPING OF BELL HOLES, AND WHERE REFILL IS REQUIRED.

⑤ REFILL – REQUIRED WHERE TRENCH HAS BEEN OVER–EXCAVATED. REFILL SHALL BE INSTALLED IN COMPLETELY DEWATERED TRENCHES IN LIFTS NOT EXCEEDING 6 INCHES AND COMPACTED TO 95% OF ASTM D1557 MAX DRY DENSITY, BY HAND OR MECHANICAL TAMPING.

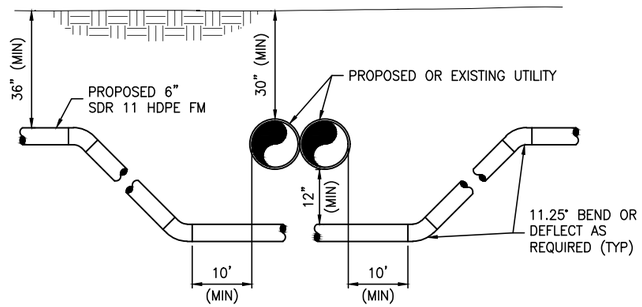
TYPICAL PIPE TRENCH DETAIL 1

NTS — C12,C13,C14,M8



STANDARD BOOT SEAL DETAIL 2

NTS — C20



NOTE:
STABILIZED SUBGRADE SHALL BE 12" MINIMUM WHERE SPACE PERMITS PER THE PLANS.

UTILITY CONFLICT DETAIL 3

NTS — C12,C13,E2

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

MECHANICAL DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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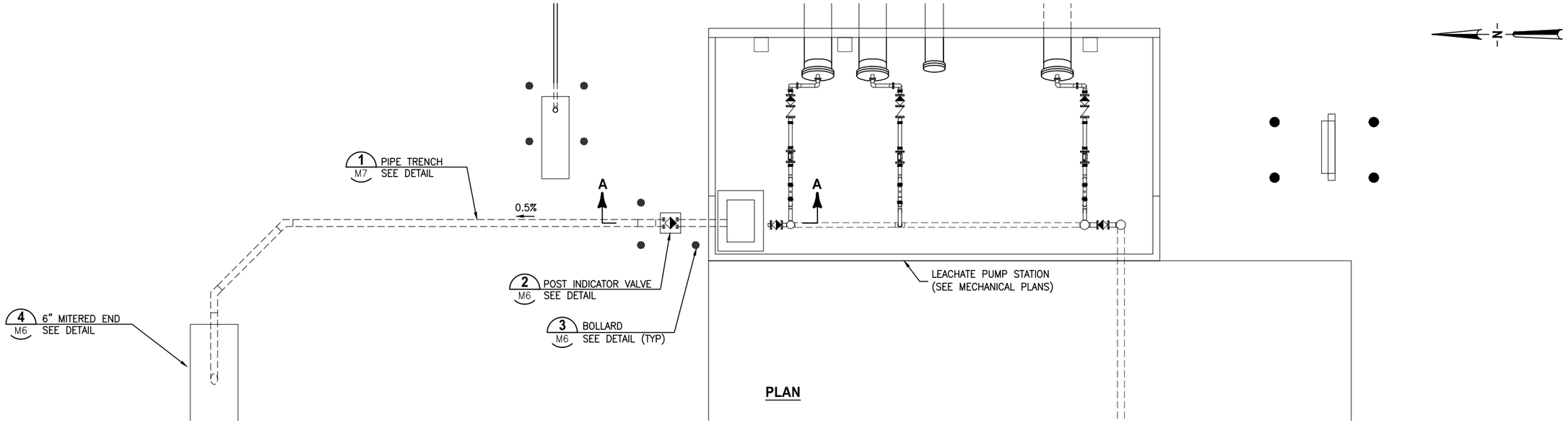

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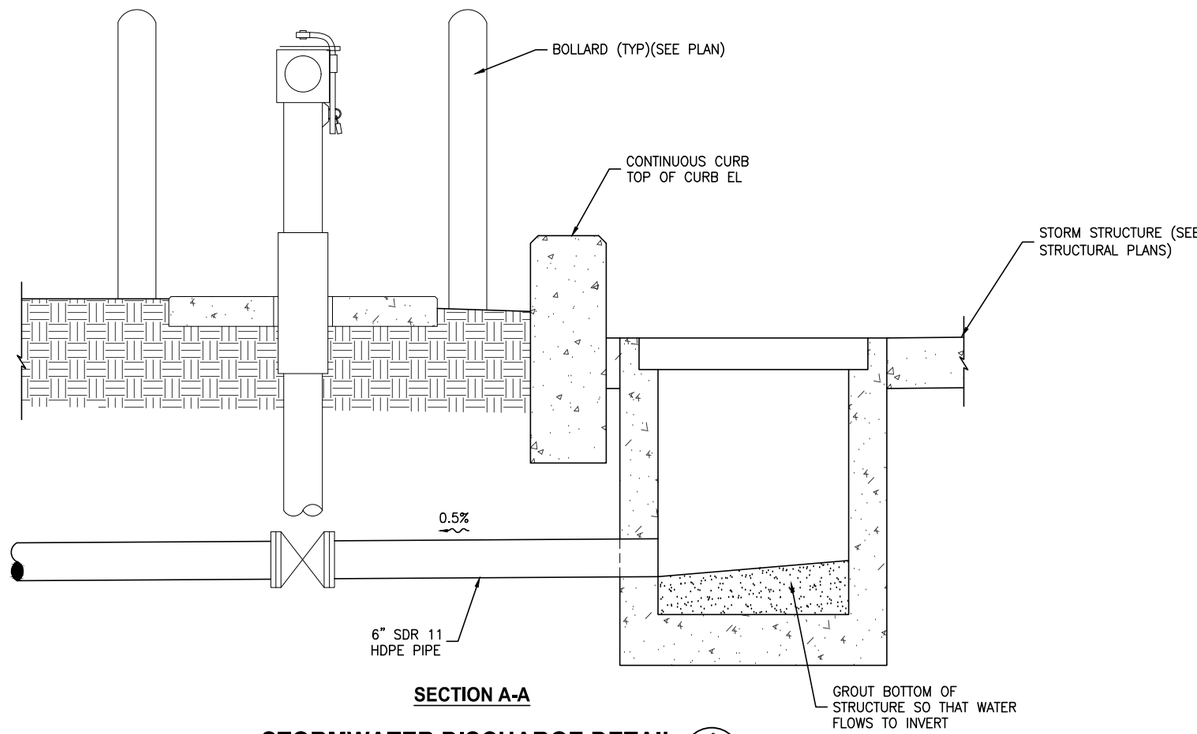

SECTION A-A

STORMWATER DISCHARGE DETAIL 1 M2

NTS

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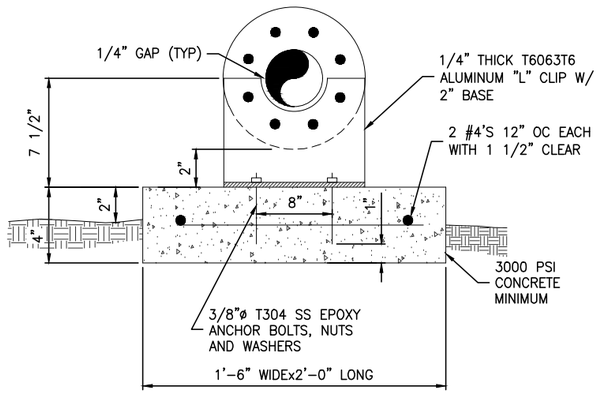
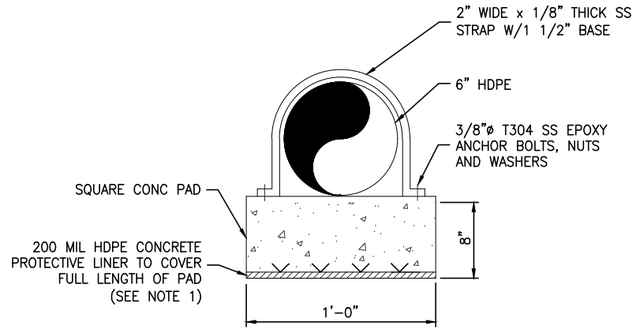
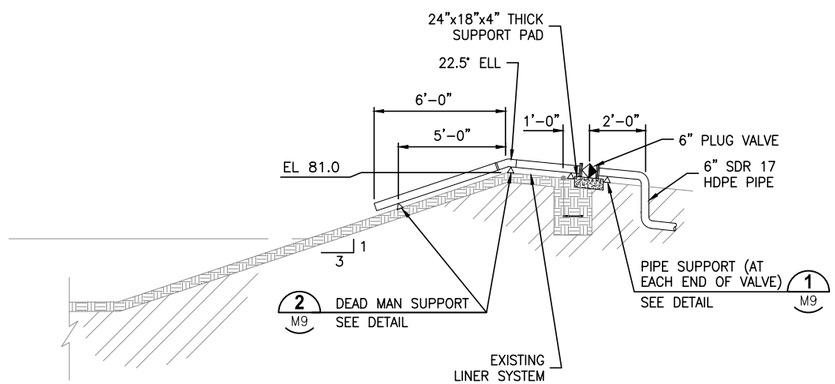


PIPE SUPPORT DETAIL 1
NTS — M9



NOTES:
1. CONCRETE PROTECTIVE LINER SHALL BE AGRU SURE-GRIP OR ENGINEER APPROVED EQUAL.

DEAD MAN SUPPORT 2
NTS — M9



LEACHATE STORAGE POND DISCHARGE DETAIL 3
NTS — C14

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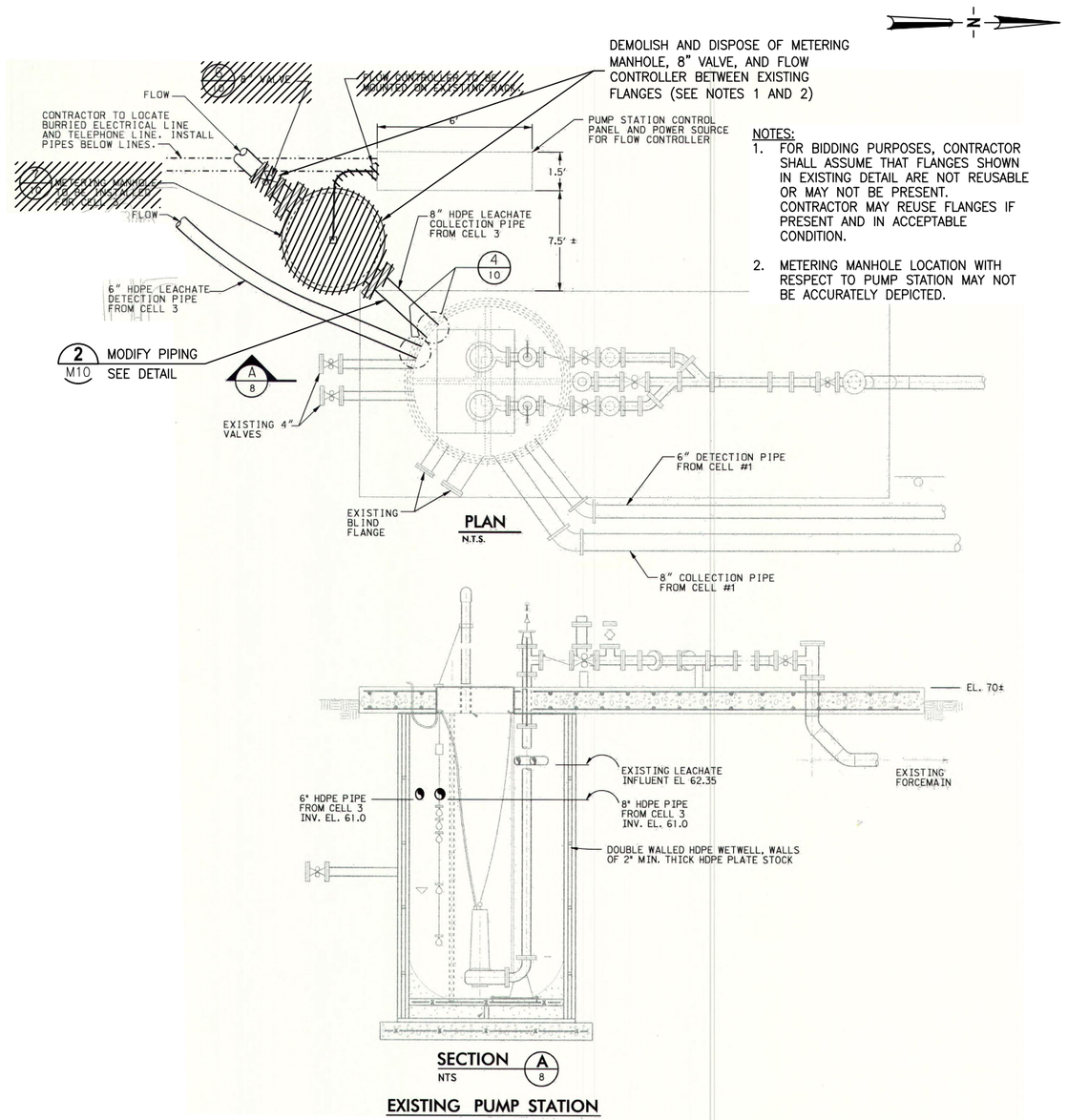
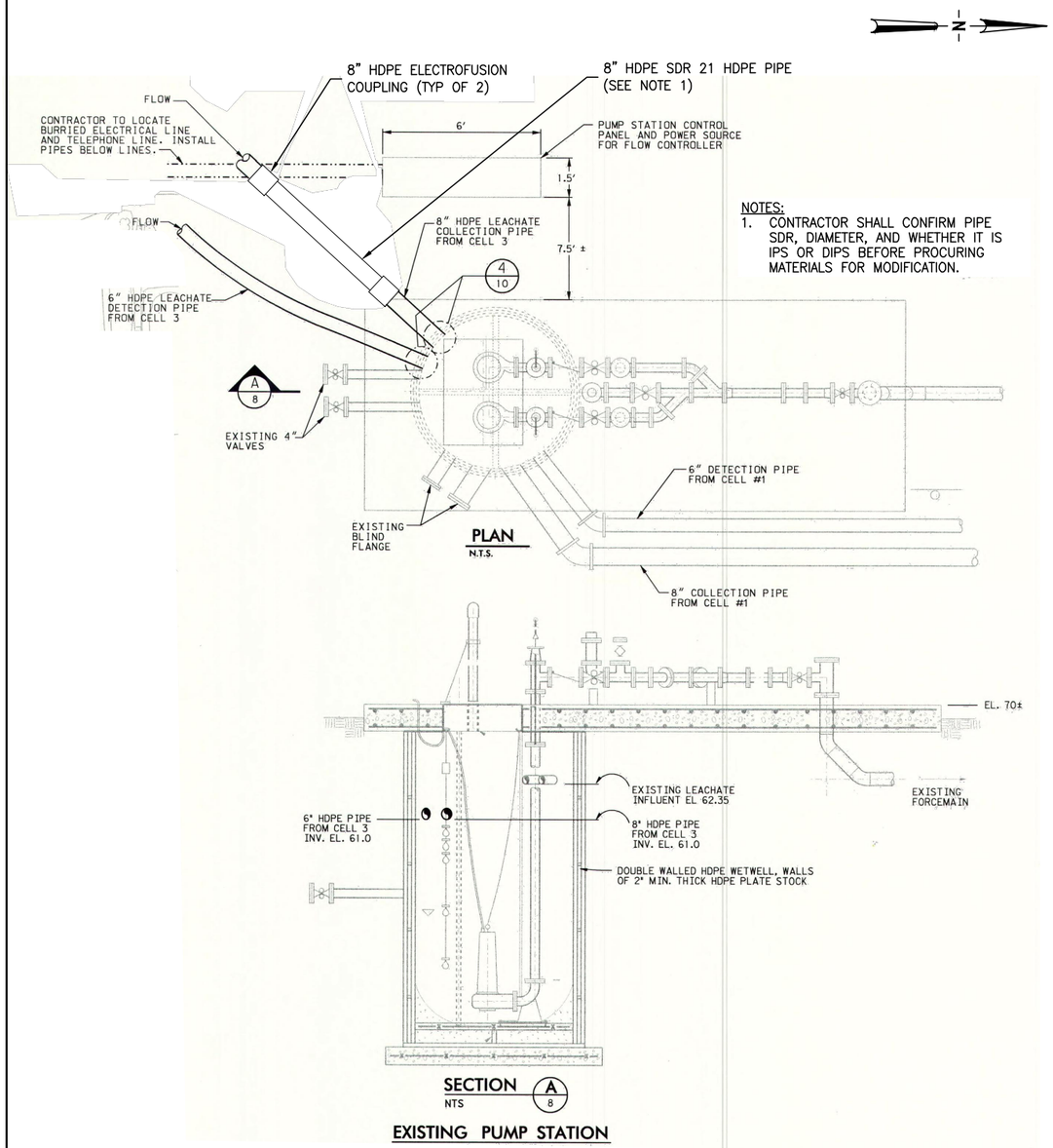


NOTES:
1. FOR BIDDING PURPOSES, CONTRACTOR SHALL ASSUME THAT FLANGES SHOWN IN EXISTING DETAIL ARE NOT REUSABLE OR MAY NOT BE PRESENT. CONTRACTOR MAY REUSE FLANGES IF PRESENT AND IN ACCEPTABLE CONDITION.
2. METERING MANHOLE LOCATION WITH RESPECT TO PUMP STATION MAY NOT BE ACCURATELY DEPICTED.

METERING MANHOLE DEMOLITION DETAIL 1
NTS
C13,M9



NOTES:
1. CONTRACTOR SHALL CONFIRM PIPE SDR, DIAMETER, AND WHETHER IT IS IPS OR DIPS BEFORE PROCURING MATERIALS FOR MODIFICATION.

MODIFY PIPING DETAIL 2
NTS
M10

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ELECTRICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
ASD	ADJUSTABLE SPEED DRIVE OR VFD
ATS	AUTOMATIC TRANSFER SWITCH
BE	BOTTOM ELEVATION
BFG	BELOW FINISH GRADE
BMS	BUILDING MANAGEMENT SYSTEM BY DIV. 15.
C	CONDUIT
CB	CIRCUIT BREAKER
CE	CENTERLINE ELEVATION
CFWE	CABLE FURNISHED WITH EQUIPMENT
COMM	COMMUNICATION
CT	CONTACTOR
CU	COPPER
DD	DUSK TO DAWN
DISTRIB	DISTRIBUTION
DN	DOWN
DPDT	DOUBLE POLE, DOUBLE THROW
GEC	GLADES ELECTRIC COOPERATIVE
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EXST	EXISTING
FF	FINISHED FLOOR
FNPT	FEMALE NATIONAL PIPE THREAD
FT	FLOW TRANSMITTER
GALV	GALVANIZED
GEN	EMERGENCY GENERATOR
GFI	GROUND FAULT INTERRUPT
GFP	GROUND FAULT PROTECTION
GND	GROUND
LB	FITTING "L"–BACK
LIU	LIGHT INTERFACE UNIT
MC	MULTI–CONDUCTOR CABLE, TYPE TC
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MD	MOTORIZED DAMPER
MDP	MAIN DISTRIBUTION PANEL
MFG	MANUFACTURER
MIN	MINIMUM
MNPT	MALE NATIONAL PIPE THREAD
MT	MACHINE TOOL
MTS	MANUAL TRANSFER SWITCH
NF	NON FUSED
NIC	NOT IN CONTRACT
NOM	NOMINAL
P	POLE
PR	PAIR
PVC	POLYVINYL CHLORIDE
RH	RADIANT HEATER
RGS	RIGID GALVANIZED STEEL
SCA	SHORT CIRCUIT AMP
SCH	SCHEDULE
SDBC	SOFT DRAWN BARE COPPER
SECT	SECTION
SMC	SOFT START MOTOR CONTROLLER
SP	SINGLE POLE
SPD	SURGE PROTECTIVE DEVICE
SPDT	SINGLE POLE, DOUBLE THROW
SSRV	SOFT START REDUCED VOLTAGE
STD	STANDARD
STL	STEEL
THWN	THERMOPLASTIC HEAT RESISTANT WATER RESISTANT NYLON COATING
T, TRANS	TRANSFORMER
TTB	TELEPHONE TERMINAL BOARD
TC	TIME CLOCK
TE	TOP ELEVATION
TELE	TELEPHONE
TELECOMM	TELECOMMUNICATIONS
TYP	TYPICAL
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UTP	UNSHIELDED TWISTED PAIR
VFD	VARIABLE FREQUENCY DRIVE BY DIV. 15, WIRED BY DIV. 16
W/	WITH
W/O	WITH OUT
WP	WEATHERPROOF
WT	WEIGHT
XMH	EXISTING MANHOLE

PHYSICAL LEGEND

1	FLAG OR SPECIFIC NOTE
1	KEY NOTES, CIRCUIT REFERENCE
E	EXISTING HANDHOLE
PB1	IN GROUND PULL BOX (NUMBER INDICATED), USED FOR ROUTING CONTROL CIRCUITS, UNLESS INDICATED OTHERWISE
HH1	HANDHOLE (NUMBER INDICATED), USED FOR ROUTING LOW VOLTAGE POWER CIRCUITS, UNLESS INDICATED OTHERWISE
J H J	JUNCTION BOX – WALL OR CEILING MOUNTED
	CONDUIT UP (MULTIPLE OR SINGLE)
	CONDUIT DOWN (MULTIPLE OR SINGLE)
	CONDUIT CAP
	CONDUIT ROUTED EXPOSED
	CONDUIT ROUTED UNDERGROUND
	MULTIPLE CONDUIT ROUTED UNDERGROUND
OHE	OVERHEAD ELECTRIC LINE
UGE	UNDERGROUND ELECTRIC LINE
UGC	UNDERGROUND COMMUNICATION LINE
OHT	OVERHEAD TELEPHONE LINE
MCC–3	CIRCUIT REFERENCE, SEE SCHEDULES
DB–1,3,5	HOMERUN (3/4" C) –1,2,3 INDICATE THE PANEL CIRCUITS. WIRE SIZES OTHER THAN #12 AND CONDUIT OTHER THAN 3/4" C SHALL BE CALLED OUT. PROVIDE GROUND IN ALL RUNS PER N.E.C. 2002 TABLE 250–95. DB INDICATES THE PANEL,
	DUPLEX RECEPTACLE
	DISCONNECT SWITCH
3 60/NF	RATING, NO. OF POLES, FUSE SIZE (NF = NON–FUSED)
	ELECTRICAL GROUND
	GROUND ROD WITH TEST WELL, 5/8"x20'–0" COPPER CLAD (UNLESS OTHERWISE INDICATED)
	COILED UP CONDUCTORS, NOT ELECTRICALLY POWERED
VFD	VARIABLE FREQUENCY DRIVE
SMC	SOFT START MOTOR CONTROLLER
	LIGHT FIXTURE
A	POLE MOUNTED LIGHT FIXTURE (A= FIXTURE TYPE)
	POWER POLE
I	INSTRUMENTATION, TYPE INDICATED
S/S	SURGE PROTECTION DEVICE
	ASPHALT RESTORATION
OR	SAFETY SHOWER
M	MOTOR OPERATED VALVE

ONE LINE DIAGRAM LEGEND

SYMBOL	DESCRIPTION
5	MOTOR, HORSEPOWER INDICATED
TC	TIME CLOCK (24 HR, 15 MIN ON/OFF)
D	TIME DELAY RELAY
E	ELAPSED TIME METER
H	MOTOR SPACE HEATER
M	METER
MC	MOTOR CONTROLLER
PM	PHASE MONITOR RELAY
T	TORQUE SWITCH
AS	AMP METER SWITCH
A	AMP METER
VS	VOLT METER SWITCH
V	VOLT METER
	FUSE
P	PHOTOELECTRIC CONTROL
	SELECTOR SWITCH HAND OFF AUTOMATIC (HOA) ON–OFF (O–O) ON OFF REMOTE (OOR) VFD/BYPASS (V–B)
	SURGE PROTECTION DEVICE (SPD)
	CIRCUIT BREAKER (TRIP AMPS INDICATED) 3 POLE UNLESS OTHERWISE INDICATED
	SWITCH
	CURRENT TRANSFORMER
	POWER TRANSFORMER
FVNR	COMBINATION MOTOR STARTER WITH CIRCUIT BREAKER FVNR = FULL VOLTAGE NON–REVERSING RVAT = REDUCED VOLTAGE AUTOTRANSFORMER VFD = VARIABLE FREQUENCY DRIVE
G	STANDBY EMERGENCY GENERATOR
CPT	CONTROL POWER TRANSFORMER
	ELECTRICAL ITEM TO BE DEMOLISHED
LT V–XC	LEVEL TRANSMITTER, LOOP NUMBER
FIT V–XC	FLOW INDICATOR TRANSMITTER, LOOP NUMBER
FE V–XC	FLOW ELEMENT, LOOP NUMBER

ELECTRICAL NOTES

1. THE CONTRACT DOCUMENTS MAY NOT REFLECT ALL EXISTING SERVICES OR SHOW THEM IN THEIR EXACT OR EXISTING LOCATIONS ABOVE OR BELOW GRADE. ANY SERVICE THAT IS INTERRUPTED BY THE CONTRACTOR WITHIN OR OUTSIDE OF THE DESIGNATED LIMITS, ABOVE OR BELOW GRADE, WHETHER SHOWN OR NOT SHOWN ON THE CONTRACT DOCUMENTS, SHALL BE IMMEDIATELY REPAIRED BY AND AT THE EXPENSE OF THE CONTRACTOR AND TO NO ADDITIONAL COST TO THE OWNER. ALL REPAIRS SHALL BE APPROVED BY THE ENGINEER PRIOR TO ACCEPTANCE OF THE REPAIR.
2. COORDINATE WITH OTHER DISCIPLINES FOR APPROXIMATE LOCATIONS OF UTILITIES. CONTRACTOR SHALL INCLUDE THE COST TO HAND DIG UTILITY TRENCHES FOR ALL UTILITY CONFLICTS FOR ALL EXISTING UNDERGROUND UTILITIES IN ORDER TO INSTALL THE NEW UNDERGROUND UTILITIES.
3. ALL WORK SHALL BE INSTALLED PER LATEST ADOPTED NATIONAL ELECTRICAL CODE (NFPA 70).
4. THESE DRAWINGS ARE INTENDED TO SHOW THE GENERAL ARRANGEMENT OF EQUIPMENT ONLY AND MAY NOT INDICATE EVERY OFFSET, BEND, FITTING OR MODIFICATION OF MATERIALS REQUIRED FOR INSTALLATION.
5. THE EXACT EQUIPMENT SIZE, CONFIGURATION, MAINTENANCE SERVICE AREAS, AND ELECTRICAL POINTS OF CONNECTION TO EQUIPMENT VARY BY MANUFACTURER, THE COORDINATION OF WHICH SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE LAYOUT SHOWN ON THE DRAWINGS IS BASED UPON THE REQUIREMENTS OF A PARTICULAR MANUFACTURER AS SELECTED BY THE ENGINEER AS THE BASIS OF DESIGN. THE CONTRACTOR SHALL SUBMIT EQUIPMENT COORDINATION DRAWINGS INDICATING THE ACTUAL SIZE AND CONFIGURATION OF PROPOSED EQUIPMENT DRAWN TO SCALE INCLUDING THE MANUFACTURER'S RECOMMENDED MAINTENANCE SERVICE AREAS AND MECHANICAL AND ELECTRICAL INTERFACE REQUIREMENTS INCLUDING ELECTRICAL CONNECTIONS AT THE TIME OF EQUIPMENT SHOP DRAWING SUBMITTAL.
6. MINIMUM SIZE CONDUIT PERMITTED SHALL BE 3/4" UNLESS NOTED OTHERWISE.
7. ALL SWITCHES SHALL BE THE HEAVY DUTY TYPE. ALL ELECTRICAL EQUIPMENT ENCLOSURES LOCATED OUTSIDE SHALL BE NEMA 4X–SS UNLESS NOTED OTHERWISE.
8. ALL EMPTY CONDUITS SHALL CONTAIN 200lb PULL–LINE. ALL SPARE CONDUITS SHALL BE CAPPED ON EACH END AND LABELED WITH PERMANENT TAG TO IDENTIFY EACH END.
9. CONNECTIONS ARE PERMITTED IN PULL BOXES FOR THE SITE LIGHTING AND RECEPTACLE CIRCUITS. CONNECTIONS FOR OTHER CIRCUITS SHALL NOT BE PERMITTED IN PULL BOXES OR HANDHOLES UNLESS APPROVED BY THE ENGINEER. CONNECTIONS WHERE PERMITTED SHALL BE MADE USING MOISTURE–PROOF SPLICES, SCOTCHCAST OR EQUAL.
10. ALL MOUNTING HARDWARE, ANCHORS, CHANNEL, PLATES, BRACKETS, CABLE HANGERS AND ENCLOSURES SHALL BE 300 SERIES STAINLESS STEEL UNLESS NOTED OTHERWISE.
11. CONDUITS SHALL BE PVC COATED RIGID GALVANIZED STEEL ABOVE GRADE AND SCH 80 PVC BELOW GRADE, CONDUIT ELBOWS BFG SHALL BE PVC COATED RGS. PVC CONDUIT SHALL BE SUNLIGHT RESISTANT, RATED FOR 90°C CONDUCTORS. FLEXIBLE CONDUIT SHALL BE METALLIC SEALTITE OR APPROVED EQUAL.
12. PROVIDE ALL EQUIPMENT AND APPURTENANCES REQUIRED TO MAKE A COMPLETE AND WORKING SYSTEM.
13. THIS DESIGN INCLUDES TWO SEPARATE PUMPING STATIONS. ONE FOR EACH SUBCELL IN CELL 5. NOTE THAT THESE TWO STATIONS ARE VIRTUAL DUPLICATES AND, AS SUCH, ONLY A SINGLE SET OF DETAILS IS SHOWN ACCOUNTING FOR EACH. THE WIRING SCHEDULE DIFFERENTIATES BETWEEN THE TWO CELLS BY ASSIGNING THE 100 SERIES CIRCUIT NUMBERS TO THE SUBCELL 5A PUMPING STATION, THE 200 SERIES TO THE SUBCELL 5B PUMPING STATION.

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DESIGNED MCLARK
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CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

ELECTRICAL LEGENDS, ABBREVIATIONS, AND GENERAL NOTES

MICHAEL L. CLARK STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE #48898.
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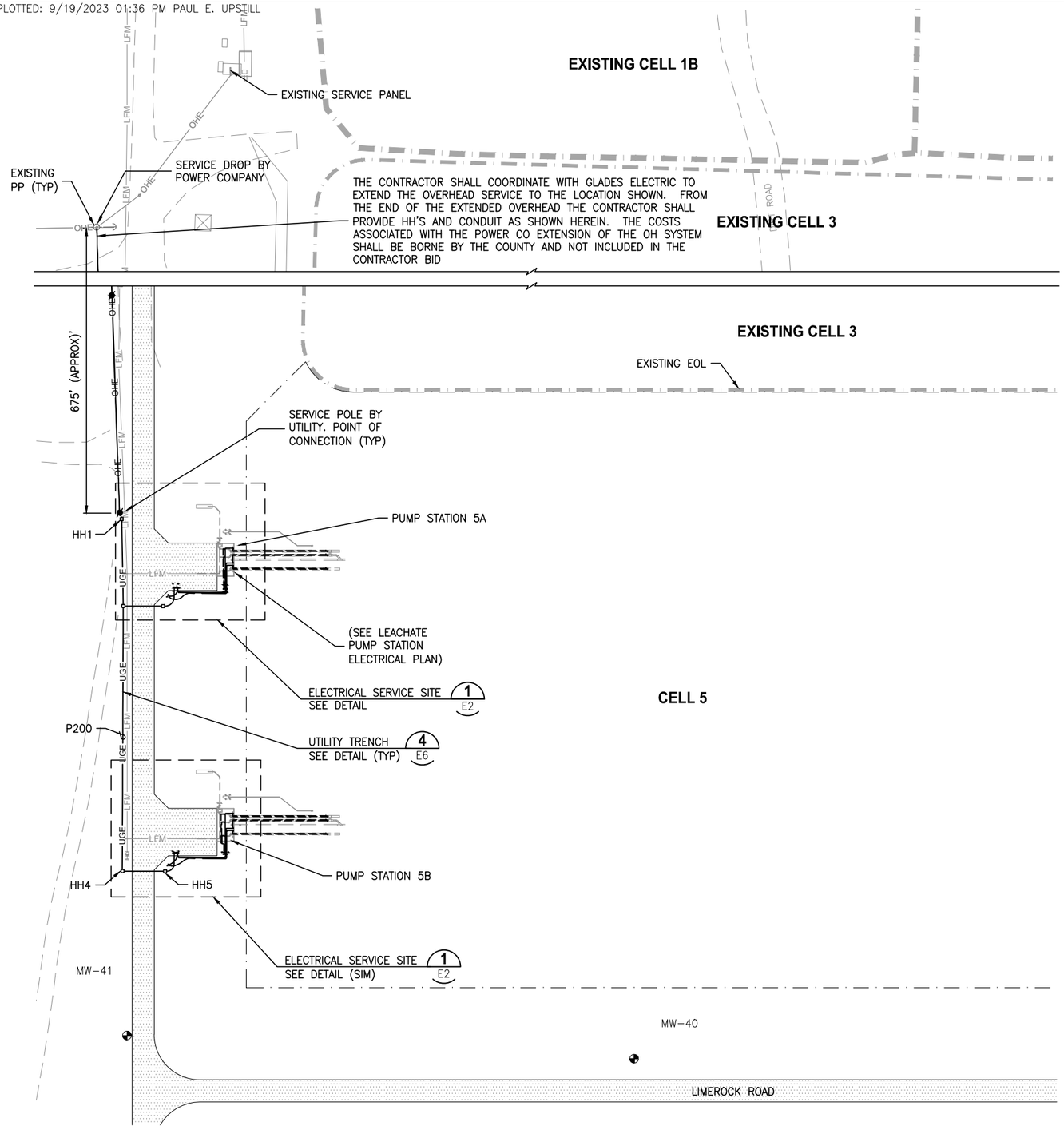
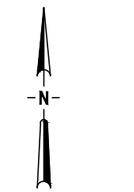
PLOTTED: 9/19/2023 01:36 PM PAUL E. UPSTILL

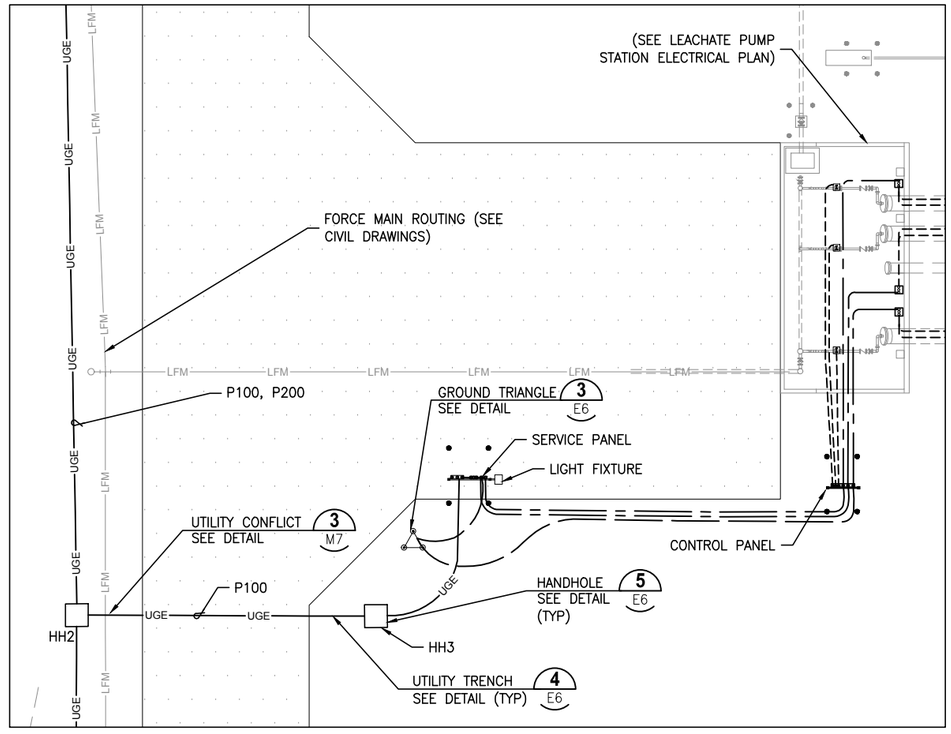




GRAPHIC SCALE

0 30 60 120

SCALE IN FEET



LEACHATE PUMP STATION
ELECTRICAL SERVICE SITE DETAIL 1 E2

NTS

NOTES

1. REFER TO CIVIL PLANS FOR PUMP AND EQUIPMENT LOCATIONS.
2. REFER TO TYPICAL TRENCHING DETAIL ON (E6). PROVIDE ELECTRICAL HANDHOLE, SEE DETAIL ON (E6), EVERY 500' MINIMUM, UNO.
3. GLADES ELECTRIC COOPERATIVE INC TO PROVIDE OVERHEAD SERVICES TO SITE. COORDINATE WITH GEC REQUIREMENTS FOR MAKING CONNECTION TO THE ELECTRICAL SERVICES.
4. CONTRACTOR TO FIELD VERIFY ACTUAL POLE LOCATION PRIOR TO BEGINNING WORK.
5. CONTRACTOR MAY MOVE ROAD CUT TO SAME CUT AS LFM, BUT MUST MAINTAIN A MINIMUM OF FIVE FEET BETWEEN LFM AND CONDUIT.

BID DOCUMENTS

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CHECKED JOPPOLD

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ELECTRICAL SITE PLAN

MICHAEL L. CLARK STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE #48898.

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NOTES

1. TRANSMITTER NUMBER SERIES TO CONTINUE FOR SUBCELL 5B PUMP STATION.
2. CIRCUIT DESIGNATIONS ARE SHOWN FOR THE SUBCELL 5A PUMP STATION. SEE THE 200 SERIES CIRCUIT NUMBERS FOR SUBCELL 5B PUMPING STATION.

N

GRAPHIC SCALE
0 1 2 4
SCALE IN FEET

(SEE NOTE 1)(TYP)

1 LT 5A-1C
1 LT 5A-1B
1 LT 5A-1A

EXPLOSION PROOF JUNCTION BOX (TYP OF 3)

S107 P108 P109 S108 S109 P110

P106, S102
P107, S103
P105, S103
FE 5A-1B
FE 5A-1C
FE 5A-1A
S106
S105
S104

CONTROL PANEL
PUMP STATION EQUIPMENT MOUNTING SEE DETAIL 1 E5 2 E5

FIT 5A-1A
FIT 5A-1B
FIT 5A-1C

3 M6 BOLLARD SEE DETAIL (TYP)

P104
TO AREA LIGHT
TO GROUND TRIANGLE

A E5

LFM

LIGHT FIXTURE
SERVICE PANEL
PUMP STATION EQUIPMENT MOUNTING SEE DETAIL 1 E5 2 E5
UGE

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TYPICAL PUMP STATION ELECTRICAL PLAN

MICHAEL L. CLARK STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE #48898.
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PROJECT NO: 08345-045-01
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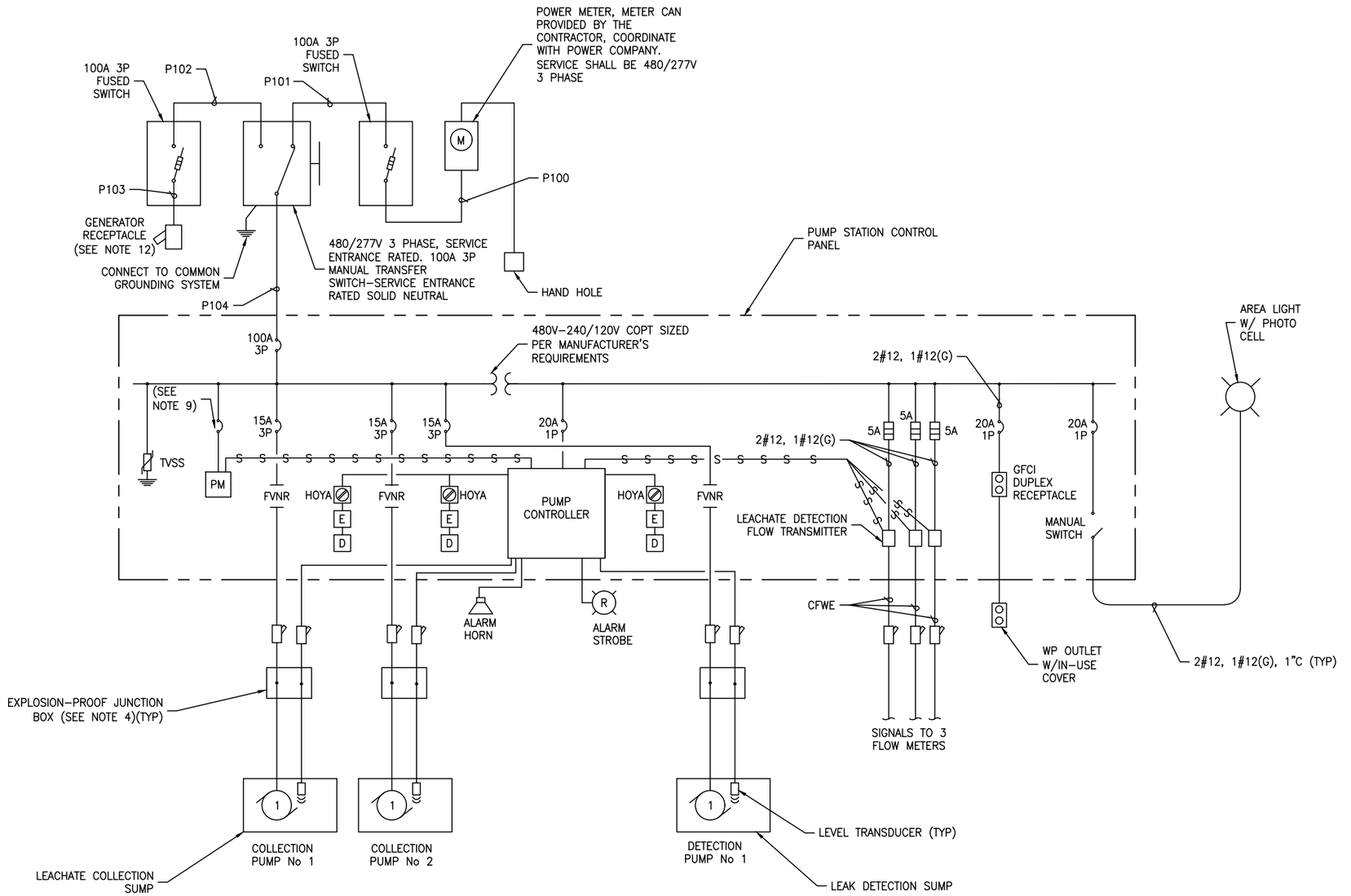
NOTES

1. PANEL LOCATION IS AS SHOWN ON THE PLANS.
2. CONDUCTORS EXITING CONTROL PANEL SHALL BE TYPE THWN INSULATED COPPER. INTERNAL CONTROL PANEL WIRING SHALL BE TYPE MT OR AS REQUIRED BY THE MANUFACTURER.
3. PROVIDE A SURGE PROTECTION DEVICE (SD) ON THE LOAD SIDE OF THE MAIN CIRCUIT BREAKER. SD SHALL BE AN ADVANCED PROTECTION TECHNOLOGIES TED/4XT, PQ PROTECTION PQC100, OR APPROVED EQUAL.
4. PROVIDE A NEMA 7 EXPLOSION–PROOF JUNCTION BOX WITH PARTITION SEPARATING POWER AND SIGNAL CONTAINING DIN RAIL MOUNTED NON–ARCING TERMINAL STRIPS FOR SPLICING POWER AND CONTROL WIRES.
5. THE PUMP CONTROL PANEL ENCLOSURE SHALL BE GASKETED NEMA 3R STAINLESS STEEL FITTED WITH A 3 POINT LOCKABLE LATCH AND DEAD FRONT PANEL.
6. ALL CONNECTIONS TO THE STATION SHALL BE INTRINSICALLY SAFE AND THE PANEL SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING: (SEE SPECIFICATIONS FOR FURTHER REQUIREMENTS)

A. THERMAL MAGNETIC CIRCUIT BREAKERS INDICATED.
B. NEMA RATED COMBINATION FULL VOLTAGE STARTERS FOR EACH PUMP.
C. DUPLEX/SIMPLEX CONTROL SYSTEM (SEE SPECIFICATION)
D. CONTROL POWER TRANSFORMERS, AS REQUIRED.
E. SURGE PROTECTION DEVICE.
F. RUN TIME METER FOR EACH PUMP.
G. HAND–OFF–AUTO SELECTOR SWITCH FOR EACH PUMP.
H. RED PUMP STOP, GREEN PUMP RUN LIGHTS FOR EACH PUMP.
I. PHASE MONITOR AND PHASE LOSS ALARM.
J. XENON ALARM STROBE.
K. CONTROL SYSTEM SHALL BE 120 VOLT.
L. TYPE GFCI 20 AMP, 125 VOLT DUPLEX RECEPTACLE.
M. SUBMERSIBLE LEVEL TRANSDUCER CONTROL.

7. THE CONTROL PANEL INTEGRATED INTERRUPT RATING SHALL BE EQUAL TO THE AVAILABLE FAULT CIRCUIT CURRENT AT THE POINT OF INSTALLATION WITH A MINIMUM OF 22,000 RIMS SYMMETRICAL AMPS.
8. CONTROL PANEL ASSEMBLY, INCOMING POWER DISTRIBUTION EQUIPMENT, AND ALL EQUIPMENT SHALL BE CONNECTED TO COMMON GROUNDING NETWORK.
9. PHASE MONITOR CONDUCTORS AND CIRCUIT BREAKER TO BE SIZED BY MANUFACTURER.
10. GROUND ALL ENCLOSURES AND EQUIPMENT IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
11. ALL COMPONENTS SHALL BE SIZED PER NATIONAL ELECTRICAL CODE.
12. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO ENSURE COMPLIANCE OF THE GENERATOR RECEPTACLE WITH COUNTY STANDARDS. THE CONTRACTOR SHALL PROVIDE A TRAILER MOUNTED 80 KW, 3–PHASE, 4W, 480/277V TRAILER MOUNTED PORTABLE GENERATOR, WITH ON BOARD FUEL, AS PART OF THE BID PACKAGE. GENERAC MODEL: MDG100DF4–STD3 OR APPROVED EQUAL.



TYPICAL PUMP STATION ONE-LINE DIAGRAM

NTS

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HIGHLANDS COUNTY, FLORIDA

ELECTRICAL ONE-LINE DIAGRAM

MICHAEL L. CLARK STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE #48898.
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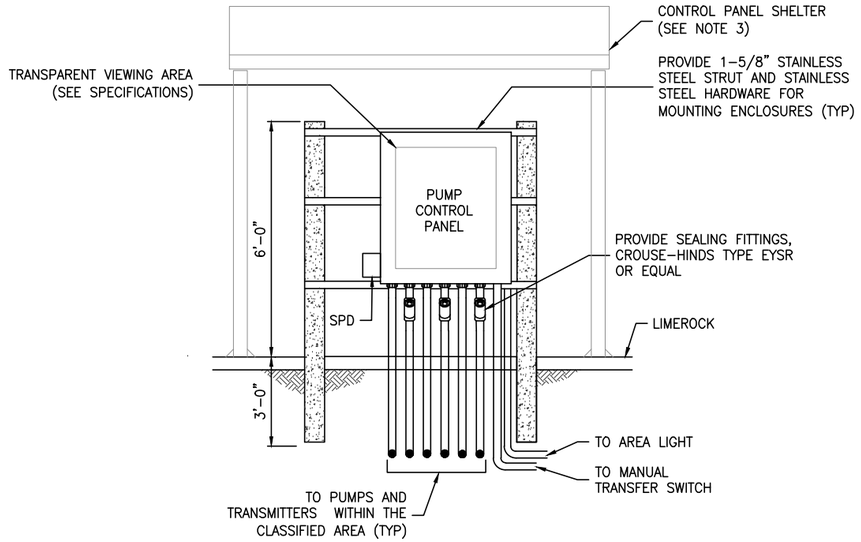
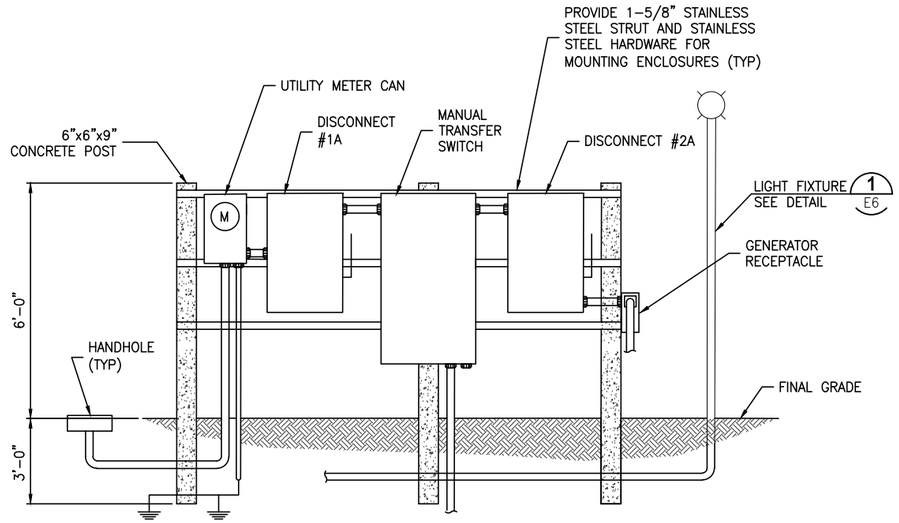


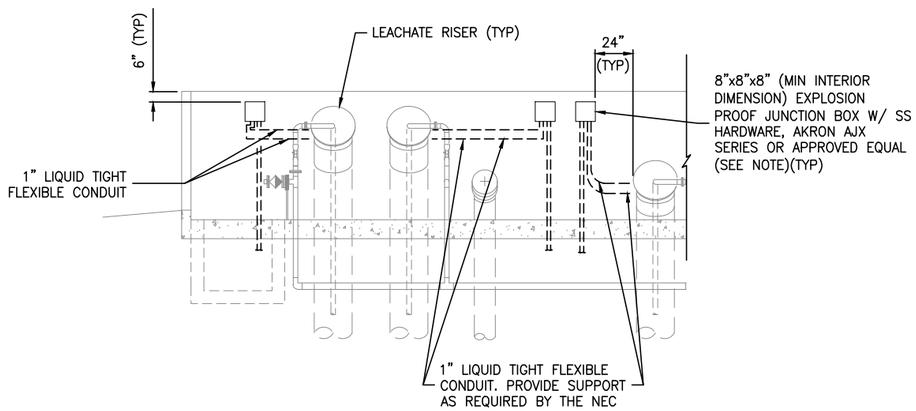
NOTES:
1. NOT ALL CONDUITS ARE SHOWN.
2. PUMP CONTROLLER SHALL BE MOUNTED AS SHOWN ON THE PLANS.
3. (NOT IN CONTRACT: PROVIDED BY OTHERS) CONTROL PANEL SHELTERS SHALL BE SIMILAR TO ROMEC UTILITIES WETWELL CONTROLS 2 POST SHELTER ASSEMBLY MODIFIED AS NEEDED TO MEET CODE REQUIREMENTS OR ENGINEER APPROVED EQUAL. SHELTERS SHALL BE OFFSET TO THE SOUTH SIDE OF THE CONTROL PANELS AND SHALL BE AN INDEPENDENT INSTALLATION FROM CONTROL PANELS. CONTRACTOR SHALL COORDINATE INSTALLATION LOCATION WITH ENGINEER.

CONTROL PANEL MOUNTING DETAIL 1
NTS — E3



NOTES:
1. NOT ALL CONDUITS ARE SHOWN.
2. ARRANGE SO THE ORIENTATION OF THE GENERATOR RECEPTACLE IS CLOSEST TO THE ROADWAY.
3. CONTRACTOR SHALL COORDINATE WITH ENGINEER ON LOCATION OF LIGHT FIXTURE.

ELECTRICAL SERVICE PANEL MOUNTING DETAIL 2
NTS — E3



NOTE:
MOUNT EACH JUNCTION BOX TO WALL W/ (4) 1/2"ø SS HILTI KWIK BOLT II EXPANSION ANCHORS (3 1/2" MIN EMBEDMENT).

EXPLOSION PROOF JUNCTION BOX CONNECTION SECTION A
NTS — E3

NOTES
1. SEE PLAN AND DIAGRAM FOR LOCAL WIRING.
2. STUB OUT EXTRA 1" CONDUIT FOR CONTROL PANEL. EXTEND CONDUIT 1' PAST EDGE OF CONCRETE. VERIFY EDGE OF CONCRETE WITH OWNER.
3. FLOW METER CABLES (FURNISHED WITH EQUIPMENT), 3/4"C.
4. PROVIDE 1/8" THICK STAINLESS STEEL PLATE INSTALLED BETWEEN EQUIPMENT AND STAINLESS STEEL STRUT FOR ADDITIONAL RIGIDITY. ATTACH EQUIPMENT TO STRUTS.
5. STRUTS SHALL BE STAINLESS STEEL. SECURE STRUTS TO POSTS WITH STAINLESS STEEL 2 PIECE PIPE CLAMPS AND EQUIPMENT TO STRUTS WITH STAINLESS STEEL HARDWARE.
6. CONDUIT SEALOFFS, TYPE EYSR, NOT SHOWN FOR CLARITY. SEE WIRING DIAGRAM FOR LOCATIONS REQUIRED.

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ELECTRICAL DETAILS

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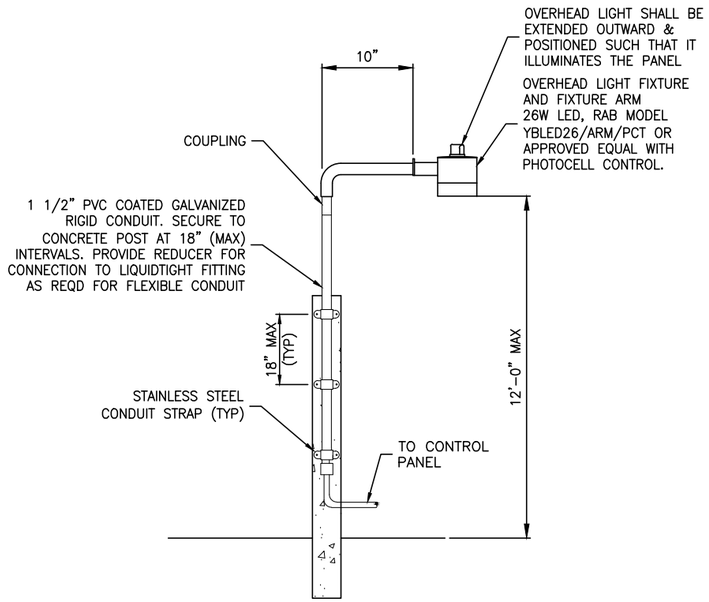
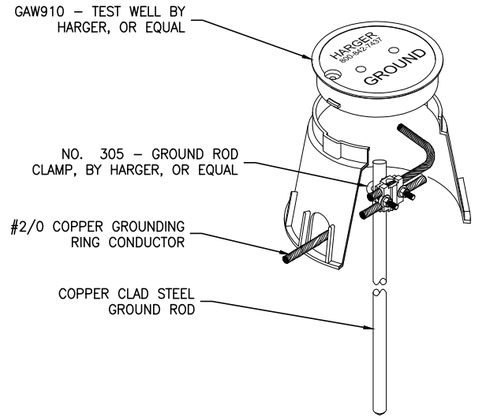
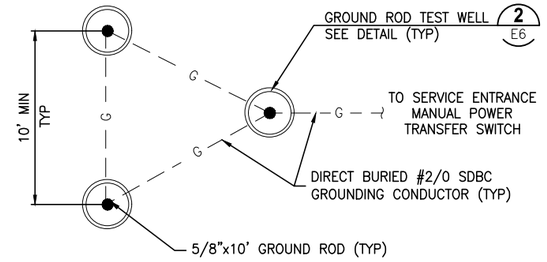


LIGHT FIXTURE DETAIL 1
NTS
E5

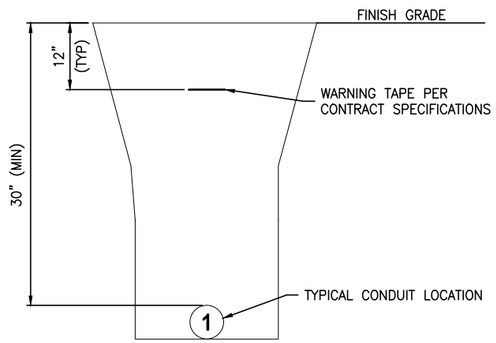


NOTE:
MOUNT TOP OF TEST WELL FLUSH WITH FINISHED GRADE FOR FUTURE ACCESS.

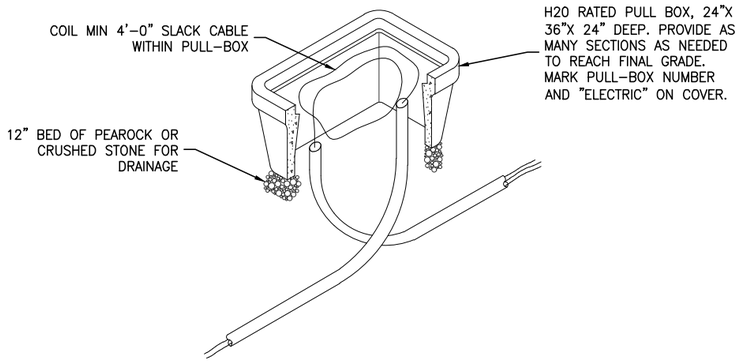
GROUND ROD TEST WELL DETAIL 2
NTS
E6



GROUND TRIANGLE DETAIL 3
NTS
E2



TYPICAL TRENCHING DETAIL 4
NTS
E2



TYPICAL UNDERGROUND HANDHOLE INSTALLATION DETAIL 5
NTS
E2

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ELECTRICAL DETAILS

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CIRCUIT NUMBER	FROM	TO	SIGNAL TYPE	CONDUCTORS			CONDUIT	ALARM OR FUNCTION
				ANALOG	DISCRETE	GROUND		
P100	EXISTING POWER POLE HH	SERVICE ENTRANCE DISC SWITCH THRU METER	480/277V	-	4-#1	#1	2"	COORD W/POWER CO, COIL 30' IN HH AND (1) SPARE CONDUIT
P101	SERVICE ENTRANCE DISCONNECT SWITCH	MANUAL TRANSFER SW	480/277V	-	4-#1	#1	2"	INCOMING SERVICE THRU POWER METER
P102	MANUAL TRANSFER SW	GENERATOR DISCONNECT SWITCH	480/277V	-	4-#1	#1	2"	GENERATOR DISCONNECT
P103	GENERATOR DISCONNECT SWITCH	GENERATOR PLUG	480/277V		4-#1	#1	2"	GEN PLUG
P104	MANUAL TRANSFER SW	PCP MAIN BREAKER	480/277V		4-#1	#1	2"	PUMP CONTROLLER PANEL POWER
P105	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX	480VAC	-	3#10	#12	1"	LEACHATE COLLECTION PUMP #1 POWER *
P106	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX	480VAC	-	3#10	#12	1"	LEACHATE COLLECTION PUMP #2 POWER *
P107	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX	480VAC	-	3#10	#12	1"	LEAK DETECTION PUMP POWER *
P108	EXPLOSION PROOF JUNCTION BOX	LEACHATE COLLECTION PUMP	480VAC	CFWE			1"	LEACHATE COLLECTION PUMP #1 *
P109	EXPLOSION PROOF JUNCTION BOX	LEACHATE COLLECTION PUMP	480VAC	CFWE			1"	LEACHATE COLLECTION PUMP #2 *
P110	EXPLOSION PROOF JUNCTION BOX	LEACHATE DETECTION PUMP	480VAC	CFWE	-	-	1"	LEAK DETECTION PUMP POWER CABLE *
S100	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX (5A-1A)	4-20 mA	1#16-TSP	-	-	3/4"	SUMP LEVEL SIGNAL, PROVIDE 1-#16-TSP SPARE
S102	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX (5A-1B)	4-20 mA	1#16-TSP	-	-	3/4"	SUMP LEVEL SIGNAL, PROVIDE 1-#16-TSP SPARE
S103	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX (5A-1C)	4-20 mA	1#16-TSP	-	-	3/4"	SUMP LEVEL SIGNAL, PROVIDE 1-#16-TSP SPARE
S104	FLOW METER TRANSMITTER	FLOW METER (FE-5A-1A)	4-20 mA	1#16-TSP	-	-	3/4"	FLOW METER SIGNAL, PROVIDE 1-#16-TSP SPARE
S105	FLOW METER TRANSMITTER	FLOW METER (FE-5A-1B)	4-20 mA	1#16-TSP	-	-	3/4"	FLOW METER SIGNAL, PROVIDE 1-#16-TSP SPARE
S106	FLOW METER TRANSMITTER	FLOW METER (FE-5A-1C)	4-20 mA	1#16-TSP	-	-	3/4"	FLOW METER SIGNAL, PROVIDE 1-#16-TSP SPARE
S107	EXPLOSION PROOF JUNCTION BOX	LT 5A-1A	4-20 mA	CFWE	-	-	1"	SUMP LEVEL TRANSMITTER SIGNAL
S108	EXPLOSION PROOF JUNCTION BOX	LT 5A-1B	4-20 mA	CFWE	-	-	1"	SUMP LEVEL TRANSMITTER SIGNAL
S109	EXPLOSION PROOF JUNCTION BOX	LT 5A-1C	4-20 mA	CFWE	-	-	1"	SUMP LEVEL TRANSMITTER SIGNAL
P200	EXISTING POWER POLE HH	SERVICE ENTRANCE DISC SWITCH THRU METER	480/277V	-	4-#1/0	#1	2"	COORD W/POWER CO, COIL 30' IN HH AND (1) SPARE CONDUIT
P201	SERVICE ENTRANCE DISCONNECT SWITCH	MANUAL TRANSFER SW	480/277V	-	4-#1	#1	2"	INCOMING SERVICE THRU POWER METER
P202	MANUAL TRANSFER SW	GENERATOR DISCONNECT SWITCH	480/277V	-	4-#1	#1	2"	GENERATOR DISCONNECT
P203	GENERATOR DISCONNECT SWITCH	GENERATOR PLUG	480/277V		4-#1	#1	2"	GEN PLUG
P204	MANUAL TRANSFER SW	PCP MAIN BREAKER	480/277V		4-#1	#1	2"	PUMP CONTROLLER PANEL POWER
P205	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX	480VAC	-	3#10	#12	1"	LEACHATE COLLECTION PUMP #1 POWER *
P206	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX	480VAC	-	3#10	#12	1"	LEACHATE COLLECTION PUMP #2 POWER *
P207	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX	480VAC	-	3#10	#12	1"	LEAK DETECTION PUMP POWER *
P208	EXPLOSION PROOF JUNCTION BOX	LEACHATE COLLECTION PUMP	480VAC	CFWE			1"	LEACHATE COLLECTION PUMP #1 *
P209	EXPLOSION PROOF JUNCTION BOX	LEACHATE COLLECTION PUMP	480VAC	CFWE			1"	LEACHATE COLLECTION PUMP #2 *
P210	EXPLOSION PROOF JUNCTION BOX	LEACHATE DETECTION PUMP	480VAC	CFWE	-	-	1"	LEAK DETECTION PUMP POWER CABLE *
S200	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX (5B-2A)	4-20 mA	1#16-TSP	-	-	3/4"	SUMP LEVEL SIGNAL, PROVIDE 1-#16-TSP SPARE
S201	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX (5B-2B)	4-20 mA	1#16-TSP	-	-	3/4"	SUMP LEVEL SIGNAL, PROVIDE 1-#16-TSP SPARE
S202	PUMP CONTROL PANEL	EXPLOSION PROOF JUNCTION BOX (5B-2C)	4-20 mA	1#16-TSP	-	-	3/4"	SUMP LEVEL SIGNAL, PROVIDE 1-#16-TSP SPARE
S203	FLOW METER TRANSMITTER	FLOW METER (FE-5B-2A)	4-20 mA	1#16-TSP	-	-	3/4"	FLOW METER SIGNAL, PROVIDE 1-#16-TSP SPARE
S204	FLOW METER TRANSMITTER	FLOW METER (FE-5B-2B)	4-20 mA	1#16-TSP	-	-	3/4"	FLOW METER SIGNAL, PROVIDE 1-#16-TSP SPARE
S205	FLOW METER TRANSMITTER	FLOW METER (FE-5B-2C)	4-20 mA	1#16-TSP	-	-	3/4"	FLOW METER SIGNAL, PROVIDE 1-#16-TSP SPARE
S206	EXPLOSION PROOF JUNCTION BOX	LT 5B-2A	4-20 mA	CFWE	-	-	1"	SUMP LEVEL TRANSMITTER SIGNAL
S207	EXPLOSION PROOF JUNCTION BOX	LT 5B-2B	4-20 mA	CFWE	-	-	1"	SUMP LEVEL TRANSMITTER SIGNAL
S208	EXPLOSION PROOF JUNCTION BOX	LT 5B-2C	4-20 mA	CFWE	-	-	1"	SUMP LEVEL TRANSMITTER SIGNAL

NOTE: * PUMPS REQUIRE ADDITIONAL SUPPORT CABLES (TEMP, HEATER, ETC). COORDINATE AND PROVIDE CONDUCTORS AND CONDUIT AS REQUIRED.

BID DOCUMENTS

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LTR.	DATE	REVISIONS	BY	APPRD.

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DRAWN PUPSTILL
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JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

ELECTRICAL WIRING SCHEDULE

MICHAEL L. CLARK STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE #48898.

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY MICHAEL L. CLARK ON THE DATE INDICATED.

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PROJECT NO: 08345-045-01
DATE: SEP 2023
INDEX NO:
DWG NO: E7

GENERAL REQUIREMENTS

1. THIS PLAN UTILIZES BEST MANAGEMENT PRACTICES TO CONTROL EROSION AND TURBIDITY CAUSED BY STORM WATER RUN OFF. AN EROSION CONTROL PLAN HAS BEEN PREPARED TO INSTRUCT THE CONTRACTOR ON PLACEMENT OF THESE CONTROLS. IT IS THE CONTRACTORS RESPONSIBILITY TO INSTALL AND MAINTAIN THE CONTROLS AS PER PLAN AS WELL AS ENSURING THE PLAN IS PROVIDING THE PROPER PROTECTION AS REQUIRED BY FEDERAL, STATE, AND LOCAL LAWS. REFER TO THESE EROSION AND SEDIMENT STABILIZATION PRACTICES FOR THE CONTROLS THAT MAY BE IMPLEMENTED.
2. THE CONTRACTOR SHALL AT A MINIMUM IMPLEMENT THE CONTRACTOR'S REQUIREMENTS OUTLINED HEREIN AND THOSE MEASURES SHOWN IN THE PLANS. IN ADDITION, THE CONTRACTOR SHALL UNDERTAKE ADDITIONAL MEASURES REQUIRED FOR COMPLIANCE WITH APPLICABLE PERMIT CONDITIONS AND STATE WATER QUALITY STANDARDS DEPENDING ON THE NATURE OF MATERIALS AND METHODS OF CONSTRUCTION. THE CONTRACTOR SHALL APPLY FOR AND COMPLY WITH A FLORIDA NPDES STORMWATER PERMIT FOR CONSTRUCTION ACTIVITY. THE CONTRACTOR SHALL OBTAIN WATER MANAGEMENT DISTRICT APPROVAL FOR DEWATERING PER FAC 40C22.
3. THE CONTRACTOR WILL BE RESPONSIBLE FOR APPLYING FOR AND PAYING FOR THE PERMIT FEE FOR THE NOTICE OF INTENT (NOI) AND THE NOTICE OF TERMINATION (NOT) FORMS.
4. TIMING OF CONTROLS/MEASURES. AS INDICATED IN THE SEQUENCE OF MAJOR ACTIVITIES, THE SILT FENCES AND SYNTHETIC BALES, STABILIZED CONSTRUCTION ENTRANCE AND SEDIMENT BASINS WILL BE CONSTRUCTED PRIOR TO CLEARING OR GRADING OF ANY OTHER PORTIONS OF THE SITE. STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICAL IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. AFTER THE ENTIRE SITE IS STABILIZED, THE ACCUMULATED SEDIMENT SHALL BE REMOVED FROM THE SEDIMENT BASINS AND THE EARTH BERM/SWALES REGRADED/REMOVED AND STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL PLAN.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IMPLEMENT THE EROSION AND TURBIDITY CONTROLS AS SHOWN ON THE SEDIMENT AND EROSION CONTROL PLAN. IT IS ALSO THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THESE CONTROLS ARE PROPERLY INSTALLED, MAINTAINED AND FUNCTIONING PROPERLY TO PREVENT TURBID OR POLLUTED WATER FROM LEAVING THE PROJECT SITE. THE CONTRACTOR WILL ADJUST THE EROSION CONTROL PLAN AND ADD ADDITIONAL CONTROL MEASURES, AS REQUIRED, TO ENSURE THE SITE MEETS ALL FEDERAL, STATE AND LOCAL EROSION AND SEDIMENT CONTROL REGULATIONS AND TO MEET THE SEDIMENT AND TURBIDITY REQUIREMENTS IMPOSED ON THE PROJECT SITE BY THE REGULATORY AGENCIES.
6. THE CONTRACTOR WILL PROVIDE THE OWNER A COPY OF THE NPDES PERMIT AND THE SWPPP.

EROSION AND SEDIMENT CONTROL – STABILIZATION PRACTICES

1. LOCATION OF STAKED SILT FENCE. STAKED SILT FENCE SHALL BE PLACED ALONG THE BOUNDARY OF FILL SLOPES, ALONG THE LIMITS OF CONSTRUCTION, AND AROUND ALL PROPOSED INLETS AND STRUCTURES. SILT FENCE SHALL BE USED AROUND ALL STOCKPILED MATERIAL.
2. LOCATION OF FLOATING TURBIDITY BARRIERS. FLOATING TURBIDITY BARRIERS SHALL BE PLACED IN PERMANENT BODIES OF WATER.
3. OFF-SITE VEHICLE TRACKING. LOADED HAUL TRUCKS SHALL BE COVERED WITH TARPAULIN. EXCESS DIRT ON THE ROAD SHALL BE REMOVED DAILY. AREAS WITHIN THE LIMITS OF CONSTRUCTION SHALL BE DAMPENED WITH WATER AS REQUIRED FOR DUST CONTROL.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTENANCE AND REPAIRS OF EROSION AND SEDIMENT CONTROL DEVICES, AND REMOVAL OF EROSION AND SEDIMENT CONTROL DEVICES AFTER THE NOTICE OF TERMINATION. MAINTENANCE AND REPAIR REQUIRED FOR THE CONTROL AND ABATEMENT OF EROSION AND WATER POLLUTION SHALL BE INCLUDED IN THE PROJECT COST.
5. DISTURBED, GRADED OR REGRADED AREAS SHALL BE STABILIZED IMMEDIATELY AFTER GRADING IS COMPLETE, OR WITHIN 7 DAYS IF SUCH AREAS ARE TO REMAIN IDLE FOR MORE THAN 7 DAYS.
6. SYNTHETIC BALE BARRIER: SYNTHETIC BALE BARRIERS CAN BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WITH THE FOLLOWING LIMITATIONS:
   A. WHERE THE MAXIMUM SLOPE BEHIND THE BARRIER IS 33 PERCENT.
   B. IN MINOR SWALES OR DITCH LINES WHERE THE MAXIMUM CONTRIBUTING DRAINAGE AREA IS NO GREATER THAN 2.0 ACRES.
   C. WHERE EFFECTIVENESS IS REQUIRED FOR LESS THAN 3 MONTHS.
   D. EVERY EFFORT SHOULD BE MADE TO LIMIT THE USE OF SYNTHETIC BALE BARRIERS CONSTRUCTED IN LIVE STREAMS OR IN SWALES WHERE THERE IS THE POSSIBILITY OF A WASHOUT. IF NECESSARY, MEASURES SHALL BE TAKEN TO PROPERLY ANCHOR BALES TO ENSURE AGAINST WASHOUT.
7. FILTER FABRIC BARRIER: FILTER FABRIC BARRIERS CAN BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WITH THE FOLLOWING LIMITATIONS:
   A. WHERE THE MAXIMUM SLOPE BEHIND THE BARRIER IS 33 PERCENT.
   B. IN MINOR SWALES OR DITCH LINES WHERE THE MAXIMUM CONTRIBUTING DRAINAGE AREA IS NO GREATER THAN 2.0 ACRES.
8. BRUSH BARRIER WITH FILTER FABRIC: BRUSH BARRIER MAY BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WHERE ENOUGH RESIDUE MATERIAL IS AVAILABLE ON SITE.
9. LEVEL SPREADER: A LEVEL SPREADER MAY BE USED WHERE SEDIMENT-FREE STORM RUNOFF IS INTERCEPTED AND DIVERTED AWAY FROM THE GRADED AREAS ONTO UNDISTURBED STABILIZED AREAS. THIS PRACTICE APPLIES ONLY IN THOSE SITUATIONS WHERE THE SPREADER CAN BE CONSTRUCTED ON UNDISTURBED SOIL AND THE AREA BELOW THE LEVEL SPREADER IS STABILIZED. THE WATER SHOULD NOT BE ALLOWED TO RECONCENTRATE AFTER RELEASE.
10. STOCKPILING MATERIAL: NO EXCAVATED MATERIAL SHALL BE STOCKPILED IN SUCH A MANNER AS TO DIRECT RUNOFF DIRECTLY OFF THE PROJECT SITE INTO ANY ADJACENT WATER BODY OR STORM WATER COLLECTION FACILITY.
11. EXPOSED AREA LIMITATION: THE SURFACE AREA OF OPEN, ERODIBLE SOIL EXPOSED BY CLEARING GRUBBING OPERATIONS OR EXCAVATION AND FILLING OPERATIONS SHALL NOT EXCEED 20 ACRES. THIS REQUIREMENT MAY BE WAIVED FOR LARGE PROJECTS WITH AN EROSION CONTROL PLAN WHICH DEMONSTRATES THAT OPENING OF ADDITIONAL AREA WILL NOT SIGNIFICANTLY AFFECT OFF-SITE DEPOSIT OF SEDIMENTS.
12. MAINTENANCE: ALL FEATURES OF THE PROJECT DESIGNED AND CONSTRUCTED TO PREVENT EROSION AND SEDIMENT SHALL BE MAINTAINED DURING THE LIFE OF THE CONSTRUCTION SO AS TO FUNCTION AS THEY WERE ORIGINALLY DESIGNED AND CONSTRUCTED.
13. PERMANENT EROSION CONTROL: THE EROSION CONTROL FACILITIES OF THE PROJECT SHOULD BE DESIGNED TO MINIMIZE THE IMPACT ON THE OFFSITE FACILITIES.

EROSION AND SEDIMENT CONTROL – WASTE AND MATERIAL CONTROLS

1. WASTE MATERIALS: ALL WASTE MATERIALS SHALL BE COLLECTED AND STORED IN ACCORDANCE WITH ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS. DUMPSTERS WILL BE EMPTIED AS NEEDED AND THE TRASH WILL BE HAULED AS DIRECTED BY THE OWNER. NOTICES STATING WASTE DISPOSAL PRACTICES WILL BE POSTED AT THE CONSTRUCTION SITE BY THE CONSTRUCTION SUPERINTENDENT, THE INDIVIDUAL WHO MANAGES THE DAY-TO-DAY SITE OPERATIONS WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED.
2. HAZARDOUS WASTE: ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF IN THE MANNER SPECIFIED BY LOCAL OR STATE REGULATION OR BY THE MANUFACTURER. SITE PERSONNEL WILL BE INSTRUCTED IN THESE PRACTICES AND THE SITE SUPERINTENDENT, THE INDIVIDUAL WHO MANAGES DAY-TO-DAY SITE OPERATIONS, WILL BE RESPONSIBLE FOR SEEING THAT THESE PRACTICES ARE FOLLOWED. THE CONTRACTOR SHALL PROVIDE A LIST OF TOXIC SUBSTANCES THAT ARE LIKELY TO BE USED ON THE JOB AND PROVIDE A PLAN ADDRESSING THE GENERATION, APPLICATION, MIGRATION, STORAGE, AND DISPOSAL OF THESE SUBSTANCES.
3. SANITARY WASTE: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NEEDED TO PREVENT POSSIBLE SPILLAGE. THE WASTE WILL BE COLLECTED AND DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL WASTE DISPOSAL REGULATIONS FOR SANITARY SEWER OR SEPTIC SYSTEMS.
4. PAVED AREAS ADJACENT TO ALL CONSTRUCTION ACCESS POINTS SHALL BE SWEPT DAILY TO REMOVE ANY EXCESS MUD, DIRT OR ROCK TRACKED FROM THE SITE. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARP.
5. SPILL PREVENTION: THE FOLLOWING ARE THE MATERIAL MANAGEMENT PRACTICES THAT WILL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES TO STORMWATER RUNOFF.
   A. GOOD HOUSEKEEPING: THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ONSITE DURING THE CONSTRUCTION PROJECT.
      i. AN EFFORT WILL BE MADE TO STORE ONLY ENOUGH PRODUCT REQUIRED TO DO THE JOB.
      ii. ALL MATERIALS STORED ONSITE WILL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR APPROPRIATE CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE.
      iii. PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH THE ORIGINAL MANUFACTURER'S LABEL.
      iv. SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER.
      v. WHENEVER POSSIBLE, ALL OF A PRODUCT WILL BE USED UP BEFORE DISPOSING OF THE CONTAINER.
      vi. MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.
      vii. THE SITE SUPERINTENDENT WILL INSPECT DAILY TO ENSURE MATERIALS ONSITE RECEIVE PROPER USE AND DISPOSAL.
   B. HAZARDOUS MATERIALS: THESE PRACTICES ARE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS.
      i. HAZARDOUS MATERIALS AND/OR TOXIC SUBSTANCES SHALL BE DISPOSED OF BY THE CONTRACTOR ACCORDING TO THE EPA'S STANDARD PRACTICES, THE MANUFACTURER'S RECOMMENDATION OR IN ACCORDANCE WITH STATE AND LOCAL REQUIREMENTS.
      ii. THE CONTRACTOR SHALL MAINTAIN COPIES OF THE MATERIAL SAFETY DATA SHEET (MSDS) FOR EACH HAZARDOUS MATERIAL PROPOSED FOR USE ON THE PROJECT. BECAUSE STATE LAW DOES NOT TREAT PETROLEUM PRODUCTS THAT ARE PROPERLY CONTAINERIZED AND INTENDED FOR EQUIPMENT USE ON THE PROJECT AS A HAZARDOUS MATERIAL, SUCH PRODUCTS DO NOT NEED A MSDS SUBMITTAL.
      iii. PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS.
      iv. MATERIALS WILL BE STORED IN ACCORDANCE WITH LOCAL CODES.
      v. ORIGINAL LABELS AND MATERIAL SAFETY DATA SHALL BE RETAINED AND AVAILABLE ON SITE.
   C. PRODUCT SPECIFIC PRACTICES: THE FOLLOWING PRODUCT SPECIFIC PRACTICES WILL BE FOLLOWED ONSITE:
      i. PETROLEUM AND LUBRICANT PRODUCTS. ALL ONSITE VEHICLES AND EQUIPMENT (I.E. – DEWATERING PUMPS) WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. FLUID PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. CONTAINMENT BERMS WILL WE CONSTRUCTED AROUND ALL FUEL STORAGE TANKS USED FOR CONSTRUCTION. ANY ASPHALT SUBSTANCES USED ONSITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
      ii. FERTILIZERS. FERTILIZERS USED WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORM WATER. STORAGE WILL BE IN A COVERED AREA. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER WILL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO AVOID SPILLS.
      iii. PAINTS. ALL CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE. EXCESS PAINT WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURERS' INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.
      iv. CONCRETE TRUCKS. CONCRETE TRUCKS WILL NOT BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER TO DITCHES, PONDS OR OTHER WATERWAYS. WASHWATER SHALL BE COLLECTED IN A TEMPORARY SETTLING POND.

EROSION AND SEDIMENT CONTROL – SPILL CONTROLS

1. SPILL CONTROL PRACTICES: IN ADDITION TO THE GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THIS PLAN, THE FOLLOWING PRACTICES WILL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:
   A. MANUFACTURERS' RECOMMENDED METHODS FOR SPILL CLEANUP SHALL BE CLEARLY POSTED ON SITE AND SITE PERSONNEL WILL BE MADE AWARE OF THE METHODS AND POSTED LOCATION.
2. MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP WILL BE KEPT IN THE MATERIAL STORAGE AREA ONSITE. EQUIPMENT AND MATERIALS WILL INCLUDE, BUT NOT BE LIMITED TO BROOMS, DUST PANS, MOPS, RAGS, OIL BLANKETS, GLOVES, GOGGLES, LIQUID ABSORBENT (I.E. KITTY LITTER OR EQUAL), SAND SAWDUST, AND PLASTIC AND METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE. ALL SPILLS WILL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY, BY THE CONTRACTOR.
3. THE SPILL AREA WILL BE KEPT WELL VENTILATED AND PERSONNEL WILL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE.
4. SPILL OF TOXIC OR HAZARDOUS MATERIAL WILL BE REPORTED IMMEDIATELY TO OWNER AND ENGINEER.
5. THE SPILL PREVENTION PLAN WILL BE ADJUSTED TO INCLUDE MEASURES TO PREVENT THIS TYPE OF SPILL FROM REOCCURRING AND HOW TO CLEAN UP THE SPILL IF THERE IS ANOTHER ONE. A DESCRIPTION OF THE SPILL, WHAT CAUSED IT AND THE CLEANUP MEASURES WILL ALSO BE INCLUDED.
6. THE SITE SUPERINTENDENT RESPONSIBLE FOR THE DAY-TO-DAY SITE OPERATIONS SHALL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR. HE/SHE SHALL DESIGNATE AT LEAST ONE OTHER SITE PERSONNEL, WHO WILL RECEIVE SPILL PREVENTION AND CLEANUP TRAINING. THESE INDIVIDUALS SHALL EACH BECOME RESPONSIBLE FOR A PARTICULAR PHASE OF PREVENTION AND CLEANUP, THE NAMES OF RESPONSIBLE SPILL PERSONNEL WILL BE POSTED IN THE MATERIAL STORAGE AREA AND IF APPLICABLE, IN THE OFFICE TRAILER ONSITE.

BID DOCUMENTS

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CHECKED TMCKNIGHT

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HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

EROSION AND SEDIMENT CONTROL REQUIREMENTS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY GEORGE A. REINHART III, PHD, PE, ON THE DATE INDICATED ON COVER PAGE (G1).
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PROJECT NO: 08345-045-01
DATE: SEP 2023
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DWG NO: EC1

PLOTTED: 9/19/2023 01:36 PM PAUL E. UPSTILL

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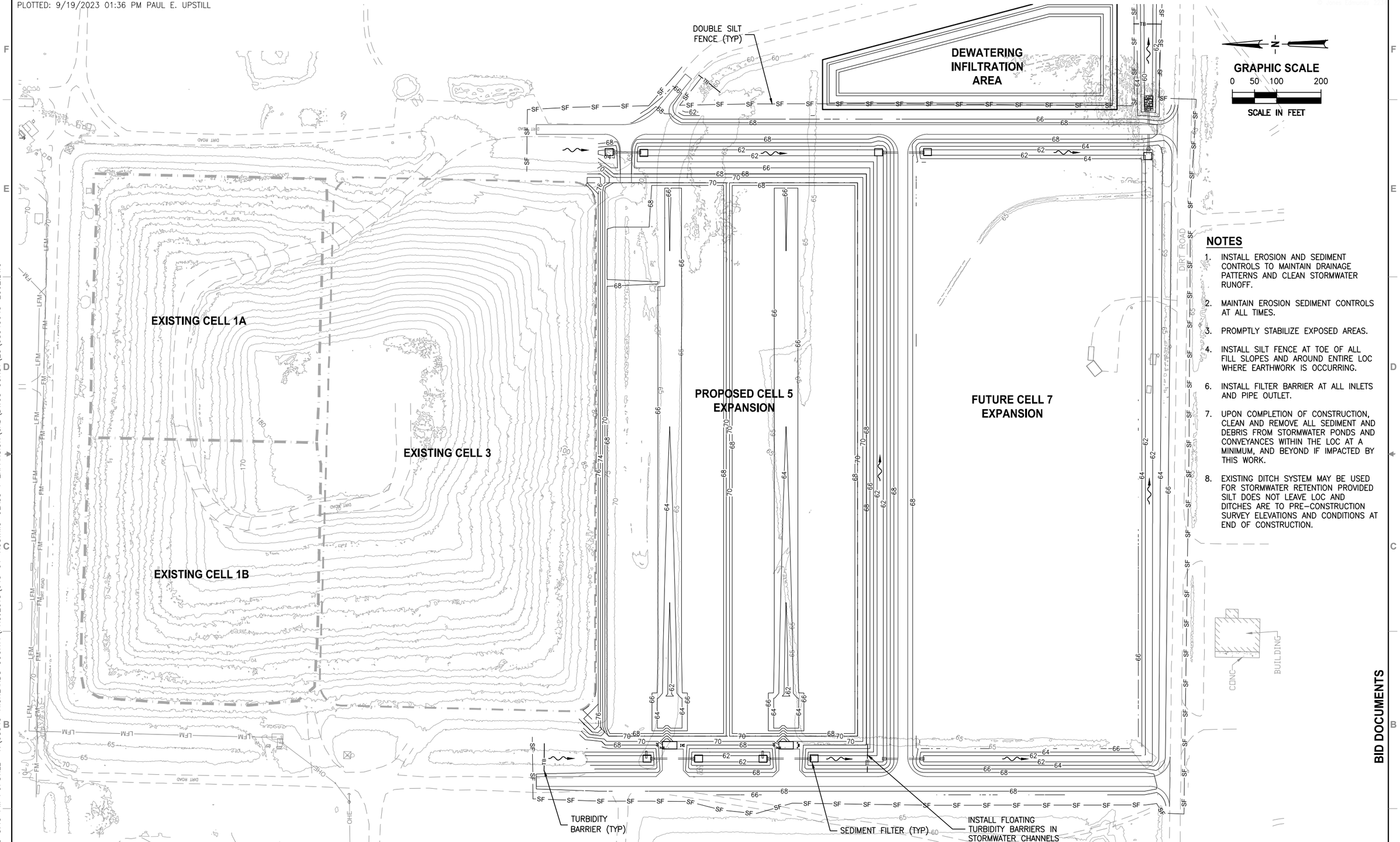

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROLS TO MAINTAIN DRAINAGE PATTERNS AND CLEAN STORMWATER RUNOFF.
2. MAINTAIN EROSION SEDIMENT CONTROLS AT ALL TIMES.
3. PROMPTLY STABILIZE EXPOSED AREAS.
4. INSTALL SILT FENCE AT TOE OF ALL FILL SLOPES AND AROUND ENTIRE LOC WHERE EARTHWORK IS OCCURRING.
6. INSTALL FILTER BARRIER AT ALL INLETS AND PIPE OUTLET.
7. UPON COMPLETION OF CONSTRUCTION, CLEAN AND REMOVE ALL SEDIMENT AND DEBRIS FROM STORMWATER PONDS AND CONVEYANCES WITHIN THE LOC AT A MINIMUM, AND BEYOND IF IMPACTED BY THIS WORK.
8. EXISTING DITCH SYSTEM MAY BE USED FOR STORMWATER RETENTION PROVIDED SILT DOES NOT LEAVE LOC AND DITCHES ARE TO PRE-CONSTRUCTION SURVEY ELEVATIONS AND CONDITIONS AT END OF CONSTRUCTION.

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

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CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

STORMWATER POLLUTION PREVENTION PLAN

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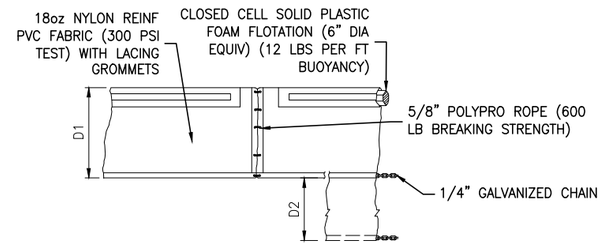
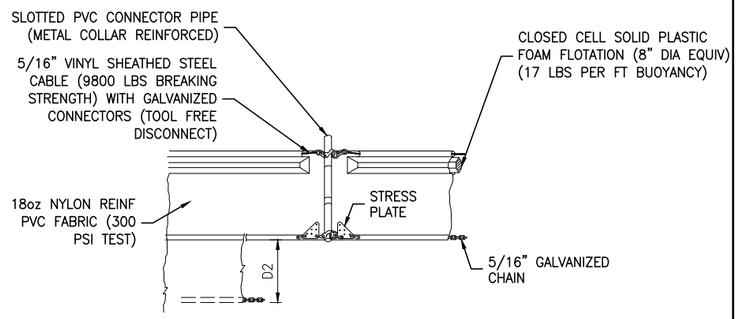
PROJECT NO:	DATE:
08345-045-01	SEP 2023
INDEX NO:	DWG NO:
	EC2



TYPE 1



TYPE 2

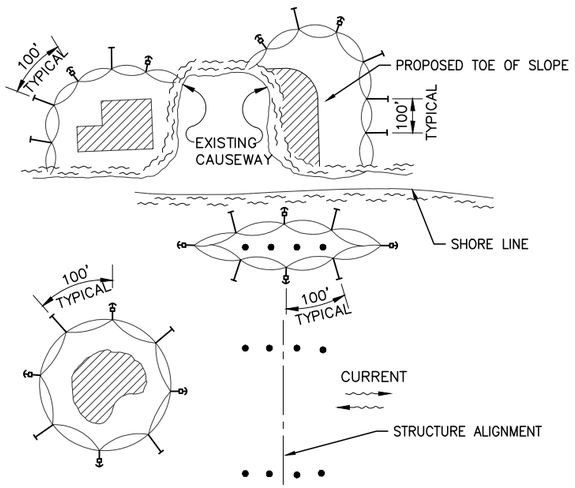
D1 =5' STD (SINGLE PANEL FOR DEPTHS 5' OR LESS)

D2 =5' STD (ADDITIONAL PANEL FOR DEPTHS 5')

CURTAIN TO REACH BOTTOM UP TO DEPTHS OF 10 FEET. TWO (2) PANELS TO BE USED FOR DEPTHS GREATER THAN 10 FEET UNLESS SPECIAL DEPTH CURTAINS SPECIFICALLY CALL FOR IN THE PLANS OR AS DETERMINED BY THE ENGINEER.

NOTICE: COMPONENTS OF TYPES 1 AND 2 MAY BE SIMILAR OR IDENTICAL TO PROPRIETARY DESIGNS. ANY INFRINGEMENT ON THE PROPRIETARY RIGHTS OF THE DESIGNER SHALL BE THE SOLE RESPONSIBILITY OF THE USER. SUBSTITUTIONS FOR TYPES 1 AND 2 SHALL BE AS APPROVED BY THE ENGINEER.

FLOATING TURBIDITY BARRIER DETAIL



LEGEND

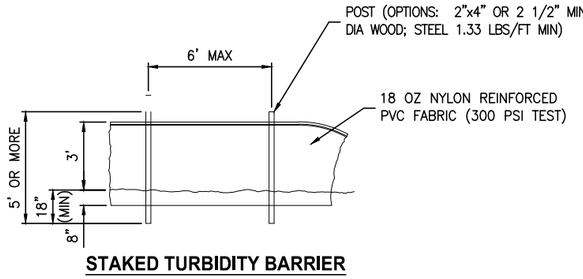
- PILE LOCATIONS
- DREDGE OR FILL AREA
- MOORING BUOY W/ANCHOR
- ANCHOR
- BARRIER MOVEMENT DUE TO CURRENT ACTION

NOTES:
1. TURBIDITY BARRIERS ARE TO BE USED IN ALL PERMANENT BODIES OF WATER REGARDLESS OF WATER DEPTH.
2. NUMBER AND SPACING OF ANCHORS DEPENDENT ON CURRENT VELOCITIES.
3. DEPLOYMENT OF BARRIER AROUND PILE LOCATIONS MAY VARY TO ACCOMMODATE CONSTRUCTION OPERATIONS.
4. NAVIGATION MAY REQUIRE SEGMENTING BARRIER DURING CONSTRUCTION OPERATIONS.
5. FOR ADDITIONAL INFORMATION SEE SECTION 104 OF THE FDOT STANDARD SPECIFICATIONS.

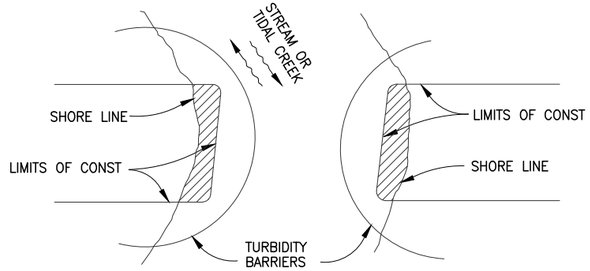
TURBIDITY BARRIER APPLICATIONS

TURBIDITY BARRIERS

NTS

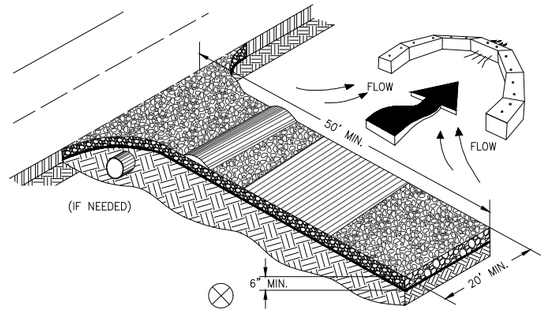


STAKED TURBIDITY BARRIER

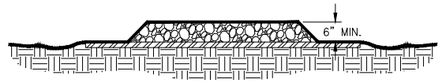


NOTE:

TURBIDITY BARRIERS FOR FLOWING STREAMS AND TIDAL CREEKS MAY BE EITHER FLOATING, OR STAKED TYPES OR ANY COMBINATIONS OF TYPES THAT WILL SUIT SITE CONDITIONS AND MEET EROSION CONTROL AND WATER QUALITY REQUIREMENTS. THE BARRIER TYPE(S) WILL BE AT THE CONTRACTORS OPTION UNLESS OTHERWISE SPECIFIED IN THE PLANS, HOWEVER PAYMENT WILL BE UNDER THE CONTRACT LUMP SUM PRICE ESTABLISHED IN THE BID PROPOSAL FOR EROSION & SEDIMENT CONTROL POSTS IN STAKED TURBIDITY BARRIERS TO BE INSTALLED IN VERTICAL POSITION UNLESS OTHERWISE DIRECTED BY THE ENGINEER.



EXIT DIAGRAM



ENTRANCE ELEVATION

NOTES:
1. AVOID LOCATING ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS.
2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
3. AGGREGATE SIZE SHALL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5"-3.5" STONE).
4. GRAVEL PAD SHALL HAVE A MINIMUM THICKNESS OF 6".
5. PAD WIDTH SHALL BE EQUAL FULL WIDTH AT ALL POINTS OF VEHICULAR EGRESS, BUT NO LESS THAN 20'.
6. A DIVERSION RIDGE SHOULD BE CONSTRUCTED WHEN GRADE TOWARD PAVED AREA IS GREATER THAN 2%..
7. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES.
8. WHEN WASHING IS REQUIRED, IT SHOULD BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN (DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE).
9. WASHRACKS AND/OR TIRE WASHERS MAY BE REQUIRED DEPENDING ON SCALE AND CIRCUMSTANCE. IF NECESSARY, WASHRACK DESIGN MAY CONSIST OF ANY MATERIAL SUITABLE FOR TRUCK TRAFFIC THAT REMOVE MUD AND DIRT.
10. MAINTAIN AREA IN A WAY THAT PREVENTS TRACKING AND/OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

(PER FDOT STANDARD INDEX 106)

SOIL TRACKING PREVENTION DETAIL

BID DOCUMENTS

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED GREINHART
DRAWN PUPSTILL
CHECKED TMCKNIGHT

JonesEdmunds
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821

HIGHLANDS COUNTY SOLID WASTE MANAGEMENT CENTER
CELL 5 LANDFILL EXPANSION
HIGHLANDS COUNTY, FLORIDA

EROSION CONTROL DETAILS

GEORGE A. REINHART, III, PHD, PE, STATE OF FLORIDA, PROFESSIONAL ENGINEER, LICENSE NO. 66516
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