ADDENDUM NO 2.

Bidding and Contract Documents

For

Deicer Management System
T. F. Green State Airport
Warwick, Rhode Island

RHODE ISLAND AIRPORT CORPORATION

January 30, 2013

PREPARED BY:
Gresham, Smith and Partners
155 East Broad Street, Suite 900
Columbus, Ohio 43215

NOTICE TO PROSPECTIVE BIDDERS

ADDENDUM NO. 2

Prospective Bidders and all concerned are hereby notified of the following changes in the Contract Documents for DEICER MANAGEMENT SYSTEM at the T. F. GREEN STATE AIRPORT. These changes shall be incorporated in and shall become an integral part of the contract documents. The number (No. 2) and date (1/30/13) of this addendum must be entered into the space provided on Page P-4 of the Proposal Form. These changes will be incorporated into the Conformed Contract Documents to be issued to the successful bidder.

CONTRACTOR'S QUESTIONS

Items needing clarification were asked during the pre-bid conference. The following pre-bid meeting and subsequent questions, along with their responses, are provided as clarification. The pre-bid conference meeting minutes are given in Attachment 1.

Q1. *What are the badging requirements at the treatment and storage site?*

A1. The Construction Safety and Phasing Plan (CSPP) included on the DVD contains requirements for badging.

Q2. *How can we get runway rules and other specifics for safety zones of the airport? Is all the information covered in the Safety & Phasing Plan?*

A2. Yes, the appropriate procedures for closing and opening runways and taxiways are contained in CSPP. This plan is incorporated into the drawings and specifications. Read carefully.

Q3. *Will the copy of the Pre-bid Conference attendance sheet be available?*

A3. Yes, the attendance sheet was made available after the meeting (Attendance Sign-in Forms and the Plan Holder's List are also attached to this Addendum with the pre-bid meeting notes.)

Q4. *Is there an Engineer's estimate?*

A4. There is an engineer's estimate, which is not generally made public. However, the project range is between $17M and $22M.

Q5. *Regarding the labor agreement: I request confirmation that the project labor agreement is enforceable through the duration of project? Is it enforceable beyond the length of the project? Request clarification of language.*

A5. The Project Labor Agreement ("PLA") by its terms applies only to the Deicer Management System. The term of the PLA is limited to the duration of this project. The successful bidder does not become a signatory contractor bound to the terms of any local collective bargaining agreement in connection with any future work.

Q6. *What is the final completion date?*

A6. There are several milestones. RIAC expects all physical construction to be completed within 365 calendar days from notice to proceed, followed by a period of testing and confirmation. Reference to 549 days for substantial completion, allows for collection and storage of deicer fluid as required by the RIDEM consent agreement. Look closely at the schedule and submit questions for further clarification.

Q7. *What is the anticipated Notice to Proceed date?*

A7. RIAC anticipates issuing the Notice either the beginning or middle of April 2013.

Q8. *What is the specification for the 3-way valve?*

A8. The 3-way valves shall follow the general requirements for Ball valves in "Common Work Results for Process Valves" 40 0523.

PROJECT MANUAL

DIVISION 31 – TECHNICAL SPECIFICATIONS

ADDENDUM ITEM NO. 1

DELETE the specification for "Earthwork for Structures" (31 2023) and **REPLACE** with "Earthwork for Structures" (31 2023) contained in Attachment 2.

DIVISION 43 – TECHNICAL SPECIFICATIONS

ADDENDUM ITEM NO. 2

On page 43 4117-4, Item 1.6.A.1 line 4 **DELETE** "AWWA D110, Type II" and **REPLACE** with "AWWA D110, Type III".

ADDENDUM ITEM NO. 3

On page 43 4117-4, Item 1.6.A.2 line 3 **DELETE** "AWWA D110, Type II" and **REPLACE** with "AWWA D110, Type III".

ADDENDUM ITEM NO. 4

On page 43 4117-4, Item 1.6.B line 4 **DELETE** "AWWA D110, Type II" and **REPLACE** with "AWWA D110, Type III".

CONTRACT DRAWINGS

ADDENDUM ITEM NO. 5

On Drawing No. D-613, make the following changes:

- **DELETE** the table value of Phase/Cycle/Voltage for P-210/P-220 of "3/60/230" and **REPLACE** with "3/60/200".

Note that Addendum No. 2 consists of 4 pages of text and two attachments of 10 and 22 pages.

APPROVED BY: Date: 1/30/13

RIAC Signature

END OF ADDENDUM No. 2

ATTACHMENT 1

PRE-BID CONFERENCE MEETING MINUTES

PRE-BID CONFERENCE
MEETING MINUTES

Pre-bid conference for: RIAC contract number 24327

Project: T. F. Green State Airport Deicer Management System

The purpose of this pre-bid conference is to answer your questions and highlight some important issues like access to project site, airport security, gate responsibility, work procedures, and safety measures during construction.

- INTRODUCTION (RIAC – Ahmed Shihadeh)

- BID PROCEDURES (RIAC – Ahmed Shihadeh)
  1. Bid date, time, and location February 19, 2013, 2 PM at 2000 Post Rd., 3rd floor reception office
  2. Bid bond requirements (5%)
  3. Basis of award, (unit price contract, bid schedules, etc.)

- PROCEDURE FOR QUESTIONS/ADDENDUM (RIAC – Ahmed Shihadeh)
  1. Single point of contact: Laurie Sirois, RIAC
  2. Deadline for additional questions February 13 at 4 P.M.
  3. Additional questions to be in writing to Laurie Sirois at lsirois@pvdairport.com
  4. Addendum (if issued) to be sent out by: February 15 at 5 PM

- FEDERAL REQUIREMENTS (RIAC – Ahmed Shihadeh)
  1. Minimum wage rates – included in specs.
  2. Certified payrolls/records
  3. Subcontractors
  4. Contractor to comply with EEO requirements
  5. Affirmative action program
  6. Reporting procedure: contractor execute standard form 100

- DBE REQUIREMENTS (RIAC – Ahmed Shihadeh)
  1. Project goal 9.45%
  2. Required documentation after the bid (from low bidder)

- SECURITY & BADGING REQUIREMENTS (RIAC – Steve Cahill)

- PROJECT LABOR AGREEMENT(RIAC – Ahmed Shihadeh)

- PROGRESS PAYMENTS(RIAC – Ahmed Shihadeh)
  1. Timing
  2. Measurement
  3. Retainage
  4. Potential payment reduction

- AIRPORT OPS (RIAC – Alan Andrade)
  1. Initial Schedule
  2. Cargo Ramp Aircraft Parking Coordination
  3. NOTAMS Coordination
  4. Runway and Taxiway Crossing Coordination
  5. Work Within Restricted Areas
  6. Review of Other Safety and Phasing Requirements

- PROJECT SCHEDULE AND REGULATORY BACKGROUND (RIAC – Jay Brolin)

- SCOPE OF PROJECT (GS&P – John Lengel and Mark Ervin)
  1. Description of work
  2. Areas of project
     - Cargo Ramp and Cargo Pump Station
     - Terminal Pump Station
     - Force Main Corridors
     - Storage and Treatment Area
  3. Affects on NAVAIDS

- PROJECT MATERIAL TESTING (GS&P – John Lengel and Mark Ervin)
  1. Testing responsibilities of contractor
  2. Payment for retesting
  3. Acceptance criteria

- EXPLANATION OF BID ITEMS (GS&P – Mark Ervin)

- INCIDENTAL ITEMS (GS&P – Mark Ervin)

- QUESTIONS AND TOUR

  The Following questions were asked at the end of the conference. The answers are listed in the CONTRACTOR'S QUESTIONS section of the addendum.

  1. *What are the badging requirements at the treatment and storage site?*

2. *How can we get runway rules and other specifics for safety zones of the airport? Is all the information covered in the Safety & Phasing Plan?*

3. *Will the copy of the Pre-bid Conference attendance sheet be available?*

4. *Is there an Engineer's estimate?*

5. *Regarding the labor agreement: I request confirmation that the project labor agreement is enforceable through the duration of project? Is it enforceable beyond the length of the project? Request clarification of language.*

6. *What is the final completion date?*

7. *What is the anticipated Notice to Proceed date?*

RHODE ISLAND AIRPORT CORPORATION

IFB No. 24327 - DEICER MANAGEMENT SYSTEM
T. F. GREEN AIRPORT
Mandatory Pre-Bid Meeting Attendance Sign-In
Wednesday, January 23, 2013 - 10:00 a.m.
Mary Brennan Board Room
(Please print clearly)

1	Company Name:	GS+P	Name: John Lengel
	Address:	155 E Broad St	Primary Point of Contact (check below)
	City, State, Zip	Columbus, OH 43215	✓ Yes / ____ No
	Telephone:	614-221-0678	
	E-Mail:	john_lengel@gsp.net.com	
2	Company Name:	GS&P	Name: Mark Ervin
	Address:	155 E Broad St.	Primary Point of Contact (check below)
	City, State, Zip	Columbus OH 43215	____ Yes / ____ No
	Telephone:	614-221-0678	
	E-Mail:	mark_ervin@gsp.net.com	
3	Company Name:	Barletta	Name: Dan McGathey
	Address:	40 Shawmut Rd Suite 200	Primary Point of Contact (check below)
	City, State, Zip	Canton Ma 02021	____ Yes / ✓ No
	Telephone:	781 737 1700	John Dargin
	E-Mail:	dmcgathey@barlettaco.com ddargin@barlettaco.com	
4	Company Name:	J.H. Lynch & Sons	Name:
	Address:	50 Lynch Place	Primary Point of Contact (check below)
	City, State, Zip	Cumberland RI 02864	✓ Yes / ____ No
	Telephone:	401 333 4300	
	E-Mail:	msaliba@JHlynch.com	
5	Company Name:	ARDEN ENG.	Name:
	Address:	505 NARRAGANSETT PARK DR.	Primary Point of Contact (check below)
	City, State, Zip	PAWT. RI	____ Yes / ✓ No
	Telephone:	401 737 3500	
	E-Mail:	Maudette@arden.com	

RHODE ISLAND AIRPORT CORPORATION

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T. F. GREEN AIRPORT
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Mary Brennan Board Room
(Please print clearly)

6	Company Name:	ARDEN ENG. CONSTR.	Name: ERIC SPURRIER
	Address:	505 NARRAGANSETT PARK DR	Primary Point of Contact (check below)
	City, State, Zip	PAWTUCKET, RI 02861	✓ Yes / ____ No
	Telephone:	401-727-3500	
	E-Mail:	ESPURRIER@ARDENENG.COM	
7	Company Name:	Gilbane Building Co.	Name: Steve McKernan
	Address:	7 Jackson Walkway	Primary Point of Contact (check below)
	City, State, Zip	Providence, RI 02903	✓ Yes / ____ No
	Telephone:	774-293-0765	
	E-Mail:	Smckernan@Gilbaneco.com	
8	Company Name:	DN TANKS / NATGUN	Name: CHRIS HODGSON
	Address:	11 TEAL RD.	Primary Point of Contact (check below)
	City, State, Zip	WAKEFIELD, MA 01880	____ Yes / ✓ No
	Telephone:	617-510-0320	
	E-Mail:	chris.hodgson@dntanks.com	
9	Company Name:	E. W. BURMAN INC	Name: PAUL BURMAN
	Address:	33 VERMONT AVE	Primary Point of Contact (check below)
	City, State, Zip	WARWICK RI 02888	✓ Yes / ____ No
	Telephone:	401-738-5400	
	E-Mail:	PBURMAN@EWBURMAN.COM	
10	Company Name:	Equality Construction	Name: Albert Bardon
	Address:	37F Lark Industrial Pkwy	Primary Point of Contact (check below)
	City, State, Zip	Greenville RI 02828	✓ Yes / ____ No
	Telephone:	401-949-4525	
	E-Mail:	Al@Capcoentl.com	
11	Company Name:	HART ENGINEERING	Name: JIM RAMOS
	Address:	800 STEERE VIEW DR	Primary Point of Contact (check below)
	City, State, Zip	CUMBERLAND RI 02864	____ Yes / ✓ No
	Telephone:	401-658-4600	
	E-Mail:	JRAMOS@HARTCOMPANIES.COM	

RHODE ISLAND AIRPORT CORPORATION

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T. F. GREEN AIRPORT
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Wednesday, January 23, 2013 - 10:00 a.m.
Mary Brennan Board Room
(Please print clearly)

12	Company Name:	Sealcoating Inc	Name:
	Address:	Grant 500	Primary Point of Contact (check below)
	City, State, Zip	Braintree MA	✓ Yes / ____ No
	Telephone:	781-428-3400	
	E-Mail:	WWolford@Sealcoatinginc.com	
13	Company Name:	DN TANKS / NATGUN	Name: STEVE PUOPOLO
	Address:	11 TEAL ROAD	Primary Point of Contact (check below)
	City, State, Zip	WAKEFIELD, MA 01880	✓ Yes / ____ No
	Telephone:	(781) 224-5161	
	E-Mail:	STEVE.PUOPOLO@DNTANKS.COM	
14	Company Name:	JH LYNCH & SONS, INC	Name: PAUL LEOFANTT
	Address:	50 LYNCH PLACE	Primary Point of Contact (check below)
	City, State, Zip	CUMBERLAND, RI	____ Yes / X No
	Telephone:	401-333-4300	
	E-Mail:	SALES@JHLYNCH.COM	
15	Company Name:	J. H. Lynch + Sons	Name: Jason LaForge
	Address:	50 lynch Place	Primary Point of Contact (check below)
	City, State, Zip	Cumberland RI	____ Yes / ✓ No
	Telephone:	401-333-4300	
	E-Mail:	Sales@Jhlynch.com	
16	Company Name:	HBT ELEC. CORP	Name: ROBERT MULLIGAN
	Address:	300 SCENIC VIEW DRIVE	Primary Point of Contact (check below)
	City, State, Zip	CUMBERLAND, RI 02864	X Yes / ____ No
	Telephone:	401 658-4600	
	E-Mail:	RMULLIGAN@HBTCOMPANIES.COM	
17	Company Name:		Name:
	Address:		Primary Point of Contact (check below)
	City, State, Zip		____ Yes / ____ No
	Telephone:		
	E-Mail:		

RHODE ISLAND AIRPORT CORPORATION

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T. F. GREEN AIRPORT
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Mary Brennan Board Room
(Please print clearly)

18 Company Name:	R ZOPPO CORP	Name:	Robert DiGirolamo
Address:	160 Old Maple Street	Primary Point of Contact (check below)	
City, State, Zip	Stoughton MA 02072	✓ Yes / ____ No	
Telephone:	781-344-8822		
E-Mail:	rdigirolamo@zoppo.com		
19 Company Name:	PROCESS ENG & CONSTR, INC	Name:	ED HUGHES
Address:	165 MILL ST	Primary Point of Contact (check below)	
City, State, Zip	CRANSTON RI 02905	✓ Yes / ____ No	
Telephone:	401 780-0780	MECHANICAL MBE	
E-Mail:	EHUGHES@PECRI.com		
20 Company Name:	DELTA MECHANICAL	Name:	JEFF BOOKBINDER
Address:	44 WILCLAR ST	Primary Point of Contact (check below)	
City, State, Zip	WARWICK RI 02886	✓ Yes / ____ No	
Telephone:	401-737-3500		
E-Mail:	J.BOOKBINDER@DELTAMECHLLC.COM		
21 Company Name:	CARDI CORPORATION	Name:	JOE COLAPIETRO
Address:	400 LINCOLN AVE	Primary Point of Contact (check below)	
City, State, Zip	WARWICK, RI 02888	✓ Yes / ____ No	
Telephone:	401-739-8300		
E-Mail:	JOECOLAPIETRO@CARDI.COM		
22 Company Name:	JAMES J. O'ROURKE, INC	Name:	MARK REZENDES
Address:	21 PINE STREET	Primary Point of Contact (check below)	
City, State, Zip	WARWICK, RI 02888	✓ Yes / ____ No	
Telephone:	401-785-9850		
E-Mail:	MREZENDES@JJOI.COM		
23 Company Name:	GILBANE BUILDING CO	Name:	Brendan Ennis
Address:	7 JACKSON WALKWAY	Primary Point of Contact (check below)	
City, State, Zip	PROVIDENCE	____ Yes / ✓ No	
Telephone:	456-5800		
E-Mail:	bennis@gilbaneco.com		

LIST OF PLANHOLDERS
INVITATION FOR BIDS No. 24327
DEICER MANAGEMENT SYSTEM - T. F. GREEN AIRPORT

1	**Company Name:**	J H Lynch & Sons		
	Address:	50 Lynch Place	**Contact Name:**	
	City, State, Zip	Cumberland, RI 02864	**Fax No.:**	(401) 333-2659
	Telephone:	(401) 333-4300	**E-Mail Address:**	sales@jhlynch.com
2	**Company Name:**	Delta Mechanical Contractors		
	Address:	44 Wilclar Street	**Contact Name:**	Jeff Bookbinder
	City, State, Zip	Warwick, RI 02286	**Fax No.:**	
	Telephone:	(401) 737-3500	**E-Mail Address:**	j.bookbinder@deltamechLLC.com
3	**Company Name:**	Hart Engineering Corp.		
	Address:	800 Scenic View Drive	**Contact Name:**	Robert Mulligan
	City, State, Zip	Cumberland, RI 02864	**Fax No.:**	(401) 658-4609
	Telephone:	(401) 658-4600	**E-Mail Address:**	rmulligan@hartcompanies.com
4	**Company Name:**	Cardi Corporation		
	Address:	400 Lincoln Avenue	**Contact Name:**	Joe Colapietro
	City, State, Zip	Warwick, RI 02888	**Fax No.:**	(781) 224-5163
	Telephone:	(401) 739-8300	**E-Mail Address:**	joecolapietro@cardi.com
5	**Company Name:**	DYK and Natgun		
	Address:	11 Teal Road	**Contact Name:**	Kristen Kershaw
	City, State, Zip	Wakefield, MA 01880	**Fax No.:**	(781) 224-5163
	Telephone:	(781) 246-1133	**E-Mail Address:**	kristen.kershaw@dntanks.com
6	**Company Name:**	Gilbane Building Company		
	Address:	7 Jackson Walkway	**Contact Name:**	Brendan Ennis
	City, State, Zip	Providence, RI	**Fax No.:**	
	Telephone:	(401) 437-6262	**E-Mail Address:**	bennis@gilbaneco.com
7	**Company Name:**	D'Ambra Construction		
	Address:	800 Jefferson Boulevard	**Contact Name:**	Fernando Sarmento
	City, State, Zip	Warwick, RI 02887	**Fax No.:**	(401) 732-4725
	Telephone:	(401) 737-1300	**E-Mail Address:**	
8	**Company Name:**	Arden Engineering		
	Address:	505 Narragansett Park Drive	**Contact Name:**	Samantha Richwine
	City, State, Zip	Pawtucket, RI 02861	**Fax No.:**	
	Telephone:	(401) 727-3500	**E-Mail Address:**	boston@isqft.com

LIST OF PLANHOLDERS
INVITATION FOR BIDS No. 24327
DEICER MANAGEMENT SYSTEM - T. F. GREEN AIRPORT

9	**Company Name:**	iSqft		
	Address:	4500 Lake Forest Drive Suite 502	**Contact Name:**	Samantha Richwine
	City, State, Zip	Blue Ash, OH 45242	**Fax No.:**	
	Telephone:	(800) 785-9850 ext 108	**E-Mail Address:**	boston@isqft.com
10	**Company Name:**	James O'Rourke, Inc.		
	Address:	21 Pine Street	**Contact Name:**	Brian Retelle
	City, State, Zip	Warwick, RI 02888	**Fax No.:**	(401) 785-2450
	Telephone:	(401) 785-9850, ext. 108	**E-Mail Address:**	bretelle@jjoi.com
11	**Company Name:**	Sealcoating Inc.		
	Address:	825 Granite Street	**Contact Name:**	Dave Wuori
	City, State, Zip	Braintree, MA 02184	**Fax No.:**	(781) 824-3430
	Telephone:	(781) 824-3419	**E-Mail Address:**	dwuori@sealcoatinginc.com
12	**Company Name:**	E W Audet & Sons		
	Address:	169 Bay Street / P O Box 2039	**Contact Name:**	
	City, State, Zip	Providence, RI 02905	**Fax No.:**	(401) 781-8820
	Telephone:	(401) 467-3510	**E-Mail Address:**	kate@ewaudet.com
13	**Company Name:**	Barletta		
	Address:	40 Shawmut Road, Suite 200	**Contact Name:**	Dan McGathey
	City, State, Zip	Canton,MA 02021	**Fax No.:**	
	Telephone:	(781) 737-1700	**E-Mail Address:**	dmcgathey@barlettaco.com
14	**Company Name:**	R Zoppo Corp		
	Address:	160 Old Maple Street	**Contact Name:**	Robert DiGirolamo
	City, State, Zip	Stoughton MA 02072	**Fax No.:**	(781) 344-7382
	Telephone:	(781) 344-8822	**E-Mail Address:**	rdigirolamo@zoppo.com
15	**Company Name:**	Rossi Electric		
	Address:	65 Western Industrial Drive	**Contact Name:**	Anthony Mrchetti
	City, State, Zip	Cranston, RI 02921	**Fax No.:**	
	Telephone:	(401) 639-2283	**E-Mail Address:**	amarchetti@rossielectric.com
16	**Company Name:**			
	Address:		**Contact Name:**	
	City, State, Zip		**Fax No.:**	
	Telephone:		**E-Mail Address:**	
17	**Company Name:**			
	Address:		**Contact Name:**	
	City, State, Zip		**Fax No.:**	
	Telephone:		**E-Mail Address:**	
18	**Company Name:**			
	Address:		**Contact Name:**	
	City, State, Zip		**Fax No.:**	
	Telephone:		**E-Mail Address:**	

ATTACHMENT 2

EARTHWORK FOR STRUCTURES (31 2023)

EARTHWORK FOR STRUCTURES

Section 31 2023

PART 1 - GENERAL

1.1 COMMENTARY

A. Earthwork for Deicer Treatment Site

The existing topsoil, subsoil, and fill overlying the natural outwash deposits at the Deicer treatment Site are not considered suitable for support of shallow foundations in their current condition and will need to be excavated and replaced with structural fill. Since the condition and density of the fill cannot be confirmed, the footprint of proposed buildings and storage tanks will require over excavation and placement of engineered backfill, in order to allow for the safe construction of the proposed building and tank foundations.

The underlying natural outwash deposits are considered competent bearing materials for shallow foundations in their current condition, provided they remain undisturbed during construction. These bearing soils, however, are located below non-engineered fill material of varying density.

Bearing pressures at the bottom of the fully loaded tank perimeter footings and tank slab-on-grade should not exceed 3,000 pounds per square foot (psf), and bearing pressures for building footings should not exceed 4,000 pounds per square foot (psf) for compacted structural fill and natural outwash deposits, to limit elastic settlement of the foundations.

The excavation for the proposed basement portion of the Deicer Treatment Building will require cuts up to 12-14 feet below current ground surface. Based upon the groundwater levels measured within B-3(OW), it is anticipated that depending on the seasonal weather and rainfall during construction, groundwater may be encountered at the proposed basement foundation subgrade. The seasonal high groundwater table at the site was estimated at approximate elevation 20.2 feet (NAVD 88). If excavations are required below the groundwater table, dewatering systems or a water resistant excavation support system may be required to facilitate construction of the below grade portions of the Deicer Treatment Building in-the-dry.

The silty nature of the surficial fill and the natural outwash soils outwash (generally 10% to 35% silt) will cause this material to be difficult to work with when wet. Wet material excavated from below the water table, or material saturated from precipitation, will likely not be able to be properly compacted for reuse as structural fill without drying it first to a workable water content. Special measures such as discing or harrowing may be required to facilitate drying of wet soils prior to compaction, which may result in construction delays. Additionally, saturated or wet silty soils may not

support wheeled vehicle traffic.

B. Earthwork for Terminal and Cargo Pump Stations

The topsoil, subsoil, artificial fill, and buried topsoil overlying the natural outwash deposits across the airport airfield are not considered suitable for support of shallow foundations in their current condition due to the unknown density of these materials.

At the terminal pump station area, the proposed stormwater collection structures will extend below the artificial fill into the natural outwash stratum that was encountered at approximately 6.5 feet below the current ground surface. Within the cargo pump station area, artificial fill and buried topsoil was encountered up to a depth of approximately 9.5 feet below the current ground surface. The cargo valve vault and the cargo flow vault bearing elevations are expected to be above this depth so that the fill and any buried topsoil below the bearing elevation of these structures will need to be excavated and replaced with structural fill in order to allow for the safe construction of the proposed foundations.

Generally, the proposed stormwater infrastructure across the airport airfield will be located below grade and include stormwater collection and diversion structures, several manholes, stormwater pump stations, and stormwater valve and flow vaults. The loads of these structures, even when filled with water, will likely be less than the weight of the existing soil that they will replace. The natural outwash deposits that were encountered in the area of the proposed structures are anticipated to provide sufficient bearing capacity provided they remain undisturbed during construction.

Apparent glacial till with boulders or bedrock was encountered in borings B-12 and B-13, at approximate depths of 36 and 65 feet below the ground surface, respectively. Since the deepest structure in these areas will be the pump stations, with an approximate depth of 30 feet below ground surface, the need for excavation of the glacial till or bedrock for the construction of the stormwater structures may not be required.

The excavation for the proposed terminal and cargo pump stations will require cuts up to 30 feet below current ground surface. Based upon the groundwater level measured within B-12(OW) and B-13(OW), it is anticipated that, depending on the seasonal weather and rainfall during construction, the excavations for these structures may extend up to 23 feet below the groundwater table at the time of construction. It is anticipated that a water resistant excavation support system will be required to facilitate construction of the diversion and pump station structures in-the-dry in both the cargo and the terminal areas. Due to the granular nature of the near surface soils, it is anticipated that dewatering the excavations with a local well point system will be difficult without a water resistant excavation support system.

The seasonal high groundwater table at the site was estimated at approximate elevation 43 feet (NAVD 88) at the terminal pump station area and 37 feet at the cargo pump

station area. Lateral hydrostatic pressures generated by seasonal high groundwater should be considered during design of temporary excavation support systems.

Due to the silty nature of the deeper outwash deposits (generally above 35% silt at depths in excess of 30 to 35 feet below the ground surface at B-12 and B-13) and the associated low hydraulic conductivity of these deeper materials, it is expected that installation of sheetpiles for a water resistant cofferdam and embedding the sheetpiles in the silty stratum will be beneficial to control the groundwater inside the deep excavations.

C. Earthwork for Stormwater Conveyance Piping

The proposed stormwater conveyance piping across the airport airfield will be located below grade and will consist of 12 to 24-inch diameter HDPE and RCP piping. The spring line of the proposed piping is anticipated at approximately four feet below ground surface where possible. The loads of these structures, even when filled with water, will likely be less than the weight of the existing soil that they will replace. The artificial fill that was encountered in the area of the proposed structures is anticipated to provide sufficient bearing capacity as long as disturbance of the existing materials is kept to a minimum and all conveyance piping trenches are properly excavated, the bottom of the trench compacted, and backfilled in accordance with the pipe manufacturer's recommendations.

The seasonal high groundwater elevation in some areas of the airport airfield may be higher than the bottom of the required trench elevation, and construction difficulties and the need for temporary dewatering should be anticipated for construction. The seasonal high groundwater elevation may also be higher than the invert elevation of the proposed stormwater conveyance piping in some areas of the airfield. Uplift pressures due to buoyancy of empty piping should be considered during the construction of the conveyance infrastructure.

1.2 REFERENCE DOCUMENTS

A. Geotechnical Investigation and Report entitled "Geotechnical Report – Deicer Treatment Facility, T. F. Green Airport, Warwick, Rhode Island", as prepared by GZA GeoEnvironmental, Inc., dated January 2012.

B. Exploration Location Plan and Geotechnical borings logs GZ-1 through GZ-19, dated January 2012.

C. The Rhode Island State Building Code, latest edition; and IBC 2009, the International Building Code.

D. American Society for Testing and Materials (ASTM) D1586-84 Method for Penetration Test and Split Barrel Sampling of Soils.

E. ASTM D1557 Modified Proctor Density

F. ASTM D422 Particle Size Analysis of Soil

G. ASTM D2922 Density of Soil and Soil Aggregate In-place by Nuclear Methods

H. Occupational Safety and Health Administration (OSHA) Regulation 29 CFR Part 1926 - Occupational Safety and Health.

1.3 SUMMARY

A. This Section includes the following:
   1. Excavating, filling, and backfilling for buildings and structures.
   2. Drainage course for slabs-on-grade.
   3. Subsurface drainage backfill for walls.
   4. Excavating and backfilling trenches within building lines.
   5. Densification of existing soil and imported fill.

B. Related Sections include the following:
   1. Division 31 Section "Site Clearing and Demolition" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
   2. Division 31 Section "Earth Moving" for site requirements beyond building pad.
   3. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
   4. Division 03 Section "Cast-in-Place Concrete" for granular course over vapor retarder.

1.4 DEFINITIONS

A. Building Area: is the area below buildings, defined by a line extending from two feet outside the edge of the exterior footings downward and outward at a 1 vertical to 1 horizontal to the existing natural subgrade.

B. Subgrade: The undisturbed earth remaining after completing excavation or the compacted soil layer immediately below granular subbase, base course, drainage course, fill or structural fill, or topsoil materials.

C. Structure: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances or other man-made stationary features occurring above or below ground surface.

D. Fill: General term for all materials used to raise existing grades.

E. Backfill: All fill material placed immediately behind retaining walls.

F. Drainage Course: Capillary water barrier layer below slab-on-grade.

G. Structural Fill: All fill material under building pad within the building area.

H. Borrow: Satisfactory soil imported from off-site for use as fill.

I. Building Pad: The building pad for the structure is the building footprint and extending two feet outside the perimeter of the building.

J. Excavation: Removal of material encountered above subgrade elevations.
   1. Authorized Additional Excavation: Excavation below subgrade elevations as directed by the Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

K. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 2 cu. yd. for bulk excavation or 1 cu. yd. for footing, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Excavation of Footings, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbf and stick-crowd force of not less than 18,700 lbf; measured according to SAE J-1179.
   2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 45,000-lbf breakout force; measured according to SAE J-732.

1.5 SUBMITTALS

A. Schedule and Earthwork Plan:
   1. The contractor shall provide a written preliminary schedule of the work at the time of bid submission.
   2. The contractor shall provide a detailed construction plan and construction schedule for the work within 10 days of award.

B. Earth Support System:
   1. Submit any proposed earth support system design (such as design for pump station cofferdams) to the Geotechnical Engineer for review at least 10 working days prior to commencement of construction. The earth support system design shall be prepared and stamped by a Professional Engineer, Registered in the State of Rhode Island.

C. Plan for Temporary Dewatering:
   1. Submit a dewatering plan (for temporary dewatering operations) to the Geotechnical Engineer for review at least 10 working days prior to commencement of construction. The dewatering plan shall be prepared by a Professional Engineer registered in the State of Rhode Island. This submittal is for information purposes only and will not be reviewed or approved.

D. Bag Samples:
   1. Submit bag samples (40 lbs minimum) of each type of material to be used as fill at least 10 working days in advance of its required use. Representative samples of excavated fill material that will be used for backfill shall also be submitted for testing.

E. Certificates:
   1. Certify that materials are new and meet or exceed specification requirements by submitting a notarized copy of manufactures certificates for all products.

F. Product Data: For the following:
   1. Geotextile Separation fabric.

G. Material Test Reports: From the Testing Agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Soil gradation curve according to ASTM D422 for on-site and borrow soil material proposed for fill.
   2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill.

H. Specifications for the vibratory compaction equipment. This submittal is for information purposes only and will not be reviewed or approved.

1.6 QUALITY ASSURANCE

A. Soil Testing and Inspection Service:
   1. Contractor is responsible for geotechnical soil testing during construction. Geotechnical soil testing and inspection service for quality control confirmation during earthwork operations will be supplied by the Owner. The Contractor will bear the cost of testing all materials which fail to conform to the specifications.

B. Pre-excavation Conference: Conduct a conference at the Project site to comply with requirements in Division 01.

C. Prior to construction, have structure location staked and certified by a Rhode Island licensed land surveyor. If discrepancies between actual lines and elevations exist, notify Engineer before proceeding with layout of buildings and structures.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Locate existing underground utilities in the areas of work. Contact utility-locator service for area where Project is located before excavating.
   2. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
   3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to

procedure. Cooperate with the Engineer in keeping respective service and facilities in operation. Repair damaged utilities to the satisfaction of the Owner.

4. Notify Engineer not less than two days in advance of proposed utility interruptions.
5. Do not proceed with utility interruptions without Engineer's written permission.
6. Do not interrupt existing utilities serving facilities occupied and used by others.

B. Site Information:

1. Data on indicated site conditions are not intended as representations or warranties of continuity of such conditions. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn there from by Contractor. Data are made available for convenience of Contractor and are not guaranteed to represent conditions that may be encountered.

C. Subsurface Conditions:

1. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. The Owner will not be responsible for interpretation or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered. The Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Obtain Owner's approval prior to making any subsurface explorations. Visit the site and become familiar with existing ground conditions.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
2. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.8 LAWS AND REGULATIONS

A. All work performed under this contract shall be accomplished in accordance with all regulations and laws of local, State, and Federal agencies and utility companies.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Sand-Gravel Fill:

1. “Sand-Gravel Fill” shall consist of hard, durable sand and gravel, and shall be free from ice and snow, roots, sod, rubbish, and other deleterious or organic matter. It shall conform to the following gradation requirements:

SIEVE SIZE	PERCENT FINER BY WEIGHT
*	100
1/2-inch	50-85
No. 4	40-75
No. 10	30-60
No. 40	10-35
No. 50	8-28
No. 100	5-20**
No. 200	0-10

* Four inches (4") where placed as base course; elsewhere, two-thirds (2/3) of the loose lift thickness; Two inches (2") where placed as bedding and backfill around utilities.

** The amount passing the No. 100 sieve should be between forty percent (40%) and seventy percent (70%) of that amount passing the No. 40 sieve.

C. Granular Fill:

1. "Granular Fill" shall be free from ice and snow, roots, sod, rubbish, and other deleterious or organic matter. It shall conform to the following gradation requirements:

SIEVE SIZE	PERCENT FINER BY WEIGHT
*	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

* Two-thirds (2/3) of the loose lift thickness.

2. Granular soils excavated during the implementation of the Soil Management Plan and other grading and earthwork operations may be used as backfill provided the above gradations are met as required and the moisture content is suitable for compaction. Granular soils not meeting the above gradation requirements may be used as backfill at the discretion of the Geotechnical Engineer provided the required compaction can be obtained.

D. Ordinary Fill / Borrow:

1. "Ordinary Fill" shall consist of well-graded mineral soil substantially free of organic materials, loam, wood, trash and other objectionable material which may be compressible or which cannot be compacted properly.
2. “Ordinary Fill” shall be unfrozen and shall not contain snow, ice, or frozen materials. Ordinary fill shall not contain stones larger than eight (8) inches in largest diameter. It shall have physical properties such that it can be readily spread and compacted during filling.
3. “Ordinary Fill” meeting the above requirements may be used as backfill at the discretion of the Geotechnical Engineer provided the required compaction can be obtained.

E. Crushed Stone:

1. Crushed Stone shall consist of one or the other of the following material:
   a. Durable crushed rock consisting of the granular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated*, or other objectionable pieces. * Thin or elongated pieces are defined as follows: Thin stones shall be considered to be such stones whose average width exceeds four (4) times their average thickness. Elongated stones shall be considered to be such stones whose average length exceeds four (4) times their average width.
   b. Durable crushed gravel stone obtained by artificial crushing of cobbles, boulders, or field stone with a minimum diameter before crushing of 8 inches.
   c. The crushed stone shall be reasonably free from clay, loam or deleterious material and not more than 1.0% of satisfactory material passing a No. 200 sieve will be allowed to adhere to the crushed stone.
   d. Crushed stone shall be uniformly blended according to the grading requirements in the following table:

SIEVE SIZE	PERCENT FINER BY WEIGHT		
	2”- CRUSHED STONE FOR CONSTRUCTION ENTRANCE	3/4" CRUSHED STONE	1-1/2" CRUSHED STONE
6-Inch	---	---	---
3-Inch	---	---	---
2-Inch	90-100	---	---
1 1/2-Inch	---	---	100
1 1/4-Inch	25-50	---	85-100
1-Inch	---	100	---
3/4-Inch	0-15	90-100	10-40
1/2-Inch	0-5	20-50	0-8
3/8-Inch	---	0-20	---
No. 4	0	0-5	---
No. 10	---	---	---
No. 100	---	---	---
No. 200	<1	<1	<1

F. Sand Fill:

1. "Sand Fill" shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic material. Sand fill shall be a well-graded, medium to coarse sand with a maximum diameter of 1/4 inch and no more than 10% passing the No. 200 sieve.

G. Off-Site Imported Fill Materials:

1. Fill materials brought to the site from off-site sources shall meet the gradation requirements of “Granular Fill” or “Sand-Gravel Fill”, if intended to be used as structural backfill.

2. Coordinate with the Geotechnical Engineer regarding geotechnical testing of samples of the proposed off-site sourced materials. The requirements of paragraph "1.5 Submittals" and "2.1 Soil Materials" apply.
3. No fill material shall be delivered to the project site without notification of the Geotechnical Engineer.

H. Controlled Density Fill / Controlled Low Strength Material (CLSM):
1. "Controlled Density Fill" shall consist of excavatable, flowable, self consolidating, rigid setting, low density material that can be substituted for compacted gravel backfills, fills and structural fills.
2. Flowable Fill shall be provided by the Contractor.
3. Flowable Fill shall be a mixture of no more than 95 percent flyash and no less than 5 percent cement and water paste. Flowable fill material shall be free of organic material, construction debris, ice, snow and deleterious material and particles greater than 1 inch in size.

I. Loam:
1. Loam (supplied from off-site) shall be a sandy loam or loam soil classification as defined by the USDA Soil Conservation Service, Soil Classification System consisting of a fertile, friable, natural topsoil/loam typical of locality, without admixture of subsoil, refuse or other foreign materials, shall be obtained from a well-drained arable site, and shall meet ASTM D5268. It shall be such a mixture of sand, silt and clay particles as to exhibit sandy and clayey properties in about equal proportions. It shall be free of stumps, roots, heavy or stiff clay, stones larger than 3/4-inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter, and shall have the following mechanical analysis:

Textural Class	% of Total Weight	Average %
Sand 0.05 - 2.0mm dia. Range	45 to 75	60
Silt 0.002 - 0.05mm dia. Range	15 to 35	25
Clay less than 0.002mm dia. Range	5 to 25	15

a. 95 percent of Loam shall pass a 2.0mm sieve.
b. Loam shall have a pH value range of 6.0 to 7.0. If Topsoil/Loam material does not fall within the required pH range, limestone or aluminum sulfate shall be added to bring the pH within the specified limit.
2. Loam shall contain not less than 4 percent nor more than 20 percent organic matter as determined by the loss on ignition of oven-dried samples. Test sample shall be oven-dried to a constant weight at a temperature of 230°F ±9°.

J. Filter Fabric:
1. Non-woven Filter fabric shall be a geotextile such as Mirafi 160N, Carthage Mills FX-40HS, Amoco 4546, or approved equivalent. Joints shall be continuously sewn or overlapped by a minimum of 2 feet.
2. Woven filter fabric shall be Mirafi 600X or approved equal, or as specified on the drawings. Joints shall be continuously sewn or overlapped by a minimum of 2 feet.

K. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; meeting the soil gradation requirements for the intended use defined above, free of debris, waste, frozen materials, vegetation, and other deleterious matter.

L. Unsatisfactory Soils:
1. ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
2. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

M. Drainage Course:
1. Material for sub-slab drainage course shall be sound and free-draining "SAND-GRAVEL FILL" with less than 8 percent passing the 200 sieve.

N. Backfill:
1. Material for backfill shall be sound and free-draining "GRANULAR FILL" as defined above, with less than 10 percent passing the 200 sieve. Maximum diameter shall be 3 inches.
2. Backfill shall be free of organics, debris and deleterious materials.

O. Structural Fill:
1. Material for structural fill shall consist of granular material. Granular material shall consist of either sand or gravel or a combination of both. Fill material will be clean, and graded in accordance with the requirements of "Sand-Gravel Fill" or "Granular Fill" depending on its intended use, non-plastic (zero PI). No clayey material, dirt or organic material will be allowed.
2. Structural fill shall be free of organics, debris and deleterious materials.

2.2 EQUIPMENT

A. Provide a Vibratory Roller with the Following Specifications:
1. Total Static Weight: 20,000 to 24,000 pounds. At least 90 percent of the weight shall be transmitted to the ground through a single smooth drum when the roller is in a level position.
2. Drum Diameter: 60 to 65 inches
3. Drum Width: 72 inches
4. Unsprung weight of drum, shaft, and internal mechanism minimum 12,000 pounds
5. Frequency of Vibration: 1100 to 1500 vibrators per minute
6. Dynamic Force: Minimum of 40,000 pounds at the operating frequency
7. Roller Speed: Not to exceed 1.5 miles per hour when towed by a rubber-tired or crawler tractor with a minimum drawbar rating of 50 horsepower.
8. Instruments: A type to measure roller vibrations per minute or a conversion chart with proper instruments may be used.

PART 3 - EXECUTION

3.1 GENERAL

A. Excavation includes the removal and disposal, stockpiling, or re-use of materials encountered when establishing required grade elevations, or when excavating to remove unsatisfactory soils.

B. Perform all excavation of every description and of whatever substances encountered to the depths and extent indicated for the proper installation of the Work.

C. Excavate to the minimum depths required for all foundations, structures, and utility systems.

D. Earth excavation includes the removal and disposal of pavements and other obstructions visible on the ground surface, underground structures and utilities indicated to be demolished and removed, and soil material of any classification regardless of whether indicated in the data on subsurface conditions.

E. If the over-excavated subgrade is disturbed and softened as determined by the geotechnical engineer, the subgrade shall be heavily surface compacted with a minimum of six passes of a vibratory roller having a drum weight of at least 10,000 pounds and a dynamic force of at least 20,000 pounds prior to placement of site fill. If working under wet conditions, care must be taken so as not to cause weaving and softening of the subgrade.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 STRIPPING

A. Strip building pad of vegetation, topsoil, roots, and other unsuitable material to a depth to be determined by a representative of the Geotechnical Engineer but not less than one foot. Coordinate with other Division 2 specification sections.

3.4 DEMOLITION

A. If required, remove existing foundations, abandoned utility piping, slabs, pavements, and other debris encountered in the proposed building area extending to a minimum depth of two feet below footings and other structures and/or to a limit defined by a 1 horizontal to 1 vertical slope extending downward and outward from two feet outside the edge of each footing. Dispose of excess or unsuitable material as part of the contract price.

3.5 EXISTING UTILITIES

A. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

B. Locate existing utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

C. Should uncharted or incorrectly charted utilities be encountered during excavation, consult the Engineer immediately for directions.

D. Repair damaged utilities that are to remain or those damaged prior to when scheduled to be taken out of service to the satisfaction of the Owner.

3.6 SLOPE STABILITY

A. Slope sides of manned excavations shall comply with OSHA requirements and local codes and ordinances having jurisdiction.

B. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated.

C. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

3.7 SHORING AND BRACING

A. If required, provide adequate shoring and bracing, such as soldier piles and lagging or sheet piling in good serviceable condition.

B. Trench shoring and bracing shall comply with OSHA requirements and local codes and authorities having jurisdiction.

C. All shoring and bracing shall be designed, sealed, and stamped by a Registered Professional Engineer, registered in the State of Rhode Island

D. Coordinate shoring and bracing with the construction to be performed.

E. Construct shoring and bracing system in accordance with the approved submittal.

F. Maintain shoring and bracing in excavations during all time periods when excavations are to be open.

3.8 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Grade all lifts of backfill to allow drainage to a designated area from which water can be removed.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of already compacted lifts of backfill material and prepared foundation bearing subgrade

C. Prevent surface water runoff from undercutting foundations, and from causing soil changes detrimental to stability of subgrades and foundations.

D. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

E. Dispose of water in accordance with the requirements of all local, State and Federal codes and in accordance with Project dewatering permits.

F. Should the subgrade become disturbed, saturated, or weave, the Contractor shall take whatever means necessary to stabilize the subgrade at the discretion of the Geotechnical Engineer.

3.9 EXPLOSIVES

A. Explosives: Do not use explosives.

3.10 EXCAVATION - GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.11 PROOF ROLLING OPERATIONS

A. Proof roll the site after stripping or excavation, and before any fill placement, with two coverages of a loaded dump truck or scraper. Areas found to be soft or pumping shall have the soft soil removed and replaced with structural fill and compacted as outlined herein.

3.12 DENSIFICATION OPERATIONS

A. Densify the site after stripping or excavation, and before any fill placement, with twenty complete coverages of 10-ton vibratory roller. A complete coverage shall include an overlap of 2 feet by each subsequent roller pass over the previous pass. Water content control may be required. Ten passes shall be made in each of 2 perpendicular directions. Use the side draft method for areas not accessible when the roller is towed directly behind the roller. Do not densify soils within 5 feet of existing structure to more than 93 percent of the maximum dry density. Proof-rolling should continue until

the soil 1 foot below the compaction surface attain a density of at least 95 percent of the maximum dry density as indicated by the Modified Proctor ASTM D1557.

B. Densify the site after stripping or excavation, and before any fill placement, with non-vibratory compaction equipment. Below footing bottoms and floor slabs, the subgrade soils should be compacted to achieve a density equal to or greater than 95 percent of the materials in conformance with ASTM D1557 maximum dry density.

3.13 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 32 degrees F.

3.14 EXCAVATION FOR STRUCTURES - GENERAL

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.15 EXCAVATION FOR FOUNDATIONS

A. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

C. Do not excavate to full depth when there is a probability of frost forming on ground freezing in excavation before concrete is placed.

D. Keep excavations dry; furnish pumps to keep surfaces clear of water where necessary.

3.16 EXCAVATION FOR PAVEMENT

A. Cut to the subgrade under pavements to comply with cross-sections, elevations and grades as shown on the Drawings.

3.17 EXCAVATION AND INSTALLATION OF UTILITIES

A. Trench for pipes shall be excavated to the required line and grade and of sufficient width to permit thorough tamping of the fill material under the haunches and around the pipe.

B. In general, utility trenches shall be excavated to a minimum 6 inches below the bottom of the utility line to accommodate bedding material as specified hereinafter or as specified by the manufacturer.

C. Soft or unsatisfactory material encountered below the normal bedding of the pipe shall be removed as directed, replaced with selected sand or manufacturer-recommended bedding material, and thoroughly compacted.

D. The bottom of the trench shall be shaped to conform to the curvature of the pipe. This bed shall also be excavated to accommodate the bells of pipes.

E. All utilities shall be installed as recommended by the manufacturer or as specified herein as directed by the Geotechnical Engineer.

3.18 APPROVAL OF SUBGRADE

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
   1. Material rendered unsuitable due to noncompliance with project specifications and drawings shall be removed and replaced as directed by the Engineer at the Contractor's expense.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.19 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.20 RE-USE OF MATERIAL

A. Excavated materials which meet the requirements for the fill materials specified above may be reused on site. Fill materials not meeting the required gradation requirements may be reused at the discretion of the Geotechnical Engineer provided the required compaction can be obtained. No additional payment shall be made if the materials cannot be properly compacted or require additional compaction effort or soil conditioning to achieve the required compaction.

3.21 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.22 FILL PLACEMENT - GENERAL

A. Place and compact fill per this specification in excavations promptly, but not before completing the following:
   1. Acceptance by the Owner/Engineer of construction below finish grade, where applicable, damp proofing, waterproofing, and perimeter insulation.
   2. Acceptance by the Geotechnical Engineer of compaction of the previously placed lift of backfill.
   3. Do not place backfill on subgrade that contains frost, mud or is frozen.
   4. Surveying locations of underground utilities for record documents.
   5. Inspecting, testing, approval, and recording locations of underground utilities.
   6. Removing concrete formwork.
   7. Removing temporary shoring and bracing, and sheeting, and backfilling of voids with satisfactory materials.
   8. Removing trash and debris.
   9. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Fill Placement Procedures:
   1. All compacted fill shall be placed in layers. Each layer shall be systemically compacted by approved compaction equipment to the density specified herein.
   2. The work area shall be graded, shaped and otherwise drained in such a manner as to minimize soil erosion, siltation of drainage channels, damage to existing vegetation and damage to property outside the limits of the work area.
   3. Grade each lift of the backfill material to drain to a designated area to avoid ponding of water from precipitation on compacted subgrade or on material to be compacted.
   4. Promptly compact all lifts of backfill with a vibratory roller with a smooth drum to seal the surface and to prevent water from precipitation to saturate uncompacted soil materials. No soil materials shall be left uncompacted overnight.
   5. Dewater excavations as required to maintain dry conditions for placement and compaction of all backfill material.
   6. Compaction equipment in open areas shall consist of a vibratory roller having a minimum drum weight of 10,000 pounds and a dynamic force of at least 20,000 pounds.
   7. Compaction equipment in confined areas (in trenches and adjacent to walls) shall be accomplished by hand-operated vibratory equipment or mechanical tampers as approved by the Engineer.
   8. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day's operations. Prior to terminating operations for the day, the final layer of fill, after compaction, shall be rolled with a smooth-wheeled roller to eliminate ridges of soil left by tractors, trucks and compaction equipment.
   9. The Contractor shall not place a layer of compacted fill on snow, ice or frozen soil. Removal of these unsatisfactory materials will be required as directed by the Owner.

3.23 PLACEMENT OF BACKFILL

A. Backfill behind walls shall be placed in layers of 6 inches.

B. Use extra care when compacting adjacent to walls and retaining walls. Where walls are buried on both sides, backfill and compaction shall proceed on both sides of the wall so that the difference in top of fill level on either side of the wall shall not exceed two feet (2 ft.) at any stage of construction. Where backfill of a wall is only on one side, only hand-operated roller or plate compactor shall be used within a lateral distance of five feet (5 ft.) of back of wall.

C. Compact backfill behind walls to provide 90-93 percent of the maximum density as measured by Modified Proctor ASTM D1557.

3.24 PLACEMENT OF DRAINAGE COURSE

A. Compact backfill under slab on grade to provide 95 percent of the maximum density as measured by Modified Proctor ASTM D1557.

3.25 PLACEMENT OF STRUCTURAL FILL

A. Structural fill shall be placed and compacted in loose layers of a maximum 12 inches thickness.

B. Compact structural fill to 95 percent as measured by Modified Proctor ASTM D1557.

3.26 SUBSURFACE DRAINAGE

A. Drainage Piping: Drainage pipe shall be perforated PVC pipe suitable for Foundation Drainage Systems.

B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 12 inches.
   1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 12 inches.
   1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 1557.
   2. Place and compact impervious fill material over drainage backfill to final subgrade.

3.27 COMPACTION REQUIREMENTS

A. General:
   1. Backfill shall be compacted to the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements:

1. Provide not less than the following percentages of the maximum density of soil material compacted at optimum moisture content, as determined by ASTM D-1557, (Modified Proctor Test).
   a. All soil materials placed below foundations and within "building areas" with the exception of crushed stone shall be compacted to 95% maximum dry density.
   b. Pavement base course: Compact 6-inch "Sand-Gravel" base course below bituminous concrete pavement to 95% maximum dry density.
   c. Pavement subbase: Compact "Granular Fill" subbase below base course to 95% maximum dry density.
   d. All materials below the pavement subbase, with the exception of crushed stone, shall be compacted to 92% maximum dry density.
   e. All materials placed behind retaining walls shall be compacted to 95% of the maximum dry density except for the area within 5 feet of the stem, which shall be compacted to between 90% and 93% of the maximum dry density.
   f. All soil materials placed on the sides of and above site utilities and duct banks, with the exception of crushed stone, shall be compacted to 92% maximum dry density. Where utilities are placed below “building areas” backfill shall be compacted to 95% maximum dry density. All pavement and exterior concrete slab base and subbase courses located above utilities and duct banks shall also be compacted to 95% maximum dry density.
   g. Fill Under Landscaped Areas: Ordinary Fill within the top 3 feet of finished grade shall be compacted to at least 90% maximum dry density. Ordinary Fill below 3 feet of finished grade shall be compacted to 85% maximum dry density.

C. Compacted materials which are below specified density shall be re-compacted at no additional expense to the Owner.

D. Moisture Control:
   1. Where the subgrade or a layer of soil material must be moisture-conditioned before compaction, uniformly apply water to the surface of subgrade or layer of soil material as needed to obtain optimum moisture content.
   2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to the specified density.

3.28 FIELD QUALITY CONTROL

A. Owner will engage a qualified Geotechnical Engineer to perform field quality-control confirmation testing. The Geotechnical Engineer shall be notified 48 hours prior to any excavation, fill, backfill, or compaction operations. Telephoned or e-mailed notification is satisfactory.
   1. Allow the Geotechnical Engineer to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
   2. When required or requested by the Engineer, the Contractor shall provide field elevations of the compacted subgrade or fill layer.

B. The Geotechnical Engineer will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

   2. Building Slab Areas: At subgrade and at each compacted fill type and backfill layer, at least one test for every 5000 sq. ft. or less building slab, but in no case fewer than three tests.
   3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
   4. Obtain samples of each type of fill from the borrow site.
   5. Determine particle size and maximum density of each type of soil.
   6. Determine liquid limit, plastic limit, and plasticity index, if required.
   7. Observe proof rolling.
   8. Observe foundation bearing subgrade.
   9. Observe quantities of material removed and quantities of material placed where Unit Prices are involved.
   10. Observe densification of subgrade after vibratory and non-vibratory compaction.

C. When Geotechnical Engineer reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.29 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.30 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
   1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

ISSUED	**DATE**
Addendum 2	01-30-13