CITY OF TAMPA

Bob Buckhorn, Mayor **CONTRACT ADMINISTRATION DEPARTMENT**

David L. Vaughn, AIA, Director

ADDENDUM NO. 1

DATE: April 25, 2014

Contract 14-C-00024; Linebaugh Pumping Station Rehabilitation

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

Item 1: Delete Workmanship and Materials Section 50 - Instrumentation and Controls.

Item 2: Add the attached Workmanship and Materials Section 46 - Controls.

Item 3: Add the attached Workmanship and Materials Section 83 - Erecting and Jointing Interior Piping.

Item 4: Attached for reference is the Geotechnical Report for the Linebaugh Pump Station.

Item 5: Attached for reference is the pre-bid meeting sign-in sheet.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to Contract Administration@tampagov.net.

Jim Greiner

Jim Greiner, P.E., Contract Management Supervisor

SECTION 46 - CONTROLS

W-46.01 General

Control components shall comply with the latest ANSI, IEEE, and NEMA standards where applicable.

Maximum control voltage shall be 120 VAC, 60 Hz.

Control devices shall be of industrial grade, heavy-duty design, utilizing modular construction to increase flexibility.

W-46.02 Motor Starters-Full Voltage Starters

The motor starter shall be 3-pole polyphase, and have a NEMA rated contactor with a minimum Size 1 rating. It shall be designed for full voltage, non-reversing service.

Motor starter contacts shall be silver alloy, double break; and shall be easily replaceable, with standard tools, without removing the starter from the enclosure; or removing the line, load, or control wiring from the starter.

Contactor coil shall be of the encapsulated type; and shall be easily replaceable, with standard tools, without removing the starter from the enclosure, or removing the line or load wiring from the starter.

The motor starter shall be provided with a Trip Class 20, bimetallic, ambient compensated, overload relay adjustable over a range of 85% to 115% of the nominal heater rating. The current in all 3-poles shall be sensed. The overload relays shall be field convertible from hand reset to automatic reset and vice-versa. When in automatic reset -- after tripping the relay -- the contacts will automatically reclose when the relay has cooled down. A manual “trip-to-test” feature shall be provided to facilitate a quick test of the mechanical and electrical operation of the overload relay. The overload relays shall include a “visible trip indicator” to easily identify a tripped overload block.

The motor starter shall have a 120VAC, 60Hz contactor coil and control circuit.

A minimum of one (1) N.O. holding contact shall be provided. The capability shall exist to install additional contacts in the field.

The motor starter shall be as manufactured by Square D, Cutler-Hammer, General Electric, Allen Bradley, or equal.

W-46.02(a) Motor Starters-Reduced Voltage Solid State Starter (RVSSS)

A. GENERAL

1. The reduced voltage solid-state starter (RVSSS) shall be designed for use with a standard three-phase, three-wire, squirrel cage, induction motor. The unit shall be

microprocessor based and programmed to slowly increase the voltage to the motor over an adjustable acceleration time, providing a shock free, smooth acceleration, while drawing the minimum current necessary to start the motor. The RVSSS shall be equipped with an internal by-pass contactor that will close at the end of acceleration time, thus reducing heating and saving power.

B. ACCEPTABLE MANUFACTURERS.

1. The reduced voltage solid state starter (RVSSS) shall be a Solcon Industries Ltd. Model Number RVS-DX-XX with Conformal Coated control boards.

C. TECHNICAL SPECIFICATIONS

1. GENERAL

a. Supply Voltage (Vn): V +10%-15%

b. Frequency: 45 – 65 Hz

c. Control Supply: 115 V +10% -15%

d. Load: HP three phase, three wire, induction motors.

2. START-STOP PARAMETERS

a. Starter FLC: Amps

b. Motor FLA: Amps

c. Start/Stop Profile: Field Programmable

d. Kick Start: A pulse of 80% Vn, adjustable range 0.1-1 Sec.

e. Initial Voltage: 10-50% VN

f. Initial Current: 100-400% of Motor FLA

g. Current Limit: 100-400% of Motor FLA

h. Acceleration Time: 1-30 Sec

i. Deceleration Time: 1-30 Sec

3. MOTOR PROTECTION

a. Too Many Starts: Maximum number of starts, range: OFF or 1-10, during a time period of 1-60 min.

b. Starts inhibit: Period of 1-60 min, during which starting is prevented, after too Many Starts Fault.

c. Long Start Time: Maximum allowable starting time 1-30 sec.

d. Over Current (Instant): Two operation functions: during starting trips the starter at 850% and during running at 100-850% In, both within one Cycle (after internal delay).

e. Overload Class: Overload Class shall be selectable between NEMA Class 10, NEMA Class 20, or NEMA Class 30. The cool down time after an overload shall be non-adjustable, fixed time setpoint.

f. Under Current: Trips when current drops below 20-90% In, time delay 1-40 sec.

g. Under Voltage: Trips when main voltage drops below 50-90%, time delay 1-10 Sec. w/ optional automatic reset.

h. Over Voltage: Trips when main voltage increase above 110-125%, time delay 1-10 sec.

i. Phase Loss, U/O Freq: Trips when one or two phases are missing and frequency is below 45Hz. or above 65Hz w/ optional automatic reset.

h. Phase Sequence: Trips when phase sequence is wrong

j. Shorted SCR: Prevents starting / trips if motor is not connected or incorrectly connected to the starter, or in case one or more SCRs have been shorted

k. Heat Sink Over temp: Trips when heat-sink temperature rises above 85°C.

l. External fault: Trips when an External Contact closes for 2 sec.

4. CONTROL

a. Displays: LCD (2-lines of 16 characters) and 4 LEDs.

b. Keypad: 6 keys for easy setting

c. Fault Contact: 2 Contacts, 8A, 250VAC, 2000VA

d. Aux. Contact: 2 Contacts, 8A, 250VAC, 2000VA

5. TEMPERATURE/HUMIDITY

   a. Operating Temp.: -10° to 40°C

   b. Storage Temp.: -20° to 70°C

   c. Humidity: 95% at 50°C or 98% at 45°C.

6. STANDARDS

   a. Dielectric Test: 2500VAC

   b. EMC Emissions: EN 55011 CISPR 11 Class A

   c. EMC Immunity: EN 55082-2 ESD 8KV air, IEC 801-2 Electric RF field 10 V/m, 20-1000MHz, IEC 801-3 Fast transients 2KV, IEC 801-4

   d. Safety EN 600947-1 Related to safety requirements. Designed and assembled to conform with UL508C

W-46.03 Switches and Push Buttons

Switches and push buttons shall be heavy-duty, oil-tight, watertight, NEMA Type 4X, corrosion resistant units intended for industrial applications. The operator shall mount in a 1.20-inch diameter opening and be provided with the proper legend plate.

Switches and push buttons shall be as manufactured by Square D, General Electric, Allen Bradley, or equal.

W-46.04 Pilot Lights

Pilot lights shall be heavy-duty, oil-tight, NEMA Type 4X, corrosion resistant, push to test, light emitting diode (LED) type, rated for 120VAC, and intended for industrial applications. The operator shall mount in a 1.20-inch diameter opening and be provided with the proper legend plate and lens color.

Pilot lights shall be as manufactured by Square D, General Electric, Allen Bradley, or equal.

W-46.05 Circuit Breakers

Circuit breakers shall be of the molded case, air-break type designed for 600 volt, 60 Hz service or as shown on the Drawings. They shall have both thermal and magnetic elements on all three poles. These elements will actuate a common tripping bar to open all poles when an overload or short circuit occurs.

The circuit breakers shall have an AIC rating greater than the available fault current at the panel.

The equipment shall be as manufactured by Square D, General Electric, or equal.

W-46.06 Control Relays

a. Multicontact- Unless otherwise noted, relays shall have a minimum of two (2) form C contacts rated at 10 amps, 120 VAC. They shall be of the type, which utilizes the circular plug system with hold down springs. Each relay shall be provided with an indicator lamp to show its status. The covers shall be dustproof, and manufactured of a clear polycarbonate material. The relays shall be Model KRPA as manufactured by Potter & Brumfield, Struthers Dunn, Square D, or equal.

b. Timing relays shall have DPDT, 10 amp, 120 VAC contacts. Timers shall be solid-state and adjustable as required. They shall utilize a plug in base mounting system. Timing relays shall be Model 328 as manufactured by ATC, Potter & Brumfield or equal.

c. NEMA Type Relays shall have two (2) normally open, 10 amp, 600 VAC, convertible instantaneous contacts. They shall have plug-in contact cartridges for easy contact conversion and replacement. Contact conversion shall be capable without removing terminal screws or wires. Coil voltage shall be as shown on the drawings or as required. NEMA Type Relays shall be Model X as manufactured Square D or equal.

W-46.07 Instrumentation Signal Multicontact Relays

Relays for switching instrumentation level signals shall have the following features: 120VAC coil; 4PDT Ag-Pd alloy bifurcated crossbar contacts; socket mount; sealed plastic cover; and hold-down spring.

The contact ratings shall exceed the requirements for the application, and shall be no less than 1 Amp at 120VAC. The expected life shall be a minimum of 200,000 operations at rated load.

The socket shall be of the surface or rail-mount design with screw terminals to facilitate circuit connections.

The relay shall be Idec model RY42, with model SY4S-05 socket, or equal.

W-46.08 Elapsed Time Meters

Elapsed time meters shall be furnished and installed where shown. Time meters shall register up to 9999.9 hours, be non-resetable, have square cases suitable for panel mounting, and have coils for 120 volt, 60 Hz operation. The units shall be as manufactured by Eagle Signal, Crammer, or equal.

W-46.09 Sewage Pump Controller / SCADA / Radio (PCSR)

The Sewage Pump Controller / SCADA / Radio subassembly comprises a programmable logic controller (PLC) based system engineered to provide duplex pump control, supervisory

control and data acquisition (SCADA), and radio telemetry in one assembled package. The components shall be mounted on an aluminum sub-panel and be fully wired, tested, and ready for field connections via conveniently located interface terminals. The subassembly shall operate on a 120 Volt, 60 Hz, single-phase power supply and shall have integral transient voltage protection.

The PCSR shall be a Motorola ACE3600 package as distributed by DCR Engineering Services Inc. or ScadaOne, LLC. The Contractor shall coordinate his efforts with DCR, Inc. or ScadaOne, LLC to ensure system compatibility, performance, and security. The Contractor shall provide and install a complete control system package as programmed by DCR, Inc. or ScadaOne, LLC. The existing Pump Station DCR controls shall revert to the City as a spare.

The following is a partial list of PCSR features:

1. Motorola ACE3600 remote terminal unit (RTU) with surge / lighting protection for power line and antenna shall be provided.
2. One Mixed I/O modules shall be provided.
3. A Motorola CDM750 conventional radio, UHF band (403-512 MHz), shall be provided.
4. The pump controller shall operate independently of the SCADA / telemetry system in the event of communications loss.
5. DC power circuits derived from the RTU and feeding external loads shall be individually fused as required. Fuses shall have indicator LEDs to indicate fuse has blown.
6. A back-up pump controller shall be provided to facilitate emergency overflow protection in the event of RTU failure.
7. Interposing control relays shall be provided as required.
8. Terminal blocks shall be arranged, and separated as follows: main power distribution block; 120VAC power; 24VDC power; RTU DC power bus.
9. All wires shall be permanently identified using a computer generated labeling system. All terminal numbers and identifying nomenclature shall correspond to and be shown on the electrical diagrams and schematics.
10. All external wiring shall terminate on terminal blocks.
11. The RTU shall provide both digital and analog inputs for use in monitoring and control. Simultaneous monitoring of analog and digital level sensing devices shall be supported where the analog level sensing device shall be primary. The RTU shall contain routines for detecting sensor failures and utilize the alternate level sensing device(s).
12. Battery back-up power shall be provided for the RTU so that monitoring is maintained during Utility power failures. The batteries shall have the capacity of operating the RTU for a minimum of four hours. The power supply shall keep the batteries at float charge. The RTU shall contain a low battery cutout circuit, and the batteries shall not be damaged by deep discharges.
13. Local manual pump control is provided by Hand-Off-Auto (HOA) switches located in the pump control panel. In the absence of RTU power or in the case of RTU failure, the pump motor starters shall remain operational in the HAND position. In no case shall the RTU have the capability to operate or override the pumps in the HAND or OFF positions.
14. The capability to remotely override or disable individual pumps shall be provided (local switches must be in the AUTO position).
15. The RTU shall have the capability to test the back-up pump controller by creating a high level condition and verifying that the back-up controller functions properly. In the event

of a controller failure, the RTU will send an alarm to the Central HMI.

16. Capability shall be provided to configure from two to four pumps.
17. Individual pump run status shall be reported to the Central HMI.
18. The following pump failures shall be reported to the Central HMI: fail to start; fail to stop; premature stop; drive fault; and stator over temperature.
19. RTU configuration parameters shall be adjustable locally and remotely from the Central HMI.
20. A fail-safe input shall be provided indicating cabinet intrusion.
21. The RTU shall have the latest RTU SCADA application license compatible with the existing Central HMI configuration.

W-46.10 Wet Well Level Monitoring System

The wet well level monitoring system shall be of the ultrasonic type. It shall consist of a transducer element and a transmitter/electronics package.

The transducer shall use a PZT ceramic element with a nominal operating frequency of 50kHz. The transducer shall have a range of 1 to 32.8 ft. The transducer shall convert a 24-volt input from the electronics package to a 3,000-volt peak-to-peak echo pulse. The transducer shall be Factory Mutual (FM) approved for use in a Class I, Div.1, group A, B, C, & D location. The transducer shall be rated intrinsically safe for zone 0. The transducer cable length shall be as required to provide a splice-free mechanization.

The transmitter/electronics package shall operate from 115Vac, 60Hz or 10 to 28Vdc power source. The unit will automatically switch to the dc source when Utility power is lost. The transmitter shall be compatible with a full line of transducers. The unit shall be simple to program via a hand-held programmer or laptop computer. Basic set-up and advanced echo analysis and diagnostics software shall be provided. A 4-20 mA output and two alarm relays shall be provided. A flashing LED shall indicate healthy status. An integral keypad and LCD display shall be provided. The accuracy shall be 0.25% of measured range and the resolution 0.1% of measured range. The unit shall be tropicalized and be housed in a NEMA 4X enclosure.

The wet well monitoring system shall be as manufactured by Pulsar, Inc., or equal (Transducer— dB10; Transmitter— Blackbox130, Part #: 130-110-300-00P-KP-TROP).

W-46.11 Type 1 Surge Protective (SPD)

The SPD shall be able to suppress lightning induced voltage surges three times greater than the industry standards. The rated line voltage for SPD shall be 120/240 VAC 3-phase, 4-wire, DELTA. The maximum single impulse current shall be 100kA per phase.

1. The SPD shall have a 10-YEAR warranty. Under that warranty, the SPD shall be replaced if it is destroyed by lightning or other impulses.

2. The SPD shall have an LED failure indicator on all three phases.

3. The clamp voltages for the SPD shall be the following:

Line to neutral – 1200 volts
Line to ground – 1200 volts
Neutral to ground – 1200 volts
Line to line – 2000 volts

The Surge Protection Device shall be Advanced Protection Technologies model TE04XDS104X, or equal.

W-46.12 Seal Leak Detector

The seal leak detector shall be compatible with the submersible pump supplied and be Underwriters Laboratories (U.L) listed for use in sewage pumping applications. The detector shall have the following features:

1. The unit shall employ low voltage, low current, conductivity probe type liquid level detection.

2. 120 VAC, 60 Hz, operating voltage.

3. The alarm output shall be an SPDT 10 amp, 250 VAC relay contact with a minimum 2000 VAC isolation to probe.

4. Probe supply characteristics - sensitivity, 4.7K to 100K OHM, adjustable; voltage, 24 VAC, 60 Hz; current, 2mA maximum.

5. Eight pin octal-type plug (provide matching screw terminal sockets).

6. The unit shall be housed in a high-impact plastic dust cover.

The seal leak detector shall be Crouzet model PNRU110A or equal.

W-46.13 Panel Mount Fuse Holder and Fuse

Panel mount fuse holders shall be rated for a minimum of 15 amps, 250 VAC. They shall accommodate 0.25 by 1.25-inch glass fuses and have a bayonet type knob. Terminations shall be by 0.25-inch Quick-Connect. Fuse holders shall be Bussman HKP, or equal.

Fuses shall be 0.25 by 1.25-inch slow blow, dual element, glass body with ratings as shown or required. Fuses shall be Bussman MDL series, or equal.

W-46.14 Emergency Receptacle

The emergency receptacle shall be of the heavy-duty, circuit breaking type with a weatherproof aluminum housing. The current rating shall be as shown with an operating voltage of 600 VAC. The receptacle assembly shall include a wiring box and angle adapter. The receptacle shall be equipped with a 4 pole exposed contact interior (reversed contacts). The receptacle shall be provided with a spring-loaded cap to cover the contacts when the receptacle is not in use. The emergency receptacle shall be Crouse-Hinds Arktite model AR-1047-S22 w/ AJA6 angle adapter, or equal.

W-46.15 Lightning Arrester

The lightning arrester shall be suitable for use in a four wire grounded service and have a rating of 650 VAC phase to ground maximum. The unit shall have a 2300 - 3800 volt impulse sparkover and an 800 - 1600 volt rms 60 Hz sparkover. Provisions for mounting shall be as shown or required and shall be supplied by the same manufacturer as the arrester.

The lightning arrester shall be as manufactured by Square D, General Electric, or equal.

W-46.16 Control Enclosure and Panel

The control enclosure shall be rated NEMA 3 and be constructed of minimum 14 gauge, 304 stainless steel. The door shall have a handle with padlock provisions and three point latch mechanism. The door shall be provided with a positive stop mechanism to prevent it from closing while controls are being serviced. Stiffeners shall be provided on the enclosure and door as necessary to provide rigidity. The closing surfaces shall have rolled lips. The outside of enclosure shall be finished with a durable RAL 9003 white powder coat to reduce solar heat gain. All hardware shall be heavy-duty, stainless steel. A print pocket shall be provided on the inside of the door. The enclosure dimensions shall be as shown or required.

The panel shall be 12 gauge steel and sized to be accommodated by the enclosure. The periphery of the panel shall be formed to provide a 0.75 inch stiffener frame. The panel shall be primed, painted with white enamel and baked, after forming.

The enclosure and panel shall be as manufactured by Quality Metals, Hoffman Engineering, or equal.

W-46.17 Panel Mount Terminal Blocks

Control terminal blocks shall be single pole units constructed of a polyamide plastic base with wire clamp terminals attached. The terminals shall be rated for 30 amps, 600 volts. The terminals shall accommodate #30 to #10 AWG conductors. The block shall mount on an aluminum DIN rail.

The terminal blocks shall be style UK5N, as manufactured by Phoenix Contact, or equal.

W-46.18 Control Panel Intrusion Sensor.

The control panel intrusion sensor shall be of the inductive proximity type, with an 18mm diameter cylindrical, short barrel body. The supply voltage rating shall be 10-30 VDC. The interface circuitry shall be standard 3-wire, NPN, shielded, and rated for a maximum load of 200mA, 600Hz. The output shall be normally open (N.O.) with short circuit protection. The unit shall have a temperature range of –13 to 158 degrees F. The detecting distance shall be 5mm, with a LED indicator.

The proximity sensor shall be Omron, model E2F-X5E1 (Grainger # 6C826) with Square D mounting hardware model XSZB118 (Grainger 5B233), or equal.

W-46.19 Power Phase Monitor

A Phase Monitor shall be provided and installed on the line-side of the utility main circuit breaker as shown on the Drawings and specified herein. The unit provided shall have the following features:

1. input— 240 volt, 3-phase, 60Hz, 4-wire, OPEN DELTA, utility service
2. adjustable voltage range control
3. SPDT relay operation and LED indication shall be triggered by phase loss, low voltage, power failure, or improper phase sequence.
4. LED indication shall be on when voltage is normal— off with fault
5. relay shall operate if fault lasts more than 2.0 seconds.
6. relay shall release after voltage is normal for 5.0 seconds
7. relay contact rating— 10 Amps
8. mounting— 8-pin plug-in— provide socket for DIN rail

Phase Monitors PM1, PM2, PM3, and PM4 shall be model SLA-440-ASA as manufactured by ATC Diversified Electronics, or equal.

W-46.20 Phase Monitor Fuse Holders and Fuses

The Fuse Holders shall be three-pole, 600V rated units suitable for use with Class CC, rejection type fuses. They shall be UL listed for branch circuit protection, and have a fuse withstand rating of 200 kA. The handle shall isolate the fuse from the circuit when installing or removing fuses— no special tools shall be required to insert or remove fuses. The fuse holder shall be provided with a blown fuse indicator to allow for easy troubleshooting. The fuse holder shall mount on a standard DIN rail.

The Fuse Holder shall be model 1492-FB3C30-L as manufactured by Allen Bradley, or equal. The fuses shall be Bussmann Limitron fast acting model KTK-R or equal, with the ampacity shown on the Drawings.

W-46.21 Control Transformers

The control transformer shall be an individual output type for primary and secondary voltages as shown. The secondary shall be grounded and circuit breaker protected. The control transformer shall have sufficient capacity to provide the energy demands for all connected control components including relays, solenoids, and other indicated items.

The electrical performance shall exceed the requirements of ANSI/NEMA ST-1. The transformers shall be as manufactured by Square D, General Electric, Westinghouse, or equal.

W-46.22 AC Current Sensor

The AC Current Sensor shall be a split core transducer used to convert a monitored AC current to a proportional 4-20mA output. The sensor shall comprise a current transformer, power circuit, precision rectifier, high-gain servo amplifier, and span and zero adjustments in one UL listed package. The sensor shall have three user selectable ranges. The two-wire loop powered 4-20mA output shall be available on two 6-32 screw terminals. The sensor shall meet the following performance parameters:

1. operating temperature— -55 to +65ºC.

2. accuracy— +/- 0.5% of full scale
3. repeatability— +/- 0.1% of full scale
4. frequency— flat from 20-100 Hz
5. response time— 100 msec (10 to 90%)
6. ripple— less than 10 millivolts
7. voltage supply— 21 to 40VDC

The AC Current Sensor shall be model SC200-1 as manufactured by Enercorp Instrument Ltd, or equal.

W-46.23 Back-Up Pump Controller

The Back-Up Pump Controller shall be designed to run one or two pumps for a fixed time interval, set by the user, when the primary wet well level controls fail. The unit shall monitor a backup level alarm in the wet well, and start up to two pumps when the high alarm switch closes. When the high level switch closes, the back-up unit closes a relay that starts Pump #1 and starts an internal Timer #1. When Timer #1 reaches its set time, and the level alarm switch is still closed, Pump #2 is started. Pump #1 and Pump #2 will run until the level alarm switch opens. When the switch opens, Timer #2 is started and both pumps continue to run until Timer #2 reaches its set time.

The Back-Up Pump Controller shall be Wilkerson model DR1920; DCR Engineering Services, Inc. model BR560, or equal.

W-46.24 Level Monitor Battery Backup System

The Level Monitor Battery Backup System shall comprise an Absorbent Glass Matt (AGM) battery and compatible three-level battery charger.

Battery:

1.) AGM technology
2.) Valve regulated, spill-proof construction to allow safe operation in any position
3.) Rugged impact resistant ABS case and cover (UL94-HB)
4.) U.L. recognized under file number MH 20845
5.) Nominal Voltage—12 Volts (6 cells)
6.) Nominal Capacity— 20-hr. (350mA to 10.5V)..... 7.0 AH
10-hr. (650mA to 10.5V) .....6.5 AH
5-hr. (1.2A to 10.2V)..... 6.0 AH
1-hr. (4.5A to 9.0V) ..... 4.5 AH
15-min. (14A to 9.0V) ..... 3.5 AH
7.) Energy Density (20-hr. rate)— 1.49 W-h/cu in
8.) Specific Energy (20-hr. rate)— 17.5 W-h/lb
9.) Internal Resistance— 23 milliohms
10.) Max Discharge Current (7 min.)— 21.0 A
11.) Max Short-Duration Discharge Current (10 sec.)— 70.0 A
12.) Shelf Life (% of normal capacity at 68deg.F)

1 Month..... 97%
3 Month..... 91%
6 Month..... 83%

13.) Terminals— Quick Disconnect Tabs, 0.25” X 0.032”

The battery shall be model PS-1270-F2 as manufactured by Power-Sonic Corporation, or equal.

Battery Charger:

1.) Waterproof, single output, for 12 Volt battery
2.) Input Voltage— 100 to 240 VAC, 50/60 Hz
3.) 3-Step Charging— Qualification, Bulk, & Float Maintenance
4.) Output Voltage— Absorption Charge Peak..... 14.4 VDC max.
Maintenance Charge..... 13.2 VDC constant
5.) Output Current— Bulk Charge— 800mADC constant.
6.) Operating Temperature— -4 ºF to +122 ºF
7.) Short Circuit Protected
8.) Reverse Polarity Protected

The battery charger shall be Battery Tender- Waterproof 800 as manufactured by Deltran Corporation, or equal.

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SECTION 83 - ERECTING AND JOINTING INTERIOR PIPING

W-83.01 General

Erecting and jointing interior piping includes furnishing of supports and hangers and installation of all interior and exposed exterior piping. Piping materials, coating, and linings shall be located and installed where shown on the Plans or as specified. The work shall include providing working drawings required by the General Provisions, showing the type, quantity, design, calculations, arrangement, and location of all hangers and supports.

W-83.02 Materials

Structural and miscellaneous steel, metal castings, ductile-iron pipe, and steel pipe used for hangers and supports shall meet the requirements of the applicable Workmanship and Materials sections.

W-83.03 Design

Hangers and supports not detailed on the Plans shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions with due allowance for expansion and contraction, and having springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved. They shall be screw adjustable after installation. Perforated straps will not be accepted.

All supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. The injury hazard shall be considered and minimized in all protruding supporting devices.

Hangers and supports shall be supported by threaded rods properly fastened in place by suitable screws, clamps, insets, bolts, or by welding.

Brackets for the support of piping from walls and columns shall be made of welded steel and designed for three maximum loads classified as follows:

Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to walls, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When the use of backplates is not practicable, the brackets shall be fastened to the wall in a manner that the safe bearing strength of the wall will not be exceeded.

Pipe rolls or chairs shall be of cast iron. Pipe rolls shall be provided with threaded nuts or with sockets to take threaded rods.

Saddle stands shall be of the adjustable type. Each stand shall consist of a length of steel pipe fitted at the base with a standard threaded ductile-iron flange and at the top with an adjustable saddle or roll. The base flanges shall be bolted to the floor, foundation, or concrete base.

Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with an adjustable saddle or roll, ductile-iron pipe saddle supports, or with pipe stanchion saddles with yokes and nuts. The base flanges shall be bolted to the floor, foundation, or concrete base.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on ductile-iron, malleable iron, or steel hooks, hook plates, rings, or ring plates.

W-83.04 Anchors

Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines, tanks, apparatus, and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval.

Anchors for piping shall be of the ductile-iron chair type with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

Anchors detailed on the Plans shall be provided as shown and specified.

W-83.05 Inserts

Inserts for concrete shall be galvanized and installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods and be designed so that they may be held in position during concreting operations. Inserts shall be designed to carry safely the maximum load that can be imposed by the rod which they engage.

W-83.06 Galvanizing and Painting

When galvanizing is specified, it shall be done in accordance with the Workmanship and Materials section headed "Galvanizing."

Hangers, supports, anchors, and similar devices shall be painted in accordance with the Workmanship and Materials section headed "Painting."

W-83.07 Transportation and Delivery

Every precaution shall be taken to prevent damage to the pipe during transportation and delivery to the site. Extreme care shall be taken in loading and unloading the pipe and fittings. Such work shall be done slowly with skids or suitable power equipment, and the pipe shall be under perfect control at all times. Under no condition shall the pipe be dropped, bumped, dragged, pushed, or moved in any way which will cause damage to the pipe or coating. When handling the pipe with a crane, a suitable pipe hook or sling around the pipe shall be used. Under no condition shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends.

If any pipe or special is damaged in the process of transportation, handling, or laying, such pipe or pipes shall be replaced or repaired by the Contractor at his own expense.

The Contractor shall furnish and install suitable blocking and stakes to prevent the pipe from rolling.

W-83.08 Flanged Joints

Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of ASTM A 307 Grade B, and ANSI B16.1.

W-83.09 Screwed Joints

Threads for screwed joints shall be thoroughly cleaned after reaming. All threads shall be coated with a suitable pipe dope, mastic metallic compound as manufactured by James K. Harbinson & Co., graphite and engine oil, or equal, before jointing. Joints shall be screwed on until a tight metal-to-metal joint is produced without evidence of heat in the threaded portion. Once a joint has been screwed up, it shall not be backed off unless the threads are recleaned and new compound applied before rejointing.

For pipe fitted with screwed flanges, the flanges shall be fitted to the pipe in the shop unless otherwise permitted. The pipe flanges shall be accurately threaded to the American Briggs gauge, after which the flanges shall be screwed on by heavy machinery until the end of the pipe projects beyond the face of the flange and a tight metal-to-metal joint is produced without evidence of heat in the threaded portion. The projecting end of the pipe shall then be cut off flush with the face of the flange. A light refacing cut shall be taken across the end of the pipe and the face of the flange at right angles to the centerline of the pipe and the pipe shall then be reamed.

W-83.10 Mechanical joints

In making up mechanical joints, the spigot shall be centered in the bell. The surfaces with which the rubber gasket come in contact shall be thoroughly brushed with a wire brush just prior to assembly of the joint. Lubricant shall be brushed over the gasket just prior to installation. The gasket and gland shall be placed in position, bolts inserted, and nuts tightened fingertight. The nuts shall be tightened by means of a torque wrench in a manner that the gland shall be brought up

toward the pipe evenly. The following range of bolt torques shall be applied:

Size Inches	Range of Torque (ft. lbs.)
5/8	45-60
3/4	75-90
1	85-100
1-1/4	105-120

If effective sealing is not obtained at the maximum torque listed above, the joint shall be disassembled and reassembled after thorough cleaning.

All bolts shall be primed by dipping with a bituminous coating, except the threads, which shall be coated immediately prior to installation of the nuts.

W-83.11 Sleeve Type Couplings

For sleeve type couplings, diametrically opposite bolts shall be equally tightened on the connection so that the gaskets will be brought up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

W-83.12 Welding

Field welding of pipe joints where shown, specified, permitted, or required shall meet the requirements of ANSI B31.1 - Power Piping, Chapter VI (Section 136.4.2 Visual Examination)(Section 137.4 Hydrostatic Tests) or (Section 137.5 Pneumatic Tests). Pipe and fittings with wall thickness of 3/17-inch and larger shall have ends beveled for welding. Parts to be welded shall be securely held in place and in proper alignment during welding. The abutting pipe ends shall be separated before welding to permit complete fusion to the inside wall of the pipe without overlapping. Welding shall be continuous around the joint and completed without interruption. Welds shall be of the single vee butt type, of sound weld metal thoroughly fused into the ends of the pipe and into the bottom of the vee. Welds shall be free from cold shuts, pinholes, oxide inclusions, or other defects. All welding of steel pipe done off site shall conform to the requirements of the Workmanship and Materials section headed "Steel Pipe and Fittings."

W-83.13 Testing

All pipelines shall be watertight and shall be tested for leakage by the Contractor under the direction of the Engineer. Air and gas lines shall be tested with compressed air and all other pipelines shall be tested with water under the pressures specified herein.

All tests shall be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress.

The Contractor shall notify the Engineer when the work is ready for testing, and tests shall be made as soon thereafter as possible. Personnel for reading meters, gauges, or other measuring devices, will be furnished by the Engineer, but all other labor, equipment, air, water, and materials, including meters, gauges, smoke producers, blower, fuel, bulkheads, and accessory equipment, shall be furnished by the Contractor.

Pressure tests of pipelines shall be made by maintaining water in the pipe at a minimum of 125 psi for a period of 30 minutes. The pipelines shall show no leakage.

* * *

BTL Engineering Services, Inc.

5802 N. Occident Street P.O. Box 15718 Tampa, Florida 33684
(813) 884-0755 - Hillsborough (727) 733-9347 - Pinellas (727) 846-1703 - Pasco (813) 886-5377 - Fax

November 19, 2013

Mr. Lawrence E. Mills, PE, PLS, LEED AP
Mills & Associates Inc.
3242 Henderson Boulevard, Suite 300
Tampa, Florida 33609

Re: Subsurface Investigation
Proposed Linebaugh Avenue Pump Station
East Linebaugh Avenue & North 10th Street
Tampa, FL
BTL Job No. 1636-13-1637

Dear Mr. Mills:

BTL Engineering Services, Inc. has completed a subsurface investigation at the referenced project site located in Tampa, Florida. This report describes the project site, discusses methods of testing, presents investigation results and provides geotechnical recommendations for proposed pump station.

Please feel free to request any further information or clarifications that may be needed. Thank you for choosing *BTL Engineering Services, Inc.*, to perform this subsurface investigation. We would be pleased to assist you further in other phases of geotechnical engineering and construction testing as project needs develop.

Sincerely,

BTL ENGINEERING SERVICES, INC.
CA 2352

M. Hai 11/19/2013

Mohammed A. Hai, P.E.
Vice President
FL Registration No. 59345

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY[1]

BTL Engineering Services, Inc. has completed a geotechnical exploration on the proposed Linebaugh Avenue Pump Station, located at East Linebaugh Avenue & North 10th Street, Tampa, Florida. The results of our findings are briefly summarized below. The text of this report should be reviewed for discussion of these items.

1. *BTL Engineering Services, Inc*. performed one (1) standard penetration test (SPT) boring to a depth of 40 feet below ground surface (BGS) within the proposed pump station footprint at locations indicated in the Boring Location Plan (Appendix B). Generally, the soil profile consists of medium dense to loose to very loose fine sand to a depth of 9 feet, loose clayey sand to a depth of 21 feet, very loose fine sand to a depth of 27 feet, firm sandy clay to a depth of 32 feet and underlain by soft weathered limestone to hard limestone up to the boring termination depth of 40 feet BGS. The soil strength of the soils excluding limestone layers revealed with standard penetration resistance values (N-values) ranging from 3 to 12 blows per foot (bpf). The soil strength of the limestone layers revealed with N-values ranging from 7 to in excess of 50 bpf.

2. Based on the loose to very loose subsurface soil conditions encountered in our soil investigation, we recommend that sufficient shoring should be placed for excavation to a depth of 20 feet BGS for the proposed wet well. A well point system around the proposed wet well excavation or sump pump should be installed to lower the ground water table at least 2 feet below the bottom of wet well excavation depth. The hydraulic excavation (manhole) bracing system may be installed for soil support for the excavation to install new precast wet well. Groundwater table was recorded at a depth of 11 feet BGS after 24-hour stabilization period.

3. Based on the subsurface soil conditions at the foundation level of wet well, we recommend a 6-inch thick layer of #57 size either concrete or rock be placed at the bottom of the proposed wet well to provide firm support and reduce potential differential settlement.

4. Upon completing the recommended site preparation, it is our opinion that if any building is planned it can be supported on shallow foundations on existing suitable bearing soils or structural fill. A net allowable soil bearing pressure of up to 2,000 pounds per square foot may be utilized for footing designs when the footings bear 16-inches to 24-inches below the finished grade.

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1 This Executive Summary is not intended to be used or relied upon without reference to the entire report and cannot otherwise be properly understood and interpreted. It is provided solely for the convenience of the Client and not as a substitute for the report or review of the report.

1.0 AUTHORIZATION

Mr. Lawrence E. Mills, PE, PLS, LEED AP, Mills & Associates Inc. requested our testing services through correspondence and telephone conversations with BTL Engineering staff. *BTL Engineering Services, Inc.* was retained by Mr. Lawrence E. Mills, PE, PLS, LEED AP, *Mills & Associates Inc.* to perform a geotechnical exploration on the project site. After receiving an email authorization dated October 30, 2013 from Mr. Lawrence E. Mills, PE, PLS, LEED AP, *Mills & Associates Inc.* a geotechnical exploration was performed.

2.0 SCOPE

The scope of our services included the following items:

1. A visual reconnaissance of the site from a geotechnical standpoint;

2. Conducting one (1) standard penetration test (SPT) boring to a depth of 40 feet below ground surface (BGS) within the proposed pump station footprint to assess subsurface soil conditions;

3. Classification of the soil samples obtained during our fieldwork program;

4. Analyzing the existing soil conditions with respect to the proposed construction;

5. Preparing this report to document the results of the fieldwork program, general information regarding soil types and to provide geotechnical recommendations for proposed pump station, and evaluation of recovered soils or groundwater.

3.0 PURPOSE

The primary purposes of the geotechnical exploration was to determine the general type and condition of the subsurface materials at the project site, and to provide recommendations for site work, geotechnical recommendations for proposed pump station, and evaluation of recovered soils or groundwater.

4.0 SITE AND PROJECT DESCRIPTION

The project site is located at East Linebaugh Avenue & North 10th Street, Tampa, Florida (Appendix A). A site plan provided by the client was used to determine the general boundaries of the project site. The project site is relatively level ground surface. An existing pump station, which will be removed, presently occupies the project site. Based on the client's provided information, a precast circular wet well of about 8 feet diameter and 20 feet deep will be installed at the proposed pump station at the project site. BTL Engineering staff performed the SPT boring at the location indicated on the provided site plan.

If the above information is significantly different than we anticipated, please inform *BTL Engineering Services, Inc.*, so that we may review our recommendations with respect to any modifications.

5.0 FIELD EXPLORATION METHODS

5.1 Standard Penetration Test Boring

BTL Engineering Services, Inc. performed the standard penetration test (SPT) boring on November 8, 2013, using a Diedrich D-25 Standard Penetration Test drill rig to advance SPT borings. The Standard Penetration Test (SPT) boring permits soil classification of samples retained during the test and allows the standard penetration resistance to be determined at selected depth intervals. These data permit estimation of soil properties such as continuity, strength, compressibility, and permeability. Drilling and standard penetration tests are performed in general conformance with ASTM D-1586.

In performing the SPT test, borings are advanced to the desired test depth by rotary drilling methods whereupon the drill bit is withdrawn and the penetration test performed using a standard 1.4-inch I.D., 2.0-inch O.D., split-barrel sampler. Spacing between each test interval varies by no more than 2.0 feet in the top 10 feet of each boring and by not

more than 5.0 feet at depths greater than 10 feet. Conventional rotary drilling procedures were utilized along with a bentonite drilling fluid to stabilize the borehole.

A 140-pound hammer falling 30 inches drives the sampler. Because of disturbance effects, the number of blows required to drive the sampler the first six inches is not considered in the standard penetration test value. The SPT value is based on the second and third 6-inch increments and this resistance is designated the "penetration resistance." Penetration resistance is an index of the soil strength and density that is used in engineering design. After each penetration test, the driller classifies the split-barrel sample according to color, texture, material type and moisture content. A portion of each sample is collected in a sealed container and transported to the laboratory where it is further examined to verify field condition. The samples are temporarily stored in the laboratory for future reference.

6.0 SUBSURFACE EXPLORATION

6.1 Subsurface Conditions

BTL Engineering Services, Inc. performed one (1) standard penetration test (SPT) boring to a depth of 40 feet below ground surface (BGS) within the proposed pump station footprint at locations indicated in the Boring Location Plan (Appendix B). Generally, the soil profile consists of medium dense to loose to very loose fine sand to a depth of 9 feet, loose clayey sand to a depth of 21 feet, very loose fine sand to a depth of 27 feet, firm sandy clay to a depth of 32 feet and underlain by soft weathered limestone to hard limestone up to the boring termination depth of 40 feet BGS. The soil strength of the soils excluding limestone layers revealed with standard penetration resistance values (N-values) ranging from 3 to 12 blows per foot (bpf). The soil strength of the limestone layers revealed with N-values ranging from 7 to in excess of 50 bpf.

Groundwater table was recorded at a depth of 11 feet BGS after 24-hour stabilization period. Fluctuation in groundwater levels should be expected due to seasonal climatic

changes, construction activity, rainfall variations, surface water runoff, re-direction of water flow as a result of natural or by anthropogenic activities and other site-specific factors. For a more precise description of the conditions encountered within the soil test boring, we refer you to the boring log sheet included in the Appendix C to this report.

6.2 Soil Survey Information

The Soil Survey of Hillsborough County indicates that natural shallow soils at the site are categorized as Map Units 55 & 61. Map Unit 55- Tavares-Urban land complex, 0 to 5 percent slopes and Map Unit 61- Zolfo fine sand. Map Unit 55 is composed of Tavares soils (50%), Urban land (35%) and minor units (15%). Map Unit 61 is composed of zolfo fine sand (94%) and minor unit (6%). The estimated historic Seasonal High Ground Water Table (SHGWT) are ranging from 2 feet to greater than 6 feet BGS for soil unit 61 and from 3.5 feet to greater than 6 feet BGS for soil unit 55. The general major soil descriptions as described in the Soil Survey are presented in the following table.

Summary of Soil Survey of Hillsborough County						
Map Unit 55- Tavares-Urban Land Complex, 0 to 5 percent slopes						
Soil Unit	Classification			Seasonal High Ground Water Table		
Tavares	Depth	USCS	AASHTO	Depth	Type	Months
	(inches)			(feet)		
	0 - 6	SP, SP-SM	A-3	3.5	None	June - Dec
	6 - 80	SP, SP-SM	A-3			
Map Unit 61- Zolfo fine sand						
Soil Unit	Classification			Seasonal High Ground Water Table		
Zolfo	Depths,	USCS	AASHTO	Depth	Type	Months
	(inches)			(feet)		
	0 - 3	SP-SM	A-2-4, A-3	2.0	None	June - Aug
	3 - 60	SM, SP-SM	A-2-4, A-3			
	60 - 80	SM, SP-SM	A-2-4, A-3			

Note: The Soil Survey does not provide the above information for Urban land

7.0 DISCUSSION AND RECOMMENDATIONS

The following recommendations are based on our understanding of the proposed construction, the data obtained in our soil test boring, visual soil classification, a site reconnaissance, and our experience with subsurface conditions similar to those encountered at the project site.

7.1 Site Preparation

Based on the existing soil layers found in the subsurface soil profile, the following geotechnical site preparation is recommended. The site inspection by an experienced geotechnical engineer or his representative from this office will be recommended to perform field density testing.

1. Initial site preparation should consist of performing clearing, grubbing and removal of topsoil in order to remove trees, vegetation, and associated root systems to a depth of their vertical reach. This should be done within and to a minimum distance of 5 feet beyond the perimeter of the proposed development footprint, if area permits. The stripped topsoil should be stockpiled on-site for later usage in landscape (non-structural) areas only.

2. Upon completion of the clearing, grubbing and removal of topsoil as noted above, perform proofrolling with a vibratory roller. We recommend a moderate weight vibratory drum roller having a total operating static weight (including fuel and water) of at least 5 tons and a drum diameter of 3 to 3.5 feet. Regardless of the degree of compaction achieved, a minimum of **6** perpendicular overlapping passes should be made in the development area with the compaction equipment in order to increase the density and improve the uniformity of the underlying loose sandy soils. Upon completion of the proofrolling, density tests shall be performed to confirm a minimum compaction compliance of **95** percent of modified proctor maximum density (ASTM D-1557). The roller coverages should be divided

evenly into two perpendicular directions, where possible. Additional passes may be necessary if compliance compaction is not achieved.

3. Place fill material in uniform lifts of 12 inches, to reach finished grade. The fill material should be inorganic (classified as SP, SW, GP, GW, SP-SM, SW-SM, GP-GM, GW-GM) containing not more than 5 percent (by weight) organic materials. Fill materials with silt-size soil fines in excess of 12% should not be used. Place fill in maximum 12-inch lifts and compact each lift to a minimum density of **95** percent of the Modified Proctor maximum dry density (ASTM D-1557) with a vibratory roller as mentioned in item #2.

4. Perform compliance tests within the fill either at a frequency of not less than one test per 2,500 square feet per lift, or at a minimum of 3 tests per lift, whichever is greater or conforming Section 125-8 –Backfilling of the current FDOT Standard Specifications For Road and Bridge Construction and City of Tampa requirements.

5. Upon completion of the building footing (**if any**) excavation and prior to placement of reinforcing steel and concrete, we recommend compaction of the bottom of the footings with the vibratory compactor over each footing. The bottom of footings shall be examined by the engineer or his representative to determine if the soil is vertically free of all organic and/or deleterious material, and if the compaction and soil pressures are achieved or if additional compaction is required. Perform compliance tests within the footings either as noted in section 7.5 or in accordance with FDOT and City of Tampa requirements.

6. The contractor shall take into account the final contours and grades as established by the plan when executing his backfilling and compaction operations.

Using vibratory compaction equipment at this site may disturb adjacent structures. Care shall be taken during the excavation, proofrolling and compaction operations to insure existing homes, any adjacent structures and utilities are not adversely affected.

7.2 Geotechnical Recommendations (if applicable)

Upon completing the recommended site preparation, it is our opinion that if any building is planned can be supported on shallow foundations on existing suitable bearing soils or structural fill. A net allowable soil bearing pressure of up to 2,000 pounds per square foot may be utilized for footing designs when the footings bear 16-inches to 24-inches below the finished grade.

Based on the log of borings, site soil improvement as noted above and our experience with this type of soil, *BTL Engineering Services, Inc*. recommends that a maximum wall load of 5 kips per linear foot for continuous footings and a maximum isolated column load of 50 kips may be used for design purpose.

7.3 Floor Slab (if applicable)

Following proper site preparation, as previously described, it is our opinion that a conventional slab-on-grade may be utilized for any building if it is planned. We recommend that the floor subgrade in the building pad areas be proofrolled and soil density be measured by a geotechnical engineer or his representative prior to floor slab concreting.

We suggest that a vapor barrier be placed immediately beneath the floor slab according to project specifications to reduce moisture migration through the concrete slab. Based on experience on similar soil types, an estimated sub-grade modulus of 120 lb/in^3 may be used to design the slab.

7.4 Structural Fill Placement

The on-site excavated soils to a depth of 9 feet BGS should generally be suitable for reuse as engineered fill with proper moisture control. Fill placed in confined areas that cannot be reached by the large roller should be compacted by lightweight vibratory equipment that can operate in confined areas. The fill loose lift thickness should be reduced to 6 inches. Each lift should be thoroughly compacted with the compaction equipment until densities equivalent to at least **95** percent of the Modified Proctor maximum dry density (ASTM D-1557) are uniformly obtained.

7.5 Compliance Testing (if applicable)

Density tests should be used to control subgrade and fill compaction. Density tests should be performed at the subgrade level, at each fill lift and at the bottom of the footing elevations to assure uniform compaction.

A minimum testing frequency of one density test per 2,500 square feet of each lift or 3 tests per lift, whichever is greater should be used. Additional testing should be performed in the excavated footing areas to confirm that excavation operations have not loosened the subgrade. A minimum of one density test per 100 linear foot of load bearing wall and on each column pad should be performed.

7.6 Excavation Conditions

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the OSHA guidelines. It is our understanding that these regulations are being strictly

enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures.

In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

7.7 Excavation Bracing System – Precast Wet Well

A precast circular wet well of about 8 feet diameter and 20 feet deep will be installed at the proposed pump station at the project site. Based on the subsurface soil condition at the foundation level of wet well, we recommend a 6-inch thick layer of #57 size either concrete or rock be placed at the bottom of the proposed wet well to provide firm support and reduce potential differential settlement.

Based on the loose to very loose subsurface soil conditions encountered in our soil investigation, we recommend that sufficient shoring should be placed for excavation to a depth of 20 feet BGS for the proposed wet well. A well point system around the proposed wet well excavation or sump pump should be installed to lower the ground water table at least 2 feet below the bottom of wet well excavation depth. The hydraulic excavation (manhole) bracing system may be installed for soil support for the excavation to install new precast wet well.

For an excavation bracing system design, we recommend that a constant earth pressure equal to $0.80K_a\gamma H$, where K_a is the co-efficient of active earth pressure, γ is the unit weight of in-situ soil, and H is the depth of the excavation. Based on our experience with

similar soils and field data, we recommend the following Table 1 summarizing the ultimate equivalent fluid pressures to be used in preliminary design for in-situ soils for temporary excavation bracing design.

TABLE 1 - SUMMARY OF ULTIMATE EQUIVALENT FLUID PRESSURES (Excavation Bracing)

Pressure Conditions	Co-efficient of Earth Pressure	Ultimate Equivalent Fluid Pressure
Active (K_a)	0.36	36 psf/ft
At-rest (K_o)	0.53	53 psf/ft
Passive (K_p)	2.77	277 psf/ft

These ultimate equivalent fluid pressures were calculated by the Rankine method using a soil unit weight of 100 lb/ft^3, a conservative angle of internal friction of 28 degrees, and zero effective cohesion.

8.0 PAVEMENT RECOMMENDATIONS (IF APPLICABLE)

8.1 General Components

We have not performed limerock bearing ratio (LBR) and maximum dry density tests on existing soils from roadway areas (to determine the soil parameter needed for pavement design.

We believe that a conventional flexible (asphalt surface) pavement section can be used for the internal roadway areas. The following structural sections are typically used for light duty asphalt pavement.

Light duty asphalt pavement sections are usually used for conventional roadway and parking areas with an average gross weight of 4,000 pounds contributed by cars and light pickup trucks.

Light Duty Asphalt Pavement	
Wearing Course	1.5-inch Type S-1 or S-3 asphalt concrete
Base Course	6- inch limerock (LBR = 100 minimum)
Subgrade	12-inch stabilized subgrade material (LBR = 40 minimum)

These pavement thicknesses given are intended as a guideline only, as the pavement should be designed specifically for the vehicle load intensities and frequencies anticipated during the design life of the project.

We also recommend pavement consisting of a concrete slab (4,000 psi) at least 6 inches thick placed over a prepared subgrade for heavy trucks (if applicable) will maneuver even if asphalt paving is used elsewhere on the project. Concrete pavement sections may be reinforced with at least 6 inch x 6 inch W1.4 x W1.4 welded wire mesh or equivalent. Reinforcement of concrete with wire mesh does not prevent cracking of the concrete in any way. The purpose of the wire mesh is to inhibit shrinkage cracks that occur in concrete. Wire mesh should be located approximately 2 inches from the surface of the slab, not at the bottom where it is commonly found.

8.2 Subgrade Course

The subgrade or embankment fill is the layer that supports the structural pavement section. Subgrade and embankment fill should be placed and compacted in compliance to specifications presented later in the pavement site preparation procedure section of this report.

We recommend subgrade material be compacted to 98 percent of the Modified Proctor maximum dry density value (AASHTO T-180). The subgrade material should have a minimum Limerock Bearing Ratio (LBR) of 40. Perform compliance tests on the stabilized subgrade for full depth either at a frequency of one test per 300 linear feet or in accordance with FDOT and City of Tampa requirements.

8.3 Base Course

The base course is the portion of the pavement section between the surface course and stabilized subbase / subgrade.

We recommend the base course be limerock with a minimum LBR of 100. The crushed concrete should be placed in lifts no greater than 6 inches and compacted to at least 98 percent of the Modified Proctor maximum dry density value (AASHTO T-180). Perform compliance tests on the base course either at a frequency of one test per 300 linear feet or in accordance with FDOT and City of Tampa requirements.

8.4 Surface Course

The surface course is the portion of the pavement section, which is exposed directly to traffic. In the light duty areas where there is occasional truck traffic, but predominantly passenger cars, we recommend using 1.5 inches of asphaltic concrete, which has a stability of 1,500 pounds.

Samples of the materials delivered to the project should be tested to verify that the aggregate gradation and asphalt content satisfies the mix design specifications. Asphalt should be compacted to a minimum of 95 percent of the laboratory density. Perform compliance tests on the surface course, by coring to evaluate the material thickness and to perform laboratory densities, either at a frequency of one test per 500 linear feet or in accordance with FDOT and City of Tampa requirements.

8.5 Pavement Site Preparation

Upon review of the site soil data, our recommendations of site preparation for pavement are noted below.

1. The proposed construction limits should be cleared, stripped and grubbed of all construction debris, trees, and vegetation and associated root systems to a depth of

their vertical reach. This should be done within and to a distance of 5 feet beyond the road perimeter and parking space (if any).

2. Prior to any fill operations, the existing ground surface should be compacted. We recommend a medium weight roller be used to prepare the site for the proposed pavement section. Upon completion of the proof-rolling, density tests should be performed either at a frequency of one test per 300 linear feet or in accordance with FDOT and City of Tampa requirements to confirm a minimum compaction compliance of 98 percent of modified proctor maximum density (AASHTO T-180).

3. Place fill material, as required. The subgrade should have at least 12 inches of stabilized subgrade material with a minimum Limerock Bearing Ratio (LBR) of 40. The fill material should be inorganic (classified as SP/GW) containing not more than 5 percent (by weight) organic materials. Fill materials with silt-size soil fines in excess of 10% should not be used. Place fill in maximum 12-inch lifts and compact each lift to a minimum density of **98** percent of the Modified Proctor maximum dry density (AASHTO T-180) with a roller as mentioned previously.

4. Perform compliance tests within the fill either at a frequency of one test per 300 linear feet per lift in the pavement areas, or at a minimum of two test locations, whichever is greater or in accordance with FDOT and City of Tampa requirements.

5. The contractor shall take into account the final contours and grades as established by the paving and drainage plan when executing any backfilling and / or compaction operations.

Using vibratory compaction equipment at this site may disturb adjacent structures. Care shall be taken during the proofrolling and compaction operations to insure any adjacent structures and utilities are not adversely affected.

9.0 LIMITATIONS

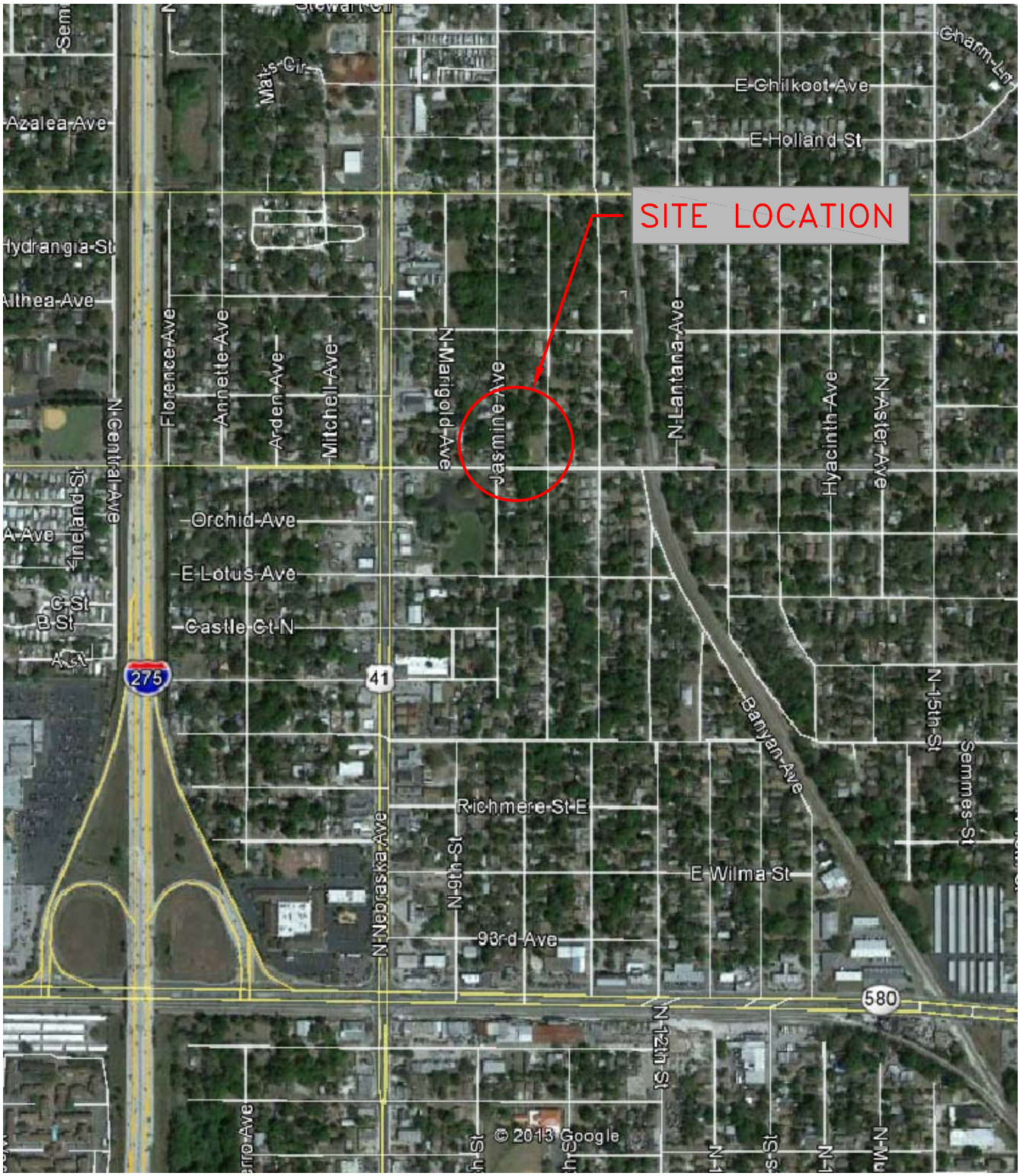
This report is for the exclusive use of ***Mills & Associates Inc.*** and the other designers of the project, and may only be applied to this specific project. Our conclusions and recommendations have been prepared using generally accepted standards of Geotechnical Engineering practice. No other warranty is expressed or implied. Our firm is not responsible for conclusions, opinions or recommendations of others.

Our conclusions and recommendations are based upon preliminary information furnished to us, data obtained from the testing program and our past experience. They do not reflect variations in subsurface conditions that may exist in unexplored areas of the site. Should such variations become apparent during construction, it will be necessary to re-evaluate our conclusions and recommendations based upon "on-site" observations of the conditions. The recommendations contained herein, must be considered preliminary and limited.

APPENDIX A

Site Location Map

NORTH



Sheet: 1 of 1	Project: East Linebaugh Ave & North 10th St Pump Station	Title: Site Location Map	BTL Engineering Services, Inc.
Date: 11/11/2013	Hillsborough Co Folio: 1441700000 Tampa, FL	Job Number: 1636-13-1637	5802 N. Occident Street P.O. Box 15718 Tampa, Florida 33684
Drawn SW Checked MH	Client: Mills & Associates	Scale: Not to Scale	(813) 884-0755-Hillsborough (727) 733-9347-Pinellas (727) 846-1703-Pasco / (813) 886-5377-Fax

APPENDIX B

Boring Location Plan

NORTH

Note:
All Locations & Measurements are Approximate

LEGEND:
SPT BORING

Sheet: 1 of 1	Project: East Linebaugh Ave & North 10th St Pump Station Hillsborough Co Folio: 1441700000 Tampa, FL	Title: Boring Location Plan
Date: 11/11/2013		Job Number: 1636-13-1637
Drawn: SW Checked: MH	Client: Mills & Associates	Scale: Not to Scale

BTL Engineering Services, Inc.
5802 N. Occident Street P.O. Box 15718 Tampa, Florida 33684
(813) 884-0755-Hillsborough (727) 733-9347-Pinellas
(727) 846-1703-Pasco / (813) 886-5377-Fax

APPENDIX C

Logs of SPT Borings

BTL Engineering Services, Inc.
P.O. Box 15718, Tampa, FL 33684
5802 N. Occident St.,Tampa, FL 33614
Phone: (813) 884-0755
Fax: (813) 886-5377

Borehole Log: SPT-1

Project No: 1636-13-1637
Project: East Linebaugh Ave & North 10th St Pump Station
Address: Hillsborough Co Folio: 1441700000
Client: Mills & Associates

Depth	Symbol	Description	Stratum	Water Table	Sample	Blow	N-Value (Blows) 5 15 25 35 45	Remarks
0		Ground Surface	0.0					
0–4		Loose to Medium Dense Gray Fine SAND (SP)	-4.0		1	3-7-5-5	12	
					2	3-3-3-4	6	
4–9		Very Loose to Loose White Fine SAND (SP)	-9.0		3	3-3-2-3	5	
					4	2-2-2-2	4	
9–21		Loose Light Gray Clayey SAND (SC)	-21.0	GW @ 11'	5	3-3-3-4	6	
					6	3-3-3	6	
					7	4-3-3	6	
21–27		Very Loose Pale Brown Fine SAND (SP)	-27.0		8	2-1-2	3	
27–32		Firm Dark Brown Sandy CLAY (CL)	-32.0		9	2-2-3	5	
32–36		Soft Weathered LIMESTONE (LS)	-36.0		10	4-3-4	7	
36–40		Hard LIMESTONE (LS)	-40.0		11	50/4"	>50	
40		End of Borehole						

NOTE:

GW - Ground Water Table
NE - Not Established
NF - Not Found
DD-Destructively Drilled

N - Value equals sum of second and third blow count increments

Drill Method: Mud Rotary
Drill Rig: Diedrich D-25
Drill Rod: AWJ

Driller: T. Hannum - Orlando
Date: 11/8/2013
Location: See Location Plan

Hole size: 3"
Datum: Ground Surface
Sheet: 1 of 1

APPENDIX D

Important Information About Your Geotechnical Report and Limitations and Reproductions

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is passed on a subsurface plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and its orientation; physical concomitants such as access roads, parking lots, and underground utilities and the level of additional risk which the client assumed by the virtue of limitations imposed upon the exploratory system. To help costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of this report may affect his recommendations.

Unless your consulting geotechnical engineer indicates otherwise, your *geotechnical report should be not used*:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- When the size or configuration of the proposed structure is altered;
- When the location or orientation of the proposed structure is modified;
- When there is a change of ownership, or
- For application to adjacent site.

A geotechnical engineer cannot accept responsibility for problems which may develop if he is not consulted after factors considered in his report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by the geotechnical engineer who then renders an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those opined to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, now matter how comprehensive, can reveal what is hidden by earth, rock, and time. For example, the actual interface between materials may be far more gradual or abrupt that the report indicates, and actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultant through the construction state*, to identify variance, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which exist at the time of subsurface exploration, *construction decisions should not be based on the geotechnical engineering report which may be affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept appraised for any such events, and should be consulted to determine if additional tests are necessary.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review their adequacy.

LIMITATIONS

- This investigation and analysis covers only the soil zones and deposits associated with the subsurface investigation. It is not intended to include deep soil or rock strata where cavities or caverns may exist. Furthermore, this study does not deal with or accept responsibility of the possibility of sinkhole development. Deep structural borings, geophysical investigation, or resistivity surveys must be conducted in order to evaluate the structural conditions and stability of soil and rock formations and is beyond the scope of this investigation.

- The preliminary findings in this report are based on analysis of the soils from each of the indicated borings with an interpolation of soil conditions and assumption of reasonable variation in the soil uniformity and properties between boring locations.

- Should any condition at variance with our report or different than those shown by borings be encountered during future explorations, we should be notified immediately so that supplemental data can be provided at minimal cost to our client.

- It is the responsibility of the client to see that these findings are brought to the attention of those concerned.

REPRODUCTIONS

- The reproduction of this report, or any part hereof, in plans or other engineering documents supplied to persons other than the client should bear the language indicating that the information contained therein is for general information only and not for reconstruction or bidding purposes and that the client and *BTL Engineering Services, Inc.*, are not liable to such other person for and representation made therein.

CONTRACT 14-C-00024; Linebaugh Pumping Station Rehabilitation - PRE-BID CONFERENCE 4/22/14 10:00 A.M.

E-Mail to **Register as a Plan Holder** and E-Mail All **Questions** to; **ContractAdministration@tampagov.net**

Sign-In Sheet Please Print — City of Tampa, Contract Administration Department

	Name	Organization	E-Mail OR Phone
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2	Timberly Weeks	RTD Construction Inc	Bids @ rtdconstruction.com
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4	Kyle Frankman	Blue Book	KFrankman@mail.thebluebook.com
5	Jed Church	Xylem Dewatering/bypass	jed.church@xyleminc.com
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