REI
CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING

October 26, 2015

**Wisconsin Department of Natural Resources**
Attn: Greer Lundquist
107 Sutliff Avenue
Rhinelander, WI 54501

**Subject:**

Well Installation Proposal
Tower Standard Service
14267 State Highway 70 W
Lac du Flambeau, WI 54538
BRRTS: 03-64-127899
PECFA: 54538-9517-67

Dear Greer,

REI Engineering, Inc. (REI) is hereby submitting a Well Installation Proposal and cost estimate for the above referenced site. This proposal is based on the scope of work (SOW) outlined during the October 22, 2015 meeting at the Wisconsin Department of Natural Resources (WDNR) Northern Region Office in Rhinelander, WI. This meeting was attended by members of the WDNR, United States Environmental Protection Agency (USEPA) and Lac du Flambeau Band of Lake Superior Chippewa Tribe.

This scope of work proposal calls for the installation of seven (7) well nests each consisting of a stand-alone monitoring well and a stand-alone piezometer. The monitoring wells are proposed to be installed to a depth of 15 feet with a 10' foot screen. REI is requesting a variance to NR 141.11 as the depth to groundwater may be less than seven (7) feet in the proposed locations. Piezometer depths range from 25 feet to 45 feet and will be constructed with five (5) foot screen lengths. See enclosed figure for proposed well placements.

REI intends on overseeing the well installation the week of November 2nd, 2015. REI will be contracting two (2) separate drilling contractors to complete the proposed SOW concurrently to reduce the overall time required to complete the proposed work. One drilling contractor will advance the monitoring wells using the Usual and Customary fee schedule. The other drilling contractor has provided a quote to install the piezometers. REI will field screen and log the soil during the installation of the monitoring wells and will also field screen and attempt to log the soil cuttings in the blind drilled piezometer borings.

A breakdown of proposed Usual and Customary (U&C) charges is as follows:

- Sample collection: 34 wells (2 rounds each of the 7 proposed monitoring wells, 7 proposed piezometers and 3 previously installed monitoring wells). Samples will be analyzed for

VOC's, nitrate, sulfate and dissolved iron. Based on analytical results, analytical parameters may be adjusted down for the second proposed sampling event.

- REI will arrange for the proper disposal of the investigative waste generated during this SOW including soil cuttings, recovered decontamination liquids, development water and purge water.

- Monitoring well and piezometer installation as previously described

- Survey the 7 proposed wells, 7 proposed piezometers and 3 existing wells into a common datum

- REI will ensure all padlocks for the 14 proposed wells and 3 existing wells are all keyed alike and will provide keys to other as requested.

The attached Variance to the U&C Schedule includes the following:

- Surcharges to the U&C allowable maximum rates due to known difficult drilling conditions

- Decontamination pad for cleaning the drilling augers and recovering the wash water

- REI time to oversee the well installation, development and surveying activities

- Geolocate the previously installed borehole (BH) locations to ensure accurate placements on the base map.

Hydraulic conductivity testing of the wells is not proposed at this time. A recommendation for performing hydraulic conductivity will be provided following the second proposed sampling event. REI has included the drilling proposal for the piezometers from Gestra Engineering, Inc. along with a spreadsheet detailed the costs for the items not covered in the U & C schedule.

REI has also included methods and procedures for the proposed activities.

If you have any comments, please contact our office at (715) 675-9784 or electronically at dlarsen@reiengineering.com.

Sincerely,
REI Engineering, Inc.

David Larsen, P.G.
Hydrogeologist / Project Manager

cc: William Kozak, 8760 W Squaw Lake Road, Lac du Flambeau, WI 54538

Attachments A/S

# Variance Request
**Tower Standard**
**Well Installation**

**Unit Costs are based on present values on above listed date**

| Cat # | Description | Units | Quantity | Unit Cost | Event | Events | Total Cost | Subtotal |
|---|---|---|---|---|---|---|---|---|
| | **Commodity** | | | | | | | |
| | Blind Drilling Surcharge (0-25') | ft | 175 | $3.00 | $525.00 | 1 | $525.00 | |
| | Blind Drilling Surcharge (25-50') | ft | 100 | $5.00 | $500.00 | 1 | $500.00 | |
| | Anticipated Additional Drill Crew Site Time | hr | 30 | $60.00 | $1,800.00 | 1 | $1,800.00 | |
| | Decontamination Pad | ea | 1 | $1,500.00 | $1,500.00 | 1 | $1,500.00 | |
| | | | | | | | **Total** | **$4,325.00** |
| | **Well Installation** | | | | | | | |
| | Project Manager - well installation prep | hr | 10 | $104.44 | $1,044.40 | 1 | $1,044.40 | |
| | Project Manager | hr | 50 | $104.44 | $5,222.00 | 1 | $5,222.00 | |
| | Soil Boring Logs (0.25 hr/boring) | hr | 3.5 | $87.00 | $304.50 | 1 | $304.50 | |
| | | | | | | | **Total** | **$6,570.90** |
| | **Project Management** | | | | | | | |
| | Contractor Scheduling | hr | 4 | $104.44 | $417.76 | 1 | $417.76 | |
| | Post SOW Completion Regulatory Discussion | hr | 30 | $104.44 | $3,133.20 | 1 | $3,133.20 | |
| | Principal | hr | 5 | $127.65 | $638.25 | 1 | $638.25 | |
| | | | | | | | **Total** | **$4,189.21** |
| | **Geolocate Soil Borings** | | | | | | | |
| | Project Manager | hr | 3 | $104.44 | $313.32 | 1 | $313.32 | |
| | Surveyor and equipment | hr | 6 | $90.00 | $540.00 | 1 | $540.00 | |
| | Travel Time (surveyor) | hr | 3 | $72.00 | $216.00 | 1 | $216.00 | |
| | Mileage (surveyor) | mi | 165 | $0.62 | $102.30 | 1 | $102.30 | |
| | CAD | hr | 12 | $63.83 | $765.96 | 1 | $765.96 | |
| | Administrative | hr | 10 | $40.62 | $406.20 | 1 | $406.20 | |
| | | | | | | | **Total** | **$2,343.78** |
| | **Well Development** | | | | | | | |
| | Project Manager | hr | 10 | $104.44 | $1,044.40 | 1 | $1,044.40 | |
| | Staff Scientists (2) | hr | 50 | $87.04 | $4,352.00 | 1 | $4,352.00 | |
| | Well Development Forms | hr | 3.5 | $87.04 | $304.64 | 1 | $304.64 | |
| | | | | | | | **Total** | **$5,701.04** |
| | **Equipment and Supplies** | | | | | | | |
| | PID | ea | 5 | $75.00 | $375.00 | 1 | $375.00 | |
| | Development Pump (per well - MW) | ea | 7 | $30.00 | $210.00 | 1 | $210.00 | |
| | Development Pump (per well - PZ) | ea | 7 | $50.00 | $350.00 | 1 | $350.00 | |
| | Development Tubing | ea | 425 | $0.40 | $170.00 | 1 | $170.00 | |
| | Water Level Indicator | ea | 5 | $25.00 | $125.00 | 1 | $125.00 | |
| | Decon Water | ea | 6 | $9.50 | $57.00 | 1 | $57.00 | |
| | Bailer | ea | 5.5 | $14.00 | $77.00 | 1 | $77.00 | |
| | Bailer Rope | ea | 0.1 | $425.00 | $42.50 | 1 | $42.50 | |
| | | | | | | | **Total** | **$1,406.50** |
| | **Total** | | | | | | **Total** | **$24,536.43** |



EPA-R5-2017-010506_0001829

# Usual and Customary Standardized Invoice #18
# July 2015 - January 2016

RR-047A

PECFA #: 54538-9514-67
BRRT's #: 03-64-127899
Site Name: Tower Standard
Site Address: 14267 Hwy 70, Lac du Flambeau

Vendor Name: REI
Invoice #:
Invoice Date: 10-21-15 SOW Request
Check #:

| | | |
|---|---|---|
| U&C Total | $ | 41,728.10 |
| Variance to U&C Total | $ | 24,536.43 |
| Grand Total | $ | 66,264.53 |

| TASK | TASK DESCRIPTION | SERVICES | ACTIVITY CODE | ACTIVITY REFERENCE CODE DESCRIPTION | UNIT | MAX UNIT COST | UNITS | TOTAL MAX |
|---|---|---|---|---|---|---|---|---|
| 1 | GW Sampling | | GS05 | Sample Collection | Well | $ 69.00 | 34 | $ 2,346.00 |
| 1 | GW Sampling | | GS10 | Incremental Sample Collection (natural attenuation) | Well | $ 45.40 | 34 | $ 1,543.60 |
| 1 | GW Sampling | | GS25 | Primary Mob/Demob | Site | $ 598.20 | 3 | $ 1,794.60 |
| 4 | Waste Disposal | Consultant | WD05 | Consultant Coordination | Site | $ 130.60 | 3 | $ 391.80 |
| 4 | Waste Disposal | Commodity | WD10 | GW Sample and/or Purge | Drum | $ 40.10 | 35 | $ 1,403.50 |
| 4 | Waste Disposal | Commodity | WD15 | Drill Cuttings | Drum | $ 103.00 | 35 | $ 3,605.00 |
| 4 | Waste Disposal | Commodity | WD25 | Primary Mob/Demob | Site | $ 274.00 | 5 | $ 1,370.00 |
| 10 | Initial Site Survey | Consultant | IS10 | Subsequent Surveys | Well | $ 104.90 | 17 | $ 1,783.30 |
| 13.a | Drilling In Unconsolidated Soils - With Soil Sampling | Consultant | DR20 | Primary Mob/Demob | Site | $ 564.80 | 2 | $ 1,129.60 |
| 13.d | Drilling In Unconsolidated Soils - With Soil Sampling | Commodity | DR45 | 0 - 25 ft bgs | Ft | $ 15.90 | 105 | $ 1,669.50 |
| 13.e | Drilling In Unconsolidated Soils - Without Soil And/Or GW Sampling | Commodity | DR60 | Drilling in Unconsolidated Soils | Ft | $ 11.40 | 275 | $ 3,135.00 |
| 14 | Monitoring Well Installation | Commodity | MWI15 | 2 inch PVC Casing | Ft | $ 15.90 | 380 | $ 6,042.00 |
| 15 | Misc. Drilling Activities & Supplies | | MDT05 | Drill Rig Mob/Demob | Mob/Demob | $ 917.50 | 2 | $ 1,835.00 |
| 15 | Misc. Drilling Activities & Supplies | | MDT10 | Well Cover/flushmount | Each | $ 193.00 | 12 | $ 2,316.00 |
| 15 | Misc. Drilling Activities & Supplies | | MDT15 | Stickup Well Cover | Each | $ 156.10 | 2 | $ 312.20 |
| 15 | Misc. Drilling Activities & Supplies | | MDT21 | Drum, 55 gal. DOT steel | Each | $ 52.50 | 70 | $ 3,675.00 |
| 15 | Misc. Drilling Activities & Supplies | | MDT25 | Commodity Service Provider Per Diem (drilling and direct push) | Person | $ 193.60 | 16 | $ 3,097.60 |
| 15 | Misc. Drilling Activities & Supplies | | MDT45 | Padlocks | Each | $ 7.60 | 17 | $ 129.20 |
| 31 | Consultant Overnight Per Diem | | COPD05 | Overnight | Night | $ 108.30 | 4 | $ 433.20 |
| 33 | Schedule Of Laboratory Maximums | Commodity | | Laboratory (see task 33 total on Lab Schedule) | Lab Schedule | Lab Schedule | 136 | $ 3,352.40 |
| 36 | Change Order Request | | COR05 | Change Order Request (cost cap exceedance requests) | Change Order | $ 363.60 | 1 | $ 363.60 |
| Variance | Well Installation, Development and Survey | | | | Variance | $24,536.43 | 1 | $24,536.43 |

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# Usual and Customary Standardized Invoice #18
# July 2015 - January 2016

RR-047A

| TOTAL LAB CHARGES | $ 3,352.40 | TASK 33 | 136 | $ 3,352.40 | TASK 24 | 0 | $ - |
|---|---|---|---|---|---|---|---|

| MATRIX | REF CODE | REIMBURSABLE ANALYTE | UNITS | MAX COST | SAMPLES | TOTAL |
|---|---|---|---|---|---|---|
| AIR | A1 | Benzene | SAMPLE | $ 42.80 | | $ - |
| AIR | A2 | BETX | SAMPLE | $ 47.10 | | $ - |
| AIR | A3 | GRO | SAMPLE | $ 43.90 | | $ - |
| AIR | A4 | VOC's | SAMPLE | $ 68.50 | | $ - |
| WATER | W1 | GRO/PVOC | SAMPLE | $ 27.80 | | $ - |
| WATER | W2 | PVOC | SAMPLE | $ 25.70 | | $ - |
| WATER | W3 | PVOC + 1,2 DCA | SAMPLE | $ 41.70 | | $ - |
| WATER | W4 | PVOC + Naphthalene | SAMPLE | $ 28.90 | | $ - |
| WATER | W5 | VOC | SAMPLE | $ 68.50 | | $ - |
| WATER | W6 | PAH | SAMPLE | $ 69.50 | | $ - |
| WATER | W7 | Lead | SAMPLE | $ 11.80 | | $ - |
| WATER | W8 | Cadmium | SAMPLE | $ 12.90 | | $ - |
| WATER | W9 | Hardness | SAMPLE | $ 11.80 | | $ - |
| WATER | W10 | BOD, Total | SAMPLE | $ 22.50 | | $ - |
| WATER | W11 | Nitrate | SAMPLE | $ 10.70 | 34 | $ 363.80 |
| WATER | W12 | Total Kjeldahl | SAMPLE | $ 19.30 | | $ - |
| WATER | W13 | Ammonia | SAMPLE | $ 16.10 | | $ - |
| WATER | W14 | Sulfate | SAMPLE | $ 9.70 | 34 | $ 329.80 |
| WATER | W15 | Iron | SAMPLE | $ 9.70 | 34 | $ 329.80 |
| WATER | W16 | Manganese | SAMPLE | $ 9.70 | | $ - |
| WATER | W17 | Alkalinity | SAMPLE | $ 9.70 | | $ - |
| WATER | W18 | methane | SAMPLE | $ 43.90 | | $ - |
| WATER | W19 | Phosphorous | SAMPLE | $ 17.20 | | $ - |
| WATER | W20 | VOC Method 524.2 | SAMPLE | $ 167.90 | | $ - |
| WATER | W21 | EDB Method 504 | SAMPLE | $ 90.90 | | $ - |
| SOILS | S1 | GRO | SAMPLE | $ 23.60 | | $ - |
| SOILS | S2 | DRO | SAMPLE | $ 28.90 | | $ - |
| SOILS | S3 | GRO/PVOC | SAMPLE | $ 26.80 | | $ - |
| SOILS | S4 | PVOC | SAMPLE | $ 24.60 | | $ - |
| SOILS | S5 | PVOC + 1,2 DCA + Naphthalene | SAMPLE | $ 47.10 | | $ - |
| SOILS | S6 | PVOC + Naphthalene | SAMPLE | $ 34.30 | | $ - |
| SOILS | S7 | VOC | SAMPLE | $ 68.50 | 34 | $ 2,329.00 |
| SOILS | S8 | SPLP Extraction VOC only | SAMPLE | $ 48.20 | | $ - |
| SOILS | S9 | PAH | SAMPLE | $ 69.50 | | $ - |
| SOILS | S10 | Lead | SAMPLE | $ 11.80 | | $ - |
| SOILS | S11 | Cadmium | SAMPLE | $ 13.90 | | $ - |
| SOILS | S12 | Free Liquid | SAMPLE | $ 10.70 | | $ - |
| SOILS | S13 | Flash Point | SAMPLE | $ 24.60 | | $ - |

| MAX COST | SAMPLES | TOTAL |
|---|---|---|
| $ 23.60 | | $ - |
| $ 28.90 | | $ - |
| $ 26.80 | | $ - |
| $ 24.60 | | $ - |
| $ 47.10 | | $ - |
| $ 34.30 | | $ - |
| $ 68.50 | | $ - |
| $ 48.20 | | $ - |
| $ 69.50 | | $ - |
| $ 11.80 | | $ - |
| | TASK 24 TOTAL | $ - |

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| MATRIX | REF CODE | REIMBURSABLE ANALYTE | UNITS | MAX COST | SAMPLES | TOTAL |
|---|---|---|---|---|---|---|
| SOILS | S14 | Grain Size - dry | SAMPLE | $ 40.70 | $ | - |
| SOILS | S15 | Grain Size - wet | SAMPLE | $ 54.60 | $ | - |
| SOILS | S16 | Bulk Density | SAMPLE | $ 12.90 | $ | - |
| SOILS | S17 | Permeability | SAMPLE | $ 39.60 | $ | - |
| SOILS | S18 | Nitrogen as Total Kjeldahl | SAMPLE | $ 19.30 | $ | - |
| SOILS | S19 | Nitrogen as Ammonia | SAMPLE | $ 16.10 | $ | - |
| SOILS | S20 | % Organic Matter | SAMPLE | $ 27.80 | $ | - |
| SOILS | S21 | TOC as NPOC | SAMPLE | $ 54.60 | $ | - |
| SOILS | S22 | Soil Moisture Content | SAMPLE | $ 6.50 | $ | - |
| SOILS | S23 | Air Filled Porosity | SAMPLE | $ 24.60 | $ | - |
| SOILS | S24 | % Total Solids | SAMPLE | $ 6.50 | $ | - |
| SOILS | S25 | Field Capacity | SAMPLE | $ 26.80 | $ | - |
| SOILS | S26 | TCLP Lead | SAMPLE | $ 79.20 | $ | - |
| SOILS | S27 | Cation Exchange (Ca, MG, & K) | SAMPLE | $ 25.70 | $ | - |
| SOILS | S28 | TCLP Cadmium | SAMPLE | $ 79.20 | $ | - |
| SOILS | S29 | TCLP Benzene | SAMPLE | $ 79.20 | $ | - |
| LNAPL | LFPS01 | Viscosity + Density<br>Interfacial tension I (LNAPL/water [dyne/cm])<br>Interfacial tension II (LNAPL/air [dyne/cm])<br>Interfacial tension III (water/air) [dyne/cm]) | SAMPLE | $ 534.60 | $ | - |
| | | | | | **TASK 33 TOTAL $** | **3,352.40** |

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GESTRA Engineering, Inc.
191 W. Edgerton Ave.
Milwaukee, WI 53207
(414) 933-7444
Fax (414) 933-7844

## Breakdown of Contract Drilling Services

Project: Lac du Flambeau, Wi
Quote To: REI Engineering
Date: 10/15/2015 Attn: Dave Larsen P.G.
Site Location: Hwy 70 & CTY D

| Usual and Customary Standard Rates | | | | | |
|---|---|---|---|---|---|
| Mobilization | Each | 1 | $917.50 | $917.50 | Assumes all borings are truck accessible. |
| SPT Drilling (0'-25') | Feet | 0 | $15.90 | $0.00 | 7 Wells/Piezometers blind drilled to 40'. |
| Blind Drilling (0-25') | Feet | 175 | $11.40 | $1,995.00 | |
| Blind Drilling (25-50') | Feet | 105 | $11.40 | $1,197.00 | |
| Blind Drilling (50-75') | Feet | 0 | $11.40 | $0.00 | |
| Monitoring Well Installation | Feet | 280 | $15.90 | $4,452.00 | |
| Per Diem | Person | 12 | $193.60 | $2,323.20 | 3 Man Crew |
| Protective Covers | Feet | 7 | $193.60 | $1,355.20 | |
| D.O.T. Drums | Feet | 15 | $52.50 | $787.50 | |
| **Total Estimated Usual and Customary Fees:** | | | | **$13,026.90** | |

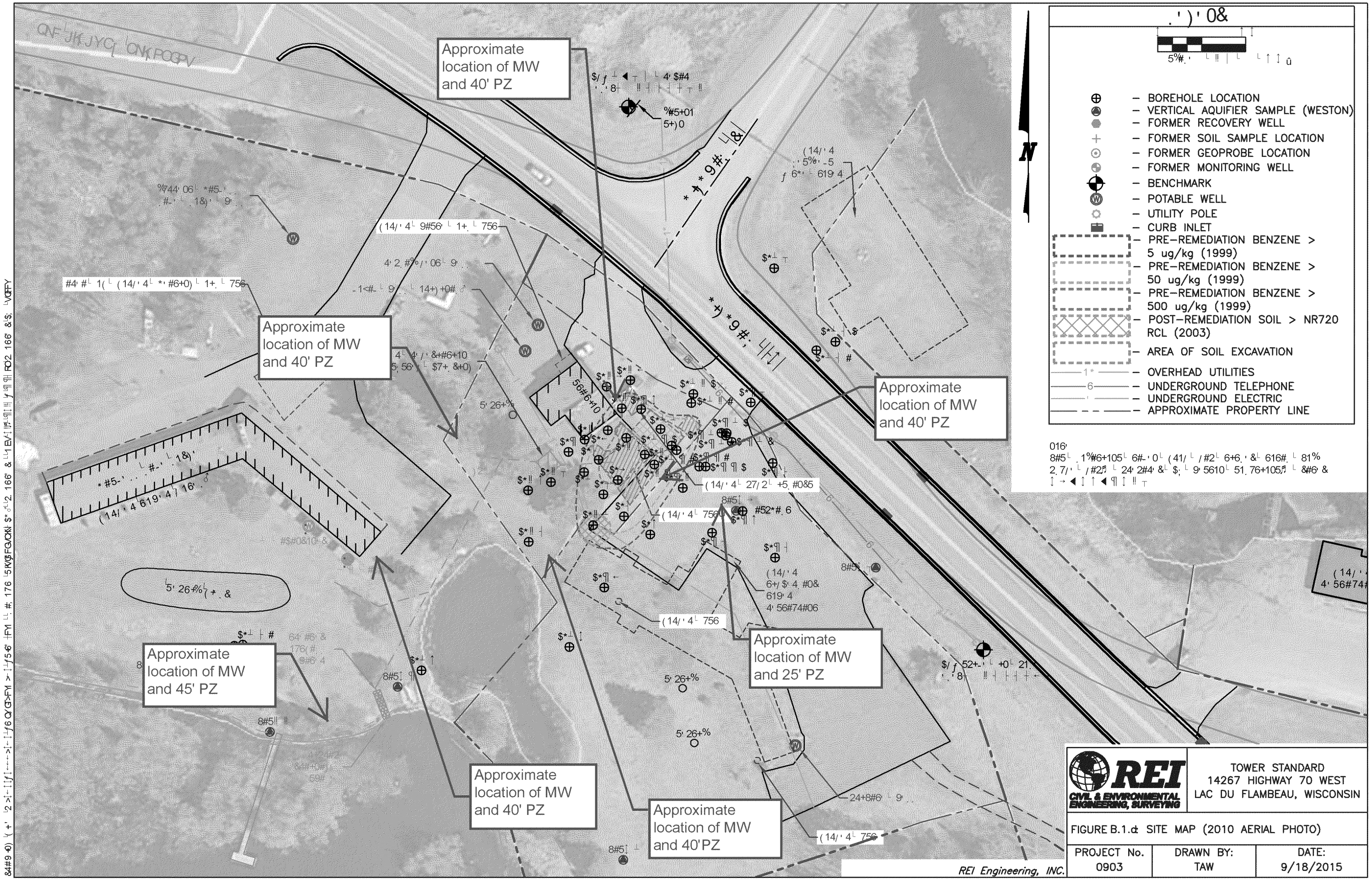
| Charges to be applied in addition to Usual and Customary Standard Rates | | | | | |
|---|---|---|---|---|---|
| Mobilization | Each | 0 | $917.50 | $0.00 | Additional mobilization fee due to length of project. A mobilization fee shall be charged for each week on site. |
| Blind Drilling (0-25') | Feet | 175 | $3.00 | $525.00 | Additional per foot fee to be charged due to known difficult drilling on project site. |
| Blind Drilling (25-50') | Feet | 105 | $5.00 | $525.00 | |
| Blind Drilling (50-75') | Feet | 0 | $8.00 | $0.00 | |
| Grouting of Piezometers | Feet | 0 | $3.00 | $0.00 | Additional fee for using grout in place of chips. |
| Drill Crew hourly increase | Hourly | 30 | $60.00 | $1,800.00 | Due to added time spent with difficult drilling and three man crew. |
| Abandonment w/ liquid grout | Feet | 0 | $8.75 | $0.00 | If needed. |
| Matts for lawn protection | Use | 0 | $150.00 | $0.00 | additional fee for up to 50' of matting. $20.00 per additional 8 feet if needed. |
| 4 1/4 HD Auger replacement | Each | 0 | $450.00 | $0.00 | Cost to replace one five foot section of damaged auger with new. |
| 4 1/4 HD Auger cutting head | Each | 0 | $650.00 | $0.00 | Cost to replace damaged cutting head with new. |
| Washing out heaving sands | Each | 0 | $150.00 | $0.00 | If heaving sands need to be cleared from augers prior to well or piezometer placement. |
| Containment of wash water | per boring | 0 | $100.00 | $0.00 | Cost to contain washout water. Does not include drums. |
| Drilling Restarts | Each | 0 | $150.00 | $0.00 | To be applied if boring has to be offset and started over due to cobles and boulders or rubble. This fee is in addition to the lineal footage rate |
| Equipment Decontamination | Boring | 0 | $75.00 | $0.00 | Additional decontamination due to grouting. |
| Decontamination Pad | Each | 1 | $1,500.00 | $1,500.00 | Includes Set-up and take down. |
| Skid Loader Rental | Week | 0 | $1,850.00 | $0.00 | Includes mobilizations of loader |
| Spoil Clean Up | per boring | 0 | $100.00 | $0.00 | Cost to move soils and place in dumpster provided by client. Provide visqueen cover of dumpster when not in use. |
| | | | **Total** | **$4,350.00** | |

**Total Estimated Drilling Services**

**$17,376.90**

This quotation is an estimate and is not a lump sum. GESTRA reserves the right to charge for services as performed according to our current fee schedule. To initiate services, GESTRA requires written acceptance of a formal proposal or purchase order with mutually agreeable terms and conditions.

Quotation Prepared By:
Timothy R. Winkler, Drilling Manager.
Print Name and Position

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# METHODS AND PROCEDURES

# FOR

# SOIL SAMPLING USING HOLLOW STEM AUGERS

Soil sampling was done in accordance with **ASTM:D1586-84**. Using this procedure, a 2 inch **OD**, 2 foot long split barrel sampler was driven into the soil by a 140 pound weight falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler an additional 12 inches is known as the penetration resistance or N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

As the samples were obtained in the field, they were visually and manually classified by the field geologist/technician in accordance with **ASTM:D2488-84**. Representative portions of the samples were returned to the laboratory for further examination and for verification of the field classification. Logs of the borings were filled out indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the borings.

Soil samples recovered by the split spoon were divided into two portions. One portion was prepared for laboratory analysis. The other portion was placed into a clean one quart Ziploc bag. A headspace analysis was then conducted on this latter portion.

## HEADSPACE ANALYSIS

The soils were scanned with a RAE photoionization detector equipped with a 10.6 eV lamp and calibrated for direct reading in units of Total Organic Vapors using an isobutylene standard. A Ziploc bag was filled two-thirds of the volume with the sample. The bags were sealed and shaken vigorously before headspace development. Headspace development is allowing the sample to rest for at least ten minutes before scanning. When ambient temperatures were below 60 degrees F, soil samples were allowed to warm for a minimum of 10 minutes in a heated environment prior to headspace development. The Ziploc bag was punctured with the probe and a reading was taken.

## SAMPLING AND CHAIN OF CUSTODY

Soil samples were c ollected from a spilt barrel sampler and placed in laboratory prepared glass vials and placed directly into a cooler pending delivery to the laboratory. Latex gloves were worn during all sample collection procedures.

Upon completion of a sample, a chain of custody log was initiated. The chain of custody record included the following information: project name, work order number, shipped by, shipped to, sampling point, location, field ID number, date and time taken, sample type, number of containers, analysis required, sampler (s) signature (s), etc. As few people as possible handled the samples.

## SURVEYING

Grade elevations of borings were surveyed to the nearest 0.1 foot and were tied to a USGS benchmark.

## DECONTAMINATION

Sampling equipment were decontamin ated prior to sampling. Augers were steam cleaned on plastic and split spoons were cleaned after every sample taken.

# METHODS AND PROCEDURES

# FOR

# MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING

The water table monitoring wells consist of pipe joint threaded, two inch by ten feet long schedule 40 PVC (#10 slot) with 2 inch schedule 40 PVC riser. After the screen and riser pipe were set, a sand filter pack was placed around the screen to a depth 3 feet above the top of the screen, capped by a 2 foot fine sand layer, covered with a bentonite seal, annular space seal and surface seal. A protective casing did enclose the PVC riser pipe.

Monitoring wells were installed in accordance with Wisconsin Administrative Code NR 141 regulations. The WDNR "Monitoring Well Construction Form 4400 -113A" were completed in accordance with NR 144 and NR 147.

The wells were developed b y bailing or pumping to establish a reliable intercept with the surrounding formation. At least ten well volumes were removed or bailed until the wells were sediment free. If the well was bailed dry, a minimum of 3 volumes were taken. The WDNR "Monitoring Well Development Form 4400-113B" was completed for each well.

## WATER LEVEL

Groundwater level measurements were obtained by using an electronic measuring device which indicated when a probe is in contact by lowering the probe into the well until the inst rument indicated that the water surface has been encountered, and the distance from the top of the well to the probe was measured. All measurements were reported to the nearest 0.01 foot.

## SAMPLING AND CHAIN OF CUSTODY

Water samples were collected using disposable bottom loading plastic bailers. Prior to sampling, the wells were purged. At least 4 well volumes were removed before sampling to ensure collection of a representative sample. If the well was purged dry, it was allowed to recharge and then it was sampled.

Samples were taken from the middle section of the bailer and placed in laboratory prepared bottles. Samples were labeled and placed in a cooler to be preserved at approximately 4 degrees C. Samples were accompanied by Chain of Custody records.

Upon completion of a sample, a chain of custody log was initiated. The chain of custody record included the following information: project name, work order number, shipped by, shipped to, sampling point, location, field ID number, date and time taken , sample type, number of containers, analysis required, sampler (s) signature (s), etc. As few people as possible handled the samples.

## SURVEYING

Grade elevations of monitoring wells were surveyed to the nearest 0.1 foot and top of riser elevations were s urveyed to the nearest 0.01 for monitoring wells. Elevations were tied to a USGS benchmark.

## DECONTAMINATION

Sampling equipment was decontaminated prior to sampling. The water level measuring device was washed before it was placed into each well using di stilled water and Alconox cleaning detergent. Latex gloves were worn during all sample collection procedures and were changed between the collection of each of the water samples from each monitoring well.



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