COLUMBIA TECHNOLOGIES

08 January 2018

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Joint Scope of Work for High-Resolution LNAPL Assessment and LCSM Development for Sac & Fox Truck Stop located in Powhattan KS

CT Project No. 3672-2017-10

Mr. Cawley,

Please find enclosed our proposed Joint Scope of Work (JSOW) to successfully isolate and manage the LNAPL contamination at the **Sac & Fox Truck Stop at Powhatten, KS**. This JSOW contemplates a collaborative approach to meet both the business goals of monetizing and controlling the long-term expense of the LNAPL management and meeting the immediate technical targets. We have relied on the systematic approach developed by the Interstate Technology and Regulatory Council as presented in the proposed technical approach.

We have reviewed the historical data provided by **Terranext LLC** in the preparation of this proposal and believe **Sac & Fox** would be best served proposed with a systematic yet flexible approach that:

- Leverages existing data and site knowledge to identify data gaps and provide a targeted, cost-effective data collection effort,
- Is interactive regarding adjusting the data collection points based on the information gained in real time, and
- Takes advantage of high-resolution technology to target the contamination distribution, soil behavior characteristics accurately, and guide the placement of future monitoring wells. This same technology can also provide an assessment of any currently installed remediation and control systems.
- Accomplishes the specific project goals outlined in the following Joint Scope of Work.

Project Management and Execution

We will support you and **Sac & Fox** with a team of experienced professionals during the execution of your project. I will serve as your Principal-in-Charge throughout the project. Please feel free to contact me directly at Tel: +1-301-455-7644 or JSohl@columbiatechnologies.com at any time.

Wendi Jacklitch will be your project manager for scheduling and information management. Her contact information is WJacklitch@columbiatechnologies.com and Tel: +1-888-344-2704, extension 225.

Real Time Information

Included in this joint scope of work is the 24/7 use of COLUMBIA Technologies' real-time GIS-based ***SmartData Solutions®*** information platform. We have taken the opportunity to upload some of the current conceptual site model data into a project website for you.

*For a preview of your project, please go to the **SmartData Solutions®** link:*
SmartData Solutions®

You will be asked to create an account password and then you will be able to view the data that has been uploaded.

During the field work, the project team and other stakeholders can use ***SmartData Solutions®*** to collaboratively analyze the LIF/UVOST®, OIP, HPT and MIP data sets against the historical data in real time to ensure the project objectives are met before demobilization from the Site. The website will allow the project team to construct cross-sections and plain-view maps from the high-resolution direct sensing data integrated with the historical information in near-real time.

We will host a web conference call each afternoon during the field work phase using this information system to review the lines of evidence and ensure project objectives are being achieved as planned.

Quality Assurance

COLUMBIA Technologies' operating protocols provide multiple dimensions of quality assurance to ensure we provide the most reliable; real-time information to our Clients.

- Our first layer of Quality Assurance begins with knowledgeable and trained operators. Each of our Field Geochemists is a college graduate with a degree in science or engineering. Each has completed an extended course of instruction that includes field procedures; health & safety awareness and responsibilities; and equipment design, maintenance, and operation.

- Second – standard equipment configurations and procedures. Each system, truck, and instrument package are configured consistently and operated in strict accordance with company procedures based on manufacturer's recommendations.
- Third – All direct sensing borings include a system performance before and after each boring in strict accordance with the manufacturers' recommendations. Corrective action is required before data collection if the performance tests indicate an unsatisfactory condition. These performance test data are recorded, uploaded with boring log data set, and retained on the company servers indefinitely.
- Fourth – A team of professionals backs the field team with experience on over 2000 site evaluations worldwide. This team provides online real-time monitoring and support via COLUMBIA Technologies' ***SmartNET***.
- Fifth - A review of all data is offered to the Client via a web teleconference before final preparation of any written report. Any discrepancies noted during the project review are investigated and corrected as appropriate.
- Sixth - All data reports are prepared and reviewed for accuracy by a senior, independent geochemist before submission to the Client

If awarded this project, we propose our team of experts in high-resolution site characterization meets with OLYMPUS's primary consulting project team to review the existing data set to help ensure we meet all of your project goals in a timely and cost-efficient approach.

Please contact me should you wish to discuss our offer in greater detail or require additional information. Thank you for considering COLUMBIA Technologies, and we look forward to the opportunity.

Sincerely,

John H. Sohl III, CEO
Direct: 301-455-7644

Enclosures:

Joint Scope of Work for LNAPL Assessment and LCSM Development

Budget Estimate

Joint Scope of Work for High-Resolution LNAPL Assessment and LCSM Development for Sac & Fox Truck Stop located in Powhattan KS

CT Project No. 3672-2017-10

This proposed Joint Scope of Work (JSOW) has been prepared following review of the historical groundwater monitoring well installation and monitoring reports prepared by Terra Next of Grandview, MO.

The goals of this JSOW are to maximize the opportunity to isolate the remaining source(s) and pathway(s) for LNAPL, determine the extent of LNAPL distribution, and evaluate the hydrostratigraphy for probably LNAPL transport and storage zones. In order to provide the most accurate and current conceptual side model to *support long-term management and recovery of LNAPL* we recommend the following systematic approach using multiple lines of evidence.

- Identify the location and depth of residual LNAPL
- Confirm the likely sources of LNAPL contamination
- Confirm the depth and zone any LNAPL impacts to groundwater
- Identify any LNAPL present at the site boundaries
- Identify the zones of soil permeability necessary to support fluid recovery
- Measure the LNAPL mass concentration and extent of impacted soil
- Perform a preliminary screening for any potential petroleum vapor intrusion
- Evaluate the location and depth of monitoring and recovery well screens to both the presence of LNAPL and the depth of permeable soil layers

This systematic approach incorporates the Interstate Technology and Regulatory Council (ITRC) guidelines for *Evaluating LNAPL Remedial Technologies for Achieving Project Goals (Dec 2009)*, and provides information needed to evaluate remedial alternatives outlined in the guide.

Current Conceptual Site Model (CSM)

Background provided by Terranext LLC in References (G) through (I)

> *On July 20, 2015, Sac & Fox reported a release of gasoline from an existing 15,000-gallon underground storage tank (UST). Due to heavy rains, approximately 63,000 gallons of impacted groundwater was pumped from the UST basin and LUST on July 10th -11th and 25th -26th, 2016.*

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Conclusions from the monitoring well installation activities, soil sampling, groundwater sampling, initial CSM development and initial soil vapor screening are as follows:

- *Based on the soil sampling, subsurface soils have been impacted above KDHE's Tier 2 non-residential RSK values at the MW4 and MW6 locations.*
- *Based on the groundwater sampling, groundwater has been impacted above KDHE's Tier 2 non-residential RSK values at the MW1, MW3, MW4 and MW6 locations.*
- *Based on the groundwater gauging, groundwater flow near the Sac & Fox Truck Stop facility is generally towards the east, towards the surface pond located approximately 600 feet east-southeast of the facility.*
- *Based on the monitoring well installation activities, there appears to be an orange silty sand and sand unit encountered approximately 12-20 feet bgs. This unit appears to become more prevalent to the east.*
- *Based on the initial soil vapor screening, there exists the potential for soil vapor intrusion into the existing facility building.*
- *Based on the initial CSM, there exist pathways for impacted subsurface soils and groundwater to reach receptors. Potentially impacted receptors included: an ecological receptor (the pond and associated animals) down gradient (east) of the facility; commercial works on-site, and construction workers should construction activities occur at the facility.*

A soil vapor survey was performed by Terranext on January 24, 2017. Soil vapor data at near-source depth (6 feet below ground surface (bgs)) and sub-slab depth (3-feet bgs) at two locations on the south side of the existing building to determine potential vapor intrusion impacts. Soil vapor concentrations were determined to be well above screening levels calculated using U.S. EPA's MAY 2016 Vapor Intrusion Screening Level (VISL) calculator indicating potential risk to human health and environment.

Business Objective(s) –

Considerable time and money has been expended to date to determine the extent and isolate residual gasoline leaked into the subsurface around the facility following the failure of the underground storage tank. The full extent in terms of mass and volume of residual light non-aqueous phase liquid (LNAPL) product needs to be determined to inform the potential risk to

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human health and environment and to monetize the total cost of cleanup and long-term risk management required.

This will require a systematic approach to isolate one or more LNAPL sources and complete the delineation of LNAPL in a complex hydrogeological setting. Information from this assessment will be used to aid in the selection of further remedial alternatives and aid in the effective design and installation of a remediation system. Together, these activities are designed help monetize and reduce the long-term cost of LNAPL removal and protection of groundwater at the site.

Specific project objectives will include:

- Verifying the source and depth of gasoline release(s) to the property
- Determining the extent of the impact of the gasoline release to groundwater
- Determining the extent of the impact of the gasoline release at the property boundaries.
- Determining the potential risk of vapor intrusion to the facility buildings resulting from the gasoline release.
- Inform the decision-making process for selection of remediation alternatives following the Interstate Training and Regulatory Council's guidelines for *Evaluating LNAPL Remedial Technologies for Achieving Project Goals (Dec 2009)*

Chemical Release – A known release of **gasoline product** has been monitored and reported via existing wells on site since 2015. The monitoring and recovery wells are primarily screened with 15-ft of screen primarily from depths of 15 to 30 feet below grade (bgs).

Site Conditions – The Site is an operating retail gasoline station with concrete slab under the canopies, concrete over the tank basin, and remainder of the site is asphalt pavement.

The potential impact of subsurface utilities or other infrastructures associated with a retail gas station will be considered in the data evaluation phase.

Assessment Challenges –

1. Lateral and vertical variations in the hydraulic conductivity and LNAPL transmissivity of the deposits underlying the site combined with potential multiple remaining source areas and historical multiphase extraction events potentially increases the complexity of the three-dimensional LNAPL distribution.
2. Any field activities will consider multiple petroleum pipeline and transfer equipment, and other utilities.
3. Field activities will need to consider potential traffic flow in and around the survey area.

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Step 1 Evaluate the Current Conceptual Site Model, Leverage Existing Information and Identify Data Gaps

1. Update the current Conceptual Site Model (CSM) and evidence of LNAPL distribution from the available existing information including:

	Historical groundwater levels
	Geology and boring logs
	Measured LNAPL thickness
	Soil analytical results
	Groundwater analytical results
	Historical infrastructure information
	Recovery well performance results
	Monitoring well construction details

2. Load this initial CSM information into a real-time software decision support system SmartData Solutions® in preparation for the field assessment activities.

Step 2 Compare Reported Impacts in Monitoring and Extraction Wells to the Adjacent Soil Formation (see Figures 2)

3. Determine a reference signature on the LIF/UVOST® or Optical Interface Probe (OIP) system for any LNAPL product present in existing monitoring wells, recovery wells, and soil samples.

4. Validate the presence and depth interval of LNAPL in monitoring wells with reported LNAPL or elevated dissolved phase concentrations by advancing LIF/UVOST® or OIP soundings adjacent to those wells. The LIF/UVOST® or OIP system is expected to delineate the extent of any residual petroleum hydrocarbons contained within the soil pore structure.

5. Consider changing technology to Membrane Interface Probe for the high-resolution soundings if LNAPL has not detected in the formation adjacent to impacted wells or if the LNAPL of concern is primarily a weathered gasoline product.

   For the Sac & Fox Truck Stop property, we are expecting gasoline product which will be most efficiently mapped using MiHpt technology. For the Sac & Fox Truck Stop, we are

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recommending an evaluation at the FOUR well locations with known LNAPL impact. (MW-1, 4, 5, and 6 – See Figure 2)

Step 3 Verify the Boundaries of LNAPL Distribution (see Figure 2)

6. Advance LIF/UVOST® or OIP (or MiHpt) soundings in a series of transects to isolate the primary source area from potential areas of migration in each direction. Early verification of boundaries is a major step in coordinating site access and controlling the budget for field investigations.

   *For the Sac & Fox Truck Stop property see **Figure 2 locations labeled "A1".***

Step 4 Complete the Delineation of LNAPL Distribution (Figure 2)

7. Advance additional direct sensing survey locations as needed, locations marked as "B" in to (a) verify the boundary and extent of LNAPL, and (b) identify any leakage sources in the fueling infrastructure. Typical indicators of LNAPL equilibrium will be a thinning of the vertical thickness of the LNAPL from the source(s)thinning towards the edges.

   For the Sac & Fox Truck Stop property, we have allocated an initial ten (10) contingency sensing locations for completing the delineation of the LNAPL body considering the size and extent of the property.

   *For the Sac & Fox Truck Stop property. **Figure 2 locations labeled "B".***

Step 5 Measure the Soil Permeability Layers

8. Use the Hydraulic Profiling Tool (HPT) or combined MiHpt (or combined OIP/HPT) technology to obtain continuous high-resolution measurements of the pore hydraulic permeability of the LNAPL impacted soils. The HPT data coupled with the LIF/UVOST® or OIP data will provide the detail needed to accurate evaluate probable pathways and their relationship to the install monitoring or recovery wells and other subsurface infrastructure.

   Locations for the HPT profiles will be identified following a real-time data review of the LNAPL impacts and boundary conditions.

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Step 6 Measure the LNAPL Concentration Level and Mass in the Impacted Soil

9. Collect discrete soil cores and obtain incremental high-resolution soil samples using En Core® or equivalent samplers for laboratory analyses of the LNAPL results. *The locations and numbers of samples should be chosen after a review of the LNAPL distribution as determined by the direct sensing technologies.* Photographs of the sampling process are enclosed at the end of this JSOW.

   We recommend a consistent, statistically valid sampling interval be used as described in the Incremental Sampling Methodology, Reference (F), to support the project goals. Some specific goals for the soil sampling to consider are:

   - confirmation of the volume and mass of impacted soil in the source area(s);
   - the determination of mass transport; and
   - correlation of high-resolution information to the measured chemicals of concern in the formation.

   For the Sac & Fox Truck Stop property, we have allocated FIVE locations with SIX equally spaced soil samples across the vertical height of the detected residual LNAPL body within the boundaries of the of the property.

Step 7 Determine the LNAPL Saturation Level and Consider Measuring LNAPL Transmissivity for Recoverability (Optional)

10. Determine LNAPL Saturation Levels at discrete locations with excess (> 0.5-ft) of LNAPL thickness in the formation using analytical measurement of % LNAPL saturation and relative soil permeability. This analysis will be performed by a specialty laboratory, PTS Labs. The results will provide a measurement for the potential of direct LNAPL fluid recovery.

   Additionally, the ASTM Standard Guide E2856 provides additional guidance on the field methods for measuring and evaluating LNAPL transmissivity as an effective of LNAPL fluid recovery.

   LNAPL Transmissivity should be considered if sufficient LNAPL volume and thickness, typically greater than 1-ft in the formation, to support effective recovery of the LNAPL. Based on the historical data for the Sac & Fox Truck Stop property, we anticipate these conditions will likely be met. A final determination will be made after the direct sensing survey.

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Step 8 Update the LNAPL Conceptual Site Model

11. Revise the LNAPL CSM (LCSM) with the information developed during this assessment. The LCSM should include at a minimum:

    - An interpretation of the high-resolution technology results
    - Accurate delineation of any residual LNAPL in the survey area
    - Identification of soil permeability pathways
    - The relationship of any residual LNAPL to the permeability pathways and the installed monitoring and recovery wells
    - An estimated volume of LNAPL impacted soil
    - Use soil analytical data that was obtained to develop an estimate of the total LNAPL mass remaining
    - Using the HPT data combined with LNAPL measurement to produce an estimate of relative LNAPL mass flow from the source area(s) can be provided
    - A summary of observations and anomalies

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Technical References:

(A) ITRC Training on LNAPL Science, Management, and Technology

(B) ITRC *Evaluating LNAPL Remedial Technologies for Achieving Project Goals (Dec 2009)*

(C) Estimating LNAPL Transmissivity: A Guide to Using ASTM Standard Guide E2856

(D) *Standard Practice for Direct Push Technology for Volatile Contaminant Logging with the Membrane Interface Probe (MIP)* ASTM STANDARD D7352 – 07

(E) Geoprobe Technical Bulletin MK3010 *Standard Operating Procedure for Geoprobe® Membrane Interface Probe (MIP)* Revised: April 2012

(F) ITRC *Incremental Sampling Methodology* ISM-1_021512_Final

(G) Monitoring Well Installation Report dated October 27, 2016 prepared by Terranext, LLC.

(H) Leaking Underground Storage Tank (LUST) Assessment Monitoring Well Installation and Groundwater Monitoring Report dated February 21, 2017 by Terranext, LLC.

(I) Groundwater and Indoor Air Monitoring Report dated May 17, 2017 prepared by Terranext, LLC.

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NOTES:

Laser Induced Fluorescence (LIF) – Responds to residual PAH present in soil pore space. Use LIF/UVOST® or OIP technologies for diesel, kerosene, jet fuels, and heavier petroleum products. If LNAPL is present in the monitoring well, a sample of the product can be evaluated in real time using the LIF/UVOST®.

Optical Interface Probe (OIP) – Similar functionality to LIF/UVOST® or OIP in that the OIP system responds to residual PAH present in soil pore space. This system is provided Geoprobe Systems and integrates directly with field computer and data acquisition system used for MIP and HPT.

Use LIF/UVOST® or OIP.to:

- Determine boundaries and extent of residual LNAPL.
- Assess whether product thickness measured in a well is representative of product in adjacent formation.
- Decide whether recovery well screens are effectively aligned with the current elevation of residual product and permeable pathway for recovery.
- Identify the type of product present at different locations throughout the site.
- Nominal 10 to 30-foot spacing; adjust spacing to close identified data gaps

Membrane Interface Probe (MIP) – Responds to volatile (VOC) components of LNAPL up to the boiling point of naphthalene. Use MIP to:

- Identify dissolved phase petroleum contamination above approximately 1 ppm in-situ concentration.
- Determine presence of petroleum vapors or degradation products in the vadose zone.
- Help identify distribution and pathways for dissolved phase petroleum contamination.
- Nominal 25 to 50-foot spacing; adjust spacing to close identified data gaps

Hydraulic Profiling Tool (HPT) [or combination MIP + HPT (MiHpt)] – Measures changes in pore pressure and soil permeability in a vertical borehole. Use Hydraulic Profiling Tool (HPT) to:

- Identify permeable transport pathways or high pore pressure, low permeability zones affecting LNAPL mobility
- Identify potential perched or confined hydraulic conditions that may relate to LNAPL mobility or transmissivity
- For selection of locations use:
    a) In areas of residual LNAPL defined by the LIF/UVOST® or OIP to determine presence or absence of constraining hydraulics;
    b) To identify pathways to monitoring and recovery wells; and
    c) To identify potential sampling locations and depths.

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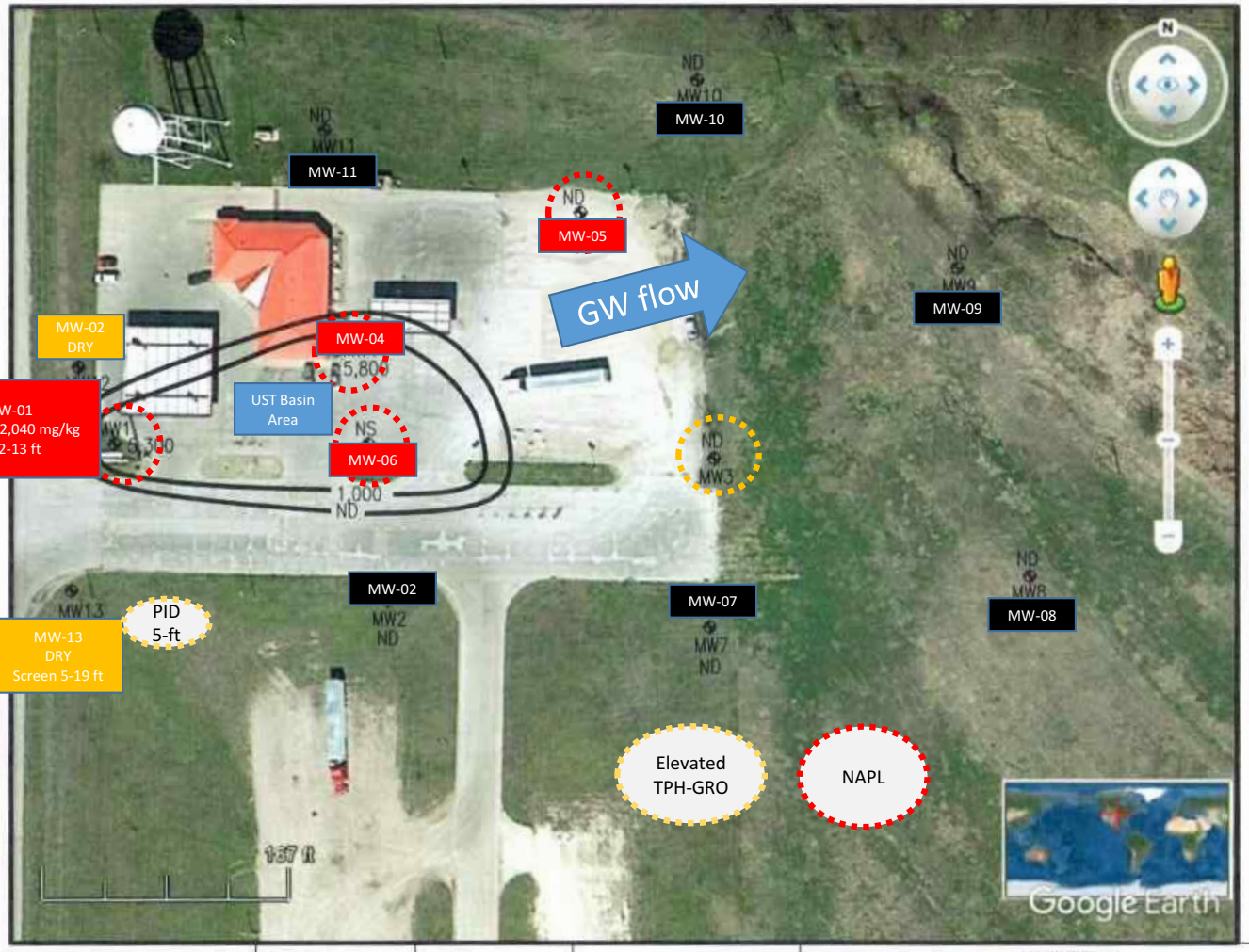

Monitoring Well Location
1,000 TPH-GRO Concentrations in ug/l
ND Non-Detect
NS Not Sampled

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SCALE: AS SHOWN	DRAWN BY:
FILE NO.	DESIGNED BY:
DATE:	APPROVED BY:

TerraNext

FIGURE 2
GROUNDWATER TPH-GRO RESULTS
JANUARY 25, 2017
SAC & FOX TRUCK STOP
1346 US 75 HIGHWAY
POWHATTEN, KANSAS

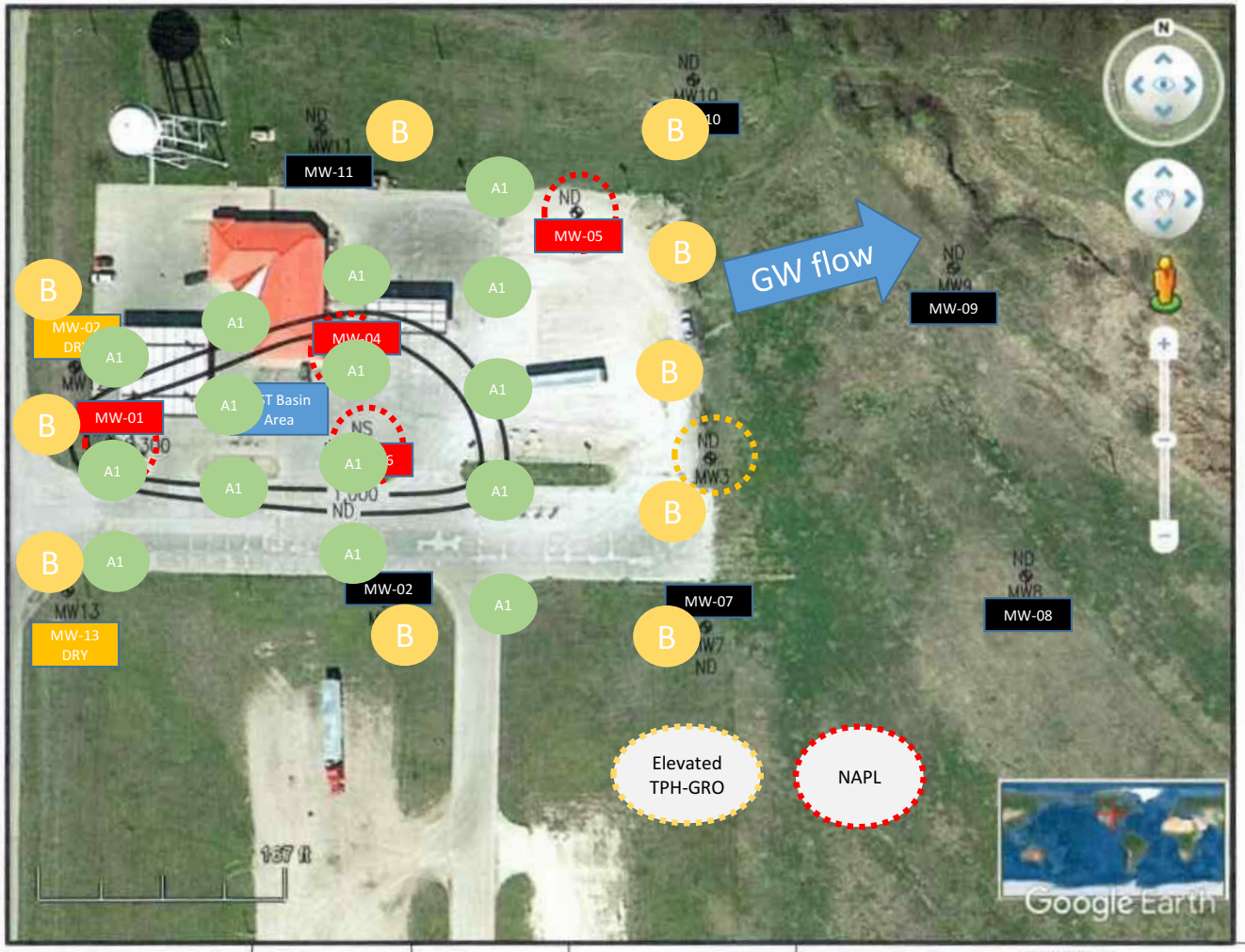
GW Results Exceeding LNAPL

Figure 1

Sac & Fox Truck Stop
Powhattan KS

January 2018

High-Resolution Assessment



Monitoring Well Location
1,000 TPH-GRO Concentrations in ug/l
ND Non-Detect
NS Not Sampled

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FIGURE 2
GROUNDWATER TPH-GRO RESULTS
JANUARY 25, 2017
SAC & FOX TRUCK STOP
1346 US 75 HIGHWAY
POWHATTEN, KANSAS

Proposed Survey Locations

Figure 2

Sac & Fox Truck Stop
Powhattan KS

January 2018

High-Resolution Assessment

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ESTIMATE

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Esq.
2019 ELMEN STREET
Houston, TX 77019

ESTIMATE # 3672-2017-10
DATE 01/08/2018
EXPIRATION DATE 04/06/2018

P.O. NUMBER	SITE ADDRESS	SITE NAME
3672-2017-10	Powhattan KS	Sac & Fox Stop

ACTIVITY	QTY	RATE	AMOUNT
High-Resolution LNAPL Site Conceptual Model Assessment Sac & Fox Truck Stop Powhattan KS			
Provision of a Secure SmartData Solutions real-time decision support system and upload the site historical data	1	2,500.00	2,500.00
Review existing site data and develop a high-resolution assessment work plan, safety plans (as required), scheduling, subcontracting, and conference calls.	1	750.00	750.00
Mobilization/Demobilization of Direct Sensing Rig & Crew	1	750.00	750.00
HRSC vertical profiles adjacent to impacted monitoring and extraction wells to determine the depth of LNAPL impact in soil formation, hydraulic permeability profiles, and their relationship to the installed screened intervals.	4	3,000.00	12,000.00
Collect high-resolution soil cores and samples using Encore® samplers for laboratory analyses to support identification of LNAPL constituents, and volume of LNAPL impact. (Requires Geologist and DPT contractor)	1	1,100.00	1,100.00
NELAP certified laboratory analyses of discrete Encore® samples for TPH. Upload the sample analytical results in real-time to SmartData Solutions®	30	65.00	1,950.00
OPTIONAL Core sampling for LNAPL PoreSaturation Evaluation and evaluation of potential LNAPL Transmissivity	6	600.00	3,600.00
Real Time Data Upload Services	5	200.00	1,000.00
Level II Data Interpretive Report including data logs, description of procedures, interpretation of LIF/UVOST®, MIP, HPT results, 2D data visualizations, and post-project data review web conference	1	3,500.00	3,500.00
Mobilization/Demobilization of DPT Rig & Team	1	750.00	750.00
DPT Rig & Crew for HRSC Survey and Soil Sampling	5	1,850.00	9,250.00
Per Diem per man-day for direct sensing & DPT team	10	175.00	1,750.00

TOTAL **$38,900.00**

Please include invoice number on your remittance.

Our EIN is 52-2141736

Accepted By

Accepted Date

Please include invoice number on your remittance.

Our EIN is 52-2141736