



July 30, 2013

Mr. Steve Teel  
Washington State Department of Ecology  
Southwest Regional Office - Toxics Cleanup Program  
P.O. Box 47775  
Olympia, Washington 98504-7775

*Subject:* **Soil Sampling and Natural Attenuation Assessment Work Plan  
Cowlitz BP / Cowlitz Food and Fuel /  
Former Texaco Service Station No. 21-1556  
101 Mulford Road  
Toledo, Washington**

Dear Mr. Teel:

SAIC Energy, Environment & Infrastructure, LLC (SAIC) prepared this work plan, on behalf of Chevron Environmental Management Company (CEMC), to perform soil sampling and natural attenuation assessment activities at the above-referenced site (the Site) in Toledo, Washington.

The objectives of the proposed assessment activities are:

- 1) To evaluate current petroleum hydrocarbon concentrations in soil on the active station portion of the Site, and underlying the 2010 interim remedial action excavation areas; and
- 2) To evaluate natural attenuation processes that appear to be occurring at the Site and which are believed to be responsible for ongoing reductions in petroleum hydrocarbon contamination in groundwater on the active station property.

Data collected from these activities will be used to assist the cleanup alternative selection process for the Site. The assessment activities proposed in this work plan are consistent with the path forward strategy that was agreed upon during our meeting with Mr. Scott Rose of Ecology and Mr. Mark Horne of CEMC on May 22, 2013.

### **SOIL SAMPLING ACTIVITIES**

In order to evaluate current concentrations of petroleum hydrocarbon contamination in soil within the southern portion of the active station property, and underlying the 2010 interim remedial action excavation areas, SAIC proposes to advance approximately thirteen soil borings within these areas. Proposed boring locations are shown on Figures 1 and 2.

In the southern portion of the active station property, ten borings (SB-9 through SB-18) are proposed to delineate the current extent of contamination along two transects that are

approximately parallel, and perpendicular, to the direction of groundwater flow at the Site (see Figure 2). Data collected from these borings will be used to evaluate whether previous remedial action and/or natural attenuation have resulted in petroleum contaminant reductions in soil within this area of the Site.

Three additional borings (SB-19 through SB-21) are proposed in the areas that were excavated during the interim remedial action performed at the Site in 2010. Data collected from these borings will be used to determine whether the addition of Oxygen Release Compound<sup>®</sup> (ORC<sup>®</sup>) was effective in reducing petroleum contamination in soil that was left in place below the water table in these areas.

### **SUBSURFACE UTILITY LOCATION**

Prior to beginning any subsurface investigation activities, SAIC will contact the Utilities Underground Location Center to request that all public utilities be marked in the vicinity of the Site. In addition, SAIC will subcontract a private utility locating subcontractor to locate any other potential utilities or other subsurface infrastructure that may be present in the vicinity of the boring locations.

### **SOIL BORING AND SAMPLING**

CEMC safety procedures currently require that all subsurface borings be cleared to a depth of at least eight feet below ground surface (bgs) by hand, or using a “soft-dig” technology, such as an air-knife, in order to reduce the potential for damaging subsurface utilities or infrastructure during assessment activities. Therefore, all soil borings will be advanced using a combination of hand-auger, air-knife, and mechanical drilling techniques.

To begin each boring, an SAIC geologist will attempt to use a hand-auger and/or posthole digger to advance the boring to a depth of at least eight feet bgs. Within this interval, soil samples will be collected approximately every two feet using a stainless steel hand auger. Upon completion of the hand-auger boring, an air-knife will be used to enlarge the boring to a diameter at least six inches larger than the diameter of drilling rod/flight that will be used to complete the boring. Below eight feet bgs, borings will be advanced using a sonic drilling rig, which is capable of boring through the alluvial cobbles present at this Site, as well as the quarry spall backfill that was used at the base of the two interim remedial action excavations. The sonic drill rig will collect a continuous core sample from approximately eight feet bgs to the bottom of the boring. Each boring will be advanced to a depth of approximately 20 feet bgs, which is below the bottommost extent of contamination that has been encountered at the Site. Air-knife and sonic drilling services will be performed by Cascade Drilling L.P. (Cascade Drilling) of Woodinville, Washington.

Soil samples collected during hand-auger and sonic drilling activities will be logged in accordance with the Unified Soil Classification System, and field screened for the presence of petroleum hydrocarbons by visual and olfactory observation, headspace vapor measurements by photo- and/or flame-ionization detector (PID and/or FID), and sheen testing.

At a minimum, two soil samples from each boring will be submitted for laboratory analysis; one from the capillary fringe and the second from the bottom-most sampling

interval attained in the boring. The bottom-most sample will be used to demonstrate that the sampling effort has advanced to a sufficient depth to define the vertical extent of petroleum hydrocarbon contamination. Additional soil samples may also be submitted based on field-screening observations. For example, the sample producing the highest PID / FID readings, strongest sheen, or having the greatest visual or olfactory indication of hydrocarbon impact may also be submitted for laboratory analysis.

Selected soil samples will be submitted to Eurofins Lancaster Laboratories Environmental, LLC (Lancaster Laboratories) for the following analyses:

- Gasoline-range organics (GRO) by ECY 97-602 NWTPH-Gx;
- Diesel-range organics (DRO) and heavy oils (HRO) by ECY 97-602 NWTPH-Dx;
- Diesel-range organics (DRO) and heavy oils (HRO) by ECY 97-602 NWTPH-Dx with silica-gel cleanup;
- Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by SW-846 8021B;
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by SW-846 8270 with selective ion monitoring; and
- Total lead by SW-846 6010B.

Following completion of soil sampling activities, Cascade Drilling will abandon each boring by filling them with bentonite chips to a depth of approximately 12 inches bgs. The upper 12 inches of each boring will then be filled to the ground surface using neat cement.

### **GROUNDWATER MONITORING FOR EVALUATION OF REMEDIATION BY NATURAL ATTENUATION**

Historical groundwater monitoring data collected to date indicate that groundwater throughout the Site is typically in compliance with MTCA Method A cleanup levels, with the exception of monitoring wells B-3, B-4, and MW-111, which are immediately downgradient of the UST basin and pump islands. In this area, groundwater continues to exceed cleanup levels; however, historical data indicate that groundwater conditions are improving, which is likely attributable to natural attenuation processes.

In order to develop a greater understanding of the natural attenuation mechanisms that are believed to be occurring at the Site, SAIC proposes to establish a groundwater monitoring program to collect data on levels of geochemical indicators that are associated with natural attenuation degradation processes.

To perform this evaluation, the following subset of 11 monitoring wells at the Site has been selected for additional groundwater analyses (see Figure 3):

- Monitoring wells B-1 and B-2: Selected to be representative of background groundwater conditions upgradient of the contaminant source area.
- Monitoring wells MW-117 and MW-119: Selected to be representative of background groundwater conditions crossgradient of the contaminant source area.

- Monitoring wells B-3, B-4, and MW-111: Selected to be representative of groundwater conditions within the contaminant source area.
- Monitoring wells MW-112, MW-113: Selected to be representative of groundwater conditions immediately downgradient of the contaminant source area.
- Monitoring wells MW-103 and MW-116: Selected to be representative of groundwater conditions within downgradient sentinel wells.

Data collection will consist of measurements of the following geochemical indicators, which will be performed through a combination of field and laboratory analysis.

### **Field Measurements**

The following parameters will be measured in the field by the Gettler-Ryan Inc. (Gettler-Ryan) sampling technician, using a direct reading meter mounted in a flow-through cell, during low-flow purging of each monitoring well:

- Dissolved oxygen (DO)
- Oxidation reduction potential (ORP)
- pH
- Temperature
- Conductivity

### **Laboratory Analyses**

The following additional parameters will be determined by laboratory analysis of groundwater samples collected by Gettler-Ryan using low-flow purging and sampling methods:

- Nitrate and sulfate by EPA 300.0
- Dissolved iron and dissolved manganese\* by SW846 6010B
- Sulfide by SM 4500-S2 D-2000
- Methane by RSKSOP-175 modified
- Alkalinity\* by SM 2320 B-1997

\* - Samples submitted for ferrous iron, manganese, and alkalinity analyses will be field filtered using a 0.45 micron in-filter.

Sample analysis will be performed by Lancaster Laboratories.

Groundwater monitoring for the evaluation of natural attenuation will be performed concurrent with the current scheduled quarterly groundwater monitoring events for the Site for at least two quarters. Based on the results of the first two monitoring events, SAIC will determine whether additional collection of natural attenuation parameters is warranted.

## SCHEDULE

SAIC will begin implementation planning for this project upon receipt of Ecology approval of this work plan. It is anticipated that planning for the soil sampling portion of the assessment will require approximately 4 to 8 weeks to complete. A data evaluation and summary report of soil sampling results will be submitted within 60 days following final receipt of all soil sampling analytical data.

Groundwater monitoring for the natural attenuation evaluation will begin during the next regularly scheduled quarterly monitoring event, following Ecology approval of the work plan. Groundwater monitoring results for natural attenuation evaluation will be presented in quarterly groundwater monitoring reports. Following completion of at least two quarters of natural attenuation monitoring, SAIC will also prepare a report summarizing the results of the natural attenuation evaluation.

## REFERENCES

The following technical documents were referenced during the preparation of this work plan:

- Washington State Department of Ecology. “Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation.” July 2005.
- Wiedemeier, T.H., Barden, M.J., Haas, P.E., and Dickson, W.Z. “Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation.” Chapter 9 of the “Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring”, Second Edition. CRC Press, 2006, pages 573 – 637.

If you have any questions or comments regarding the content of this work plan, please contact me at (425) 482-3323 or via email at [russell.s.shropshire@saic.com](mailto:russell.s.shropshire@saic.com).

Sincerely,

**SAIC Energy, Environment & Infrastructure, LLC**



Russell S. Shropshire, PE  
Senior Project Engineer

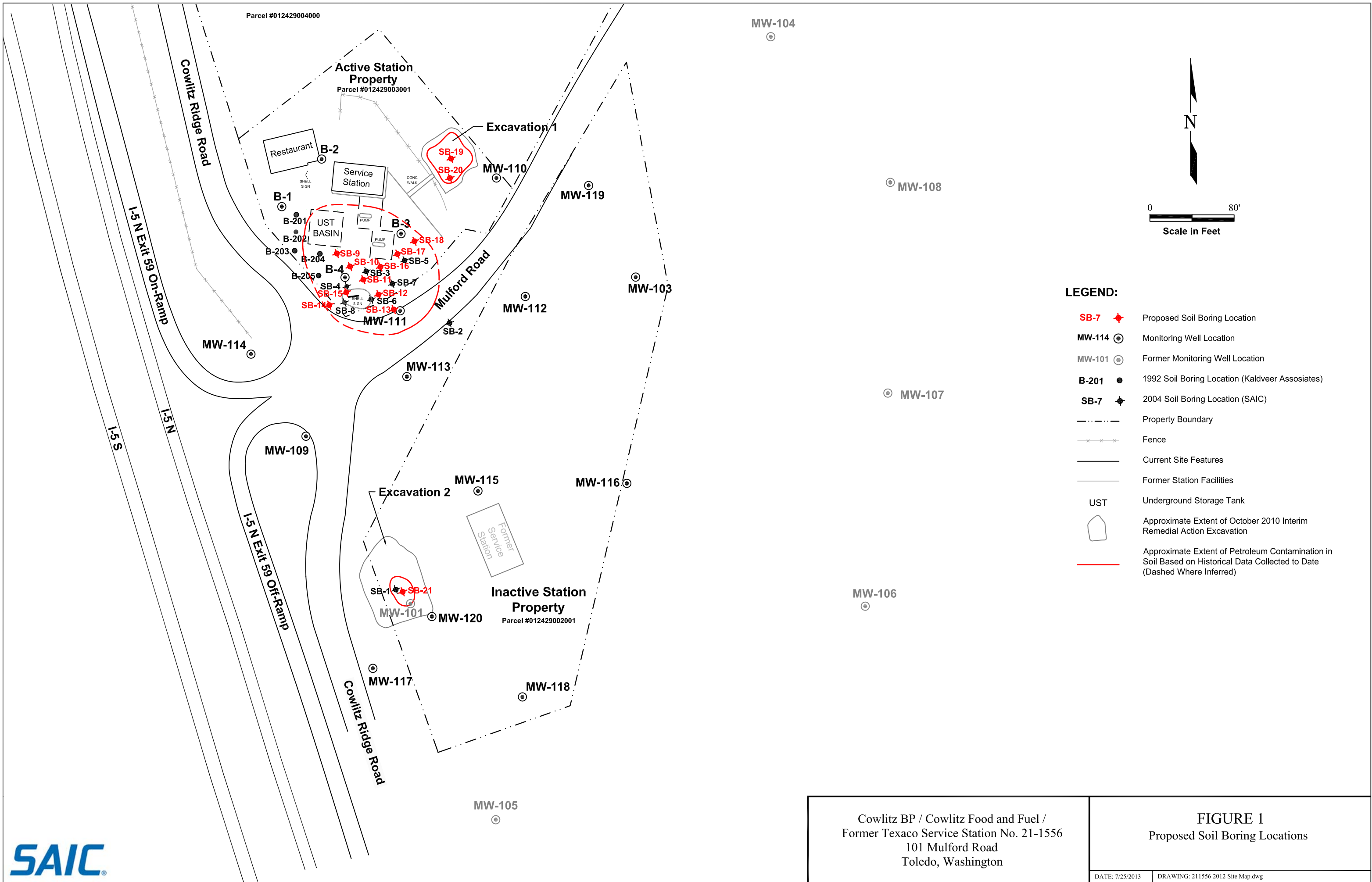
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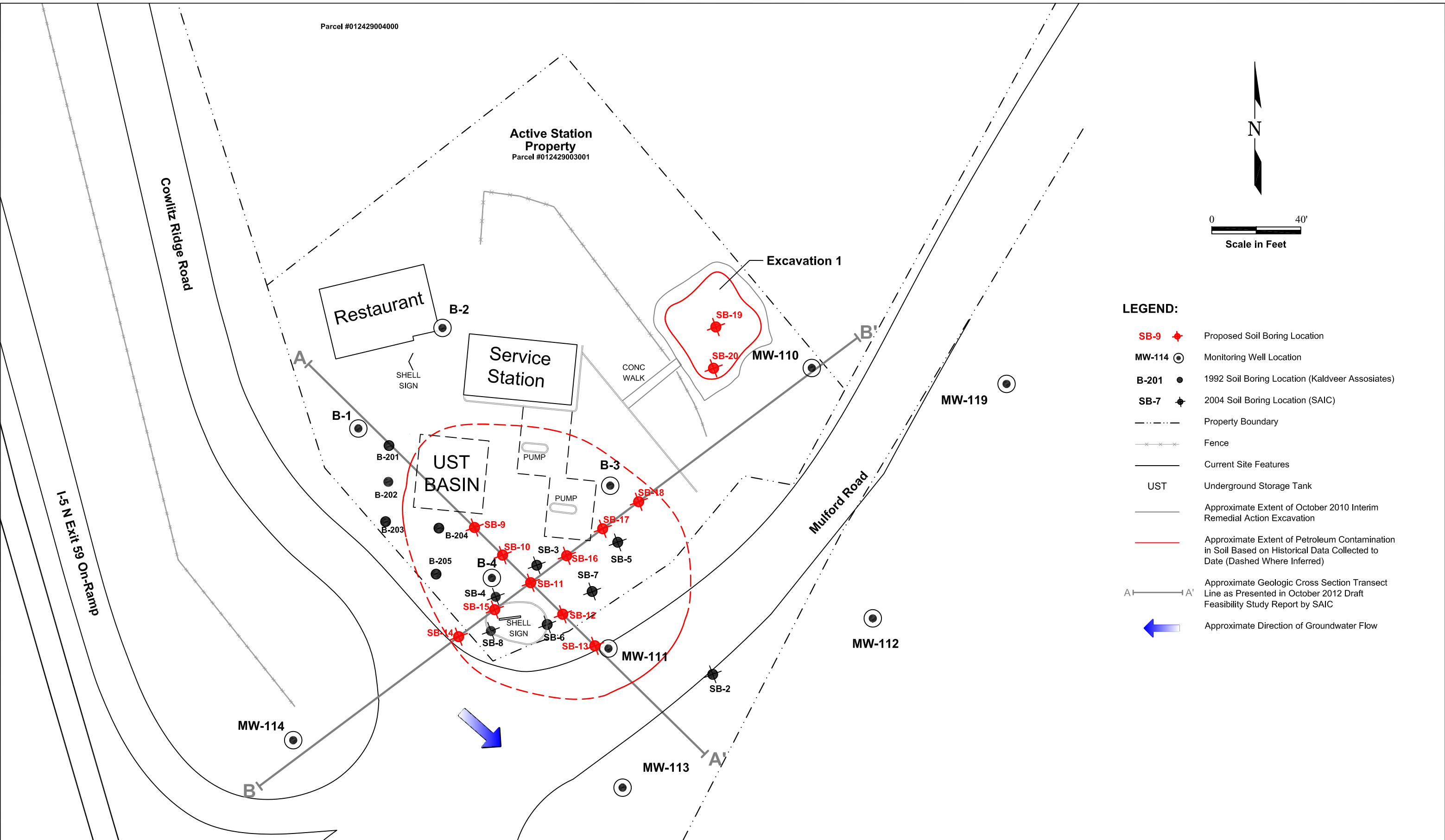
Figure 1 – Proposed Soil Boring Locations

Figure 2 – Proposed Soil Boring Locations – Active Station Property

Figure 3 – Proposed Monitoring Well Network for Natural Attenuation Evaluation

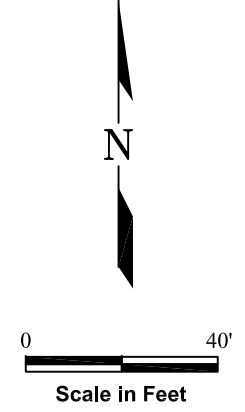
cc: Mr. Mark Horne – CEMC  
Mr. Charles Vineyard  
Mr. John Houlihan – Houlihan Law

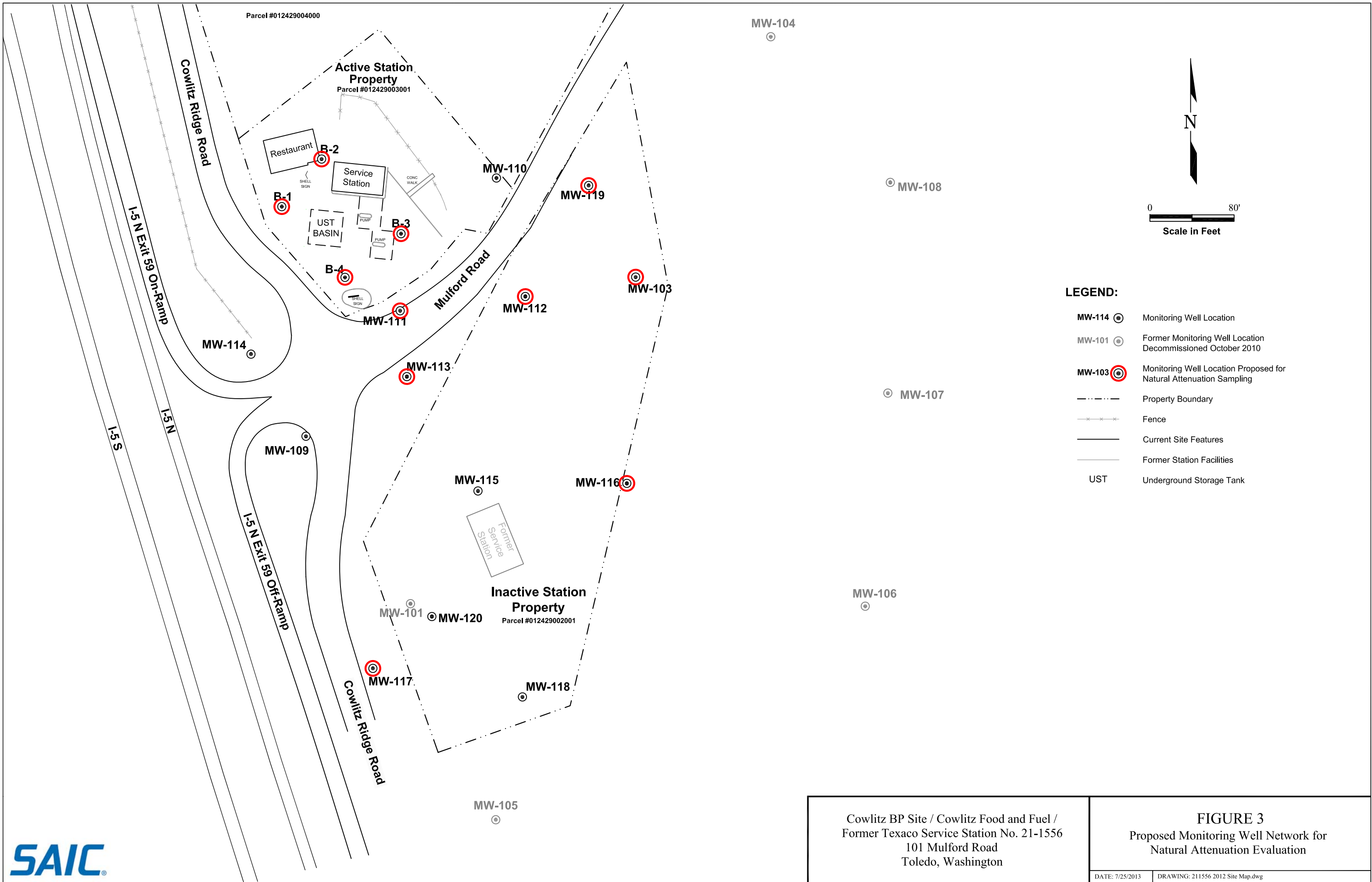




**LEGEND:**

- ◆ SB-9 Proposed Soil Boring Location
- MW-114 Monitoring Well Location
- B-201 1992 Soil Boring Location (Kaldveer Associates)
- ◆ SB-7 2004 Soil Boring Location (SAIC)
- - - - - Property Boundary
- x - x - Fence
- Current Site Features
- UST
- Approximate Extent of October 2010 Interim Remedial Action Excavation
- Approximate Extent of Petroleum Contamination in Soil Based on Historical Data Collected to Date (Dashed Where Inferred)
- A — A' Approximate Geologic Cross Section Transect Line as Presented in October 2012 Draft Feasibility Study Report by SAIC
- ← Approximate Direction of Groundwater Flow





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**FIGURE 3**  
Proposed Monitoring Well Network for  
Natural Attenuation Evaluation

DATE: 7/25/2013 DRAWING: 211556 2012 Site Map.dwg