

FARALLON CONSULTING, L.L.C.

**1201 Cornwall Avenue, Suite 105
Bellingham, Washington 98225**

**Phone
(360) 527-0241**

**Fax
(360) 527-0243**

T E C H N I C A L M E M O R A N D U M

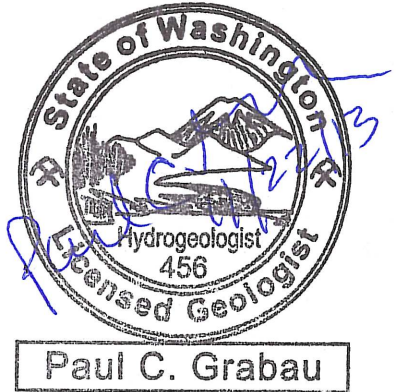
TO: Diane Escobedo – Washington State Department of Ecology

cc: Marty Winn
Al Peyser, Peyser Family LLC (e-mail only)
Ray Lotto
James Porter, JPA Enterprises, LLC (e-mail only)
Peter Hapke, Advocates Law Group PLLC (e-mail only)
Doug Kelly, Island County (e-mail only)
Andy Campbell, Freeland Water and Sewer District (e-mail only)
David Campbell, Scotty's Towing (e-mail only)
Tod Gold, Joyce Ziker Parkinson PLLC (e-mail only)
Carol Lybeer – Colony Specialty (e-mail only)

FROM: Paul Grabau, Principal Hydrogeologist

DATE: November 22, 2013

RE: **SCOPE OF WORK FOR INSTALLATION OF SEA LEVEL AQUIFER
MONITORING WELLS
WHIDBEY MARINE & AUTO SUPPLY SITE
FREELAND, WASHINGTON
FARALLON PN: 454-001**



Farallon Consulting, L.L.C. (Farallon) has prepared this Technical Memorandum to present the scope of work for installation of four monitoring wells in the Sea Level Aquifer in the down-gradient direction of groundwater flow from the former Whidbey Marine & Auto Supply facility at 1689 Main Street in Freeland, Washington (herein referred to as the Site) (Figure 1). The cleanup action at the Site is being conducted under the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program and in accordance with the provisions of the Washington State Model Toxics Control Act Cleanup Regulation (MTCA) as established in Chapter 173-340 of the Washington Administrative Code (WAC 173-340). The Site has been assigned Toxics Cleanup Program Identification No. NW1529 by Ecology.

BACKGROUND

Environmental investigation and cleanup activities have been ongoing at the Site following the discovery and reporting of a release of gasoline from an underground storage tank in 2005. The initial investigation and cleanup activities were focused on the Perched Groundwater Zone found at approximately 55 feet below ground surface (bgs) beneath the former Whidbey Marine & Auto Supply facility and adjacent properties. Total petroleum hydrocarbons as gasoline-range organics (GRO) and benzene, toluene, ethylbenzene, and xylenes (BTEX) have been detected in groundwater samples collected from various Site monitoring wells at concentrations exceeding MTCA Method A cleanup levels.

Cleanup activities conducted at the Site have included soil vapor extraction from the vadose zone above the Perched Groundwater Zone and injection of chemical oxidants into the Perched Groundwater Zone. The soil vapor extraction operations at the Site removed over 12,000 pounds of gasoline-range organic vapors from vadose zone soil. Groundwater monitoring results indicate that GRO and BTEX concentrations were reduced in groundwater in the Perched Groundwater Zone in the central area of the former Whidbey Marine & Auto Supply facility as a result of the chemical oxidant injections. The in-situ chemical oxidant injection was intended to target the Perched Groundwater Zone only and was not expected to have a significant effect on the deeper Sea Level Aquifer.

Environmental investigation activities conducted at the Site have included installation of eight groundwater monitoring wells within the Perched Groundwater Zone and four monitoring wells within the Sea Level Aquifer found at approximately 105 feet bgs at the Site. The Perched Groundwater Zone monitoring wells are designated MW-1 through MW-8 and the Sea Level Aquifer monitoring wells are designated MW-9 through MW-12 (Figure 2). GRO and BTEX constituents have been detected at concentrations exceeding MTCA Method A cleanup levels in groundwater samples collected from Sea Level Aquifer monitoring wells, MW-9, MW-11, and MW-12. The direction of groundwater flow within the Sea Level Aquifer at the Site appears to be to the southeast.

In the letter regarding Opinion Pursuant to WAC 173-440-515(5) on Proposed Remedial Action for the Whidbey Marine & Auto Supply Site at 1689 Main Street in Freeland, Washington dated June 3, 2013 (June 2013 Opinion Letter), Ecology requested further characterization of petroleum hydrocarbon contamination in the Sea Level Aquifer down-gradient of the existing Sea Level Aquifer monitoring wells. The former owner of the Whidbey Marine & Auto Supply facility and Farallon met with Ecology in July 2013 to discuss the path forward for the cleanup action at the Site including installation and sampling of additional groundwater monitoring wells in the Sea Level Aquifer. In early August 2013, Farallon met with representatives of Ecology, Island County, and the Freeland Water and Sewer District on the Site to discuss the proposed additional characterization activities and to evaluate potential locations for the installation of four additional Sea Level Aquifer monitoring wells.

The proposed well locations are down-gradient from the former Whidbey Marine & Auto Supply facility as shown on Figure 3. Farallon has obtained access agreements from three of the four

property owners contacted for installation of the monitoring wells. The proposed well locations were adjusted in consultation with Ecology and Island County so that the four monitoring wells could be installed on the three parcels for which access was obtained. The final monitoring well locations will depend on the results of utility locating to be conducted by public and private utility locating services and upon final approval by the property owners.

OBJECTIVE

The objective of the work described herein is to characterize groundwater conditions down-gradient of the existing Sea Level Aquifer monitoring wells at the Site. The projected centerline of the plume of dissolved phase petroleum hydrocarbon contamination in groundwater in the Sea level Aquifer is shown on Figure 3. The centerline of the dissolved petroleum hydrocarbon plume was estimated based on groundwater flow direction derived from groundwater elevations in the existing Sea Level Aquifer wells assuming a source area near monitoring well MW-9 where the highest concentrations of GRO and BTEX have been detected in groundwater samples and light non-aqueous phase liquid (LNAPL) which appears to be free-phase gasoline was found on groundwater in 2012. The contaminant plume centerline shown on Figure 3 is provided for conceptual purposes since the actual area of dissolved-phase petroleum hydrocarbons in groundwater in the Sea Level Aquifer is not delineated by the existing groundwater monitoring network. The proposed monitoring well locations were selected to provide monitoring points along and cross-gradient from the projected centerline of the dissolved-phase petroleum hydrocarbon plume in groundwater in the Sea Level Aquifer.

FIELD METHODS

MONITORING WELL INSTALLATION

The proposed well locations and parcel numbers for the properties where the wells will be located are shown on Figure 3. Borings for the monitoring wells will be advanced using a hollow-stem auger drill rig. The monitoring wells will be installed in accordance with WAC 173-160-400, *Minimum Standards for Construction and Maintenance of Resource Protection Wells and Geotechnical Soil Borings*. The monitoring wells on Parcels R22911-052-1430 and R22911-017-1240 will be constructed using 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) pipe with 10 feet of 0.010-inch slotted PVC well screen and a filter pack consisting of #2/12 or comparable silica sand. The total depth of all four monitoring wells is anticipated to be between 110 and 115 bgs. The monitoring well on Parcel R22911-059-211 will be constructed using 4-inch-diameter Schedule 40 PVC pipe with 0.020-inch slotted PVC well screen and a filter pack consisting of #8/12 silica sand to facilitate the collection of LNAPL, if encountered. During the advancement of the borings, the lithology will be logged in accordance with the Unified Soil Classification System ASTM Standard D2488-06, *Standard Practice for Description and Identification of Soils*. Evidence of potential contamination such as elevated photoionization detector readings, unusual odor, discoloration, or sheen will also be noted. Soil samples will be retained for potential chemical analysis if evidence of petroleum hydrocarbon contamination is observed in soil overlying the Perched Groundwater Zone.

Following the installation, each well will be developed to remove fine-grained materials from the screen and sand pack. Each well will then be purged until the quantity of fine-grained sediment suspended in the extracted water reduces and stabilizes. The development water will be stored in drums on or near the Site along with the drill cuttings and sampling purge water pending receipt and review of laboratory analytical data for disposal characterization.

The completed groundwater monitoring wells and recovery well will be surveyed with a vertical accuracy of plus or minus 0.01 foot to a common datum at the Site. The survey will be made to a point on the north rim of the top of the PVC casing.

GROUNDWATER SAMPLING

Groundwater samples will be collected from the new and existing monitoring wells at the Site using low-flow sampling techniques with a submersible bladder or electric impeller pump. Sampling will occur approximately 2 weeks after the installation of the wells to allow for equilibration of groundwater conditions following the disturbance to the aquifer from the drilling activities. Monitoring well MW-5 has been dry since installation and is not included for sampling and monitoring well MW-7 typically does not contain sufficient water for sampling. Prior to sampling, the depth to groundwater will be measured in each monitoring well using an electronic water level indicator for monitoring wells MW-1 through MW-4 and using an oil/water interface probe for monitoring wells MW-6 through MW-12 and the new monitoring wells. Field measurements for pH, temperature, specific conductivity, dissolved oxygen, and oxidation/reduction potential will be recorded during purging of groundwater, prior to sampling at each monitoring well, using a water quality analyzer equipped with a flow-through cell. Groundwater samples will be collected after the temperature, conductivity, and pH parameters stabilize. Stabilization is determined as a relative percent difference of less than 3 percent for temperature and conductivity between readings for three consecutive measurements and a change of +/- 0.1 pH unit between readings for three consecutive measurements.

Groundwater samples will be analyzed for will be analyzed for GRO and BTEX by Northwest Method NWTPH-Gx and U.S. Environmental Protection Agency (EPA) Method 8021B. The wells will also be sampled once for total petroleum hydrocarbons as diesel-range organics using Northwest Method NWTPH-Dx as requested in the Ecology June 2013 Opinion Letter.

Wastewater generated during the development and purging of the monitoring wells will be stored temporarily in labeled 55-gallon drums either on or near the Site pending receipt of the analytical results for waste profiling. The wastewater and drilling cuttings will be transported for proper disposal off of the Site once the profiling has been completed in accordance with the requirements of the treatment or disposal facility. Farallon is currently evaluating options for locations to store the drummed drilling cuttings and wastewater pending the completion of the waste profiling activities.

REPORTING

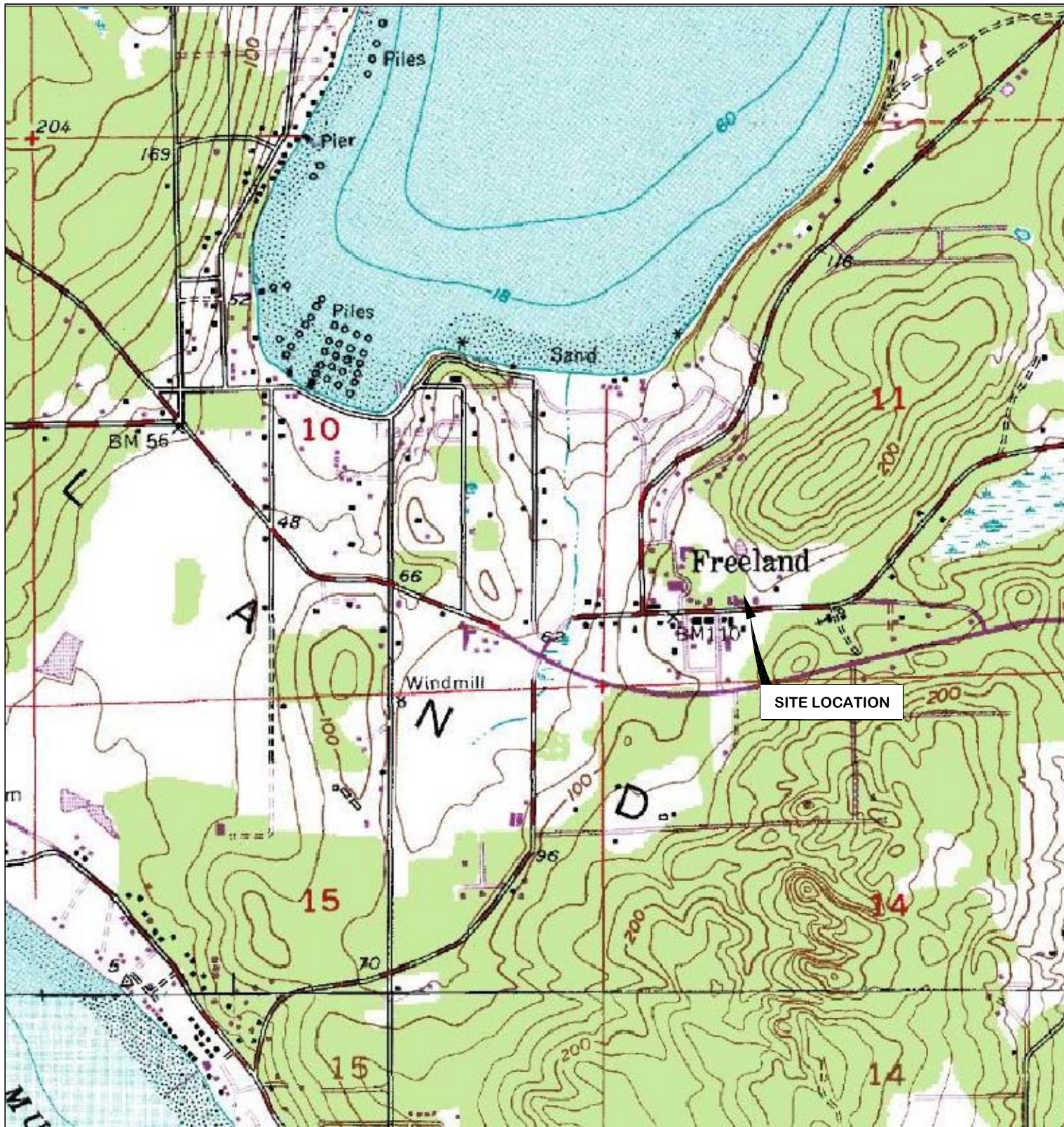
Following the completion of the field activities described herein, a Progress Report will be prepared to summarize the investigation activities and present the analytical results. At a minimum, the report will include the following:

- A summary of the monitoring well installation activities including descriptions of soil conditions and well construction and boring logs;
- A summary of the analytical results and summary tables for soil and groundwater samples collected during the monitoring well installation and sampling activities;
- A summary table of depths to groundwater and groundwater elevations in the new and existing groundwater monitoring wells
- Figures depicting the new and existing monitoring well locations with groundwater elevations and analytical results; and
- Farallon's conclusions pertaining to the Site characterization.

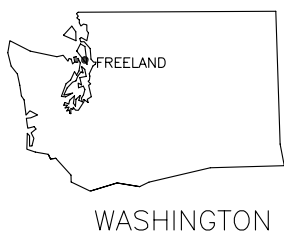
The Progress Report will be submitted to Ecology, the property owners who provided access for the monitoring wells, and other interested parties within 30 days of the completion of quality assurance/quality control review of the analytical and survey data.

Attachments: Figure 1, *Site Vicinity Map*
Figure 2, *Site Plan*
Figure 3, *Aerial Photograph Showing Proposed Monitoring Well Locations*

PG:bw



REFERENCE: 7.5 MINUTE USGS QUADRANGLE FREELAND, WASHINGTON. DATED 1993



FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 1

SITE VICINITY MAP
WHIDBEY MARINE & AUTO SUPPLY
1689 MAIN STREET
FREELAND, WASHINGTON

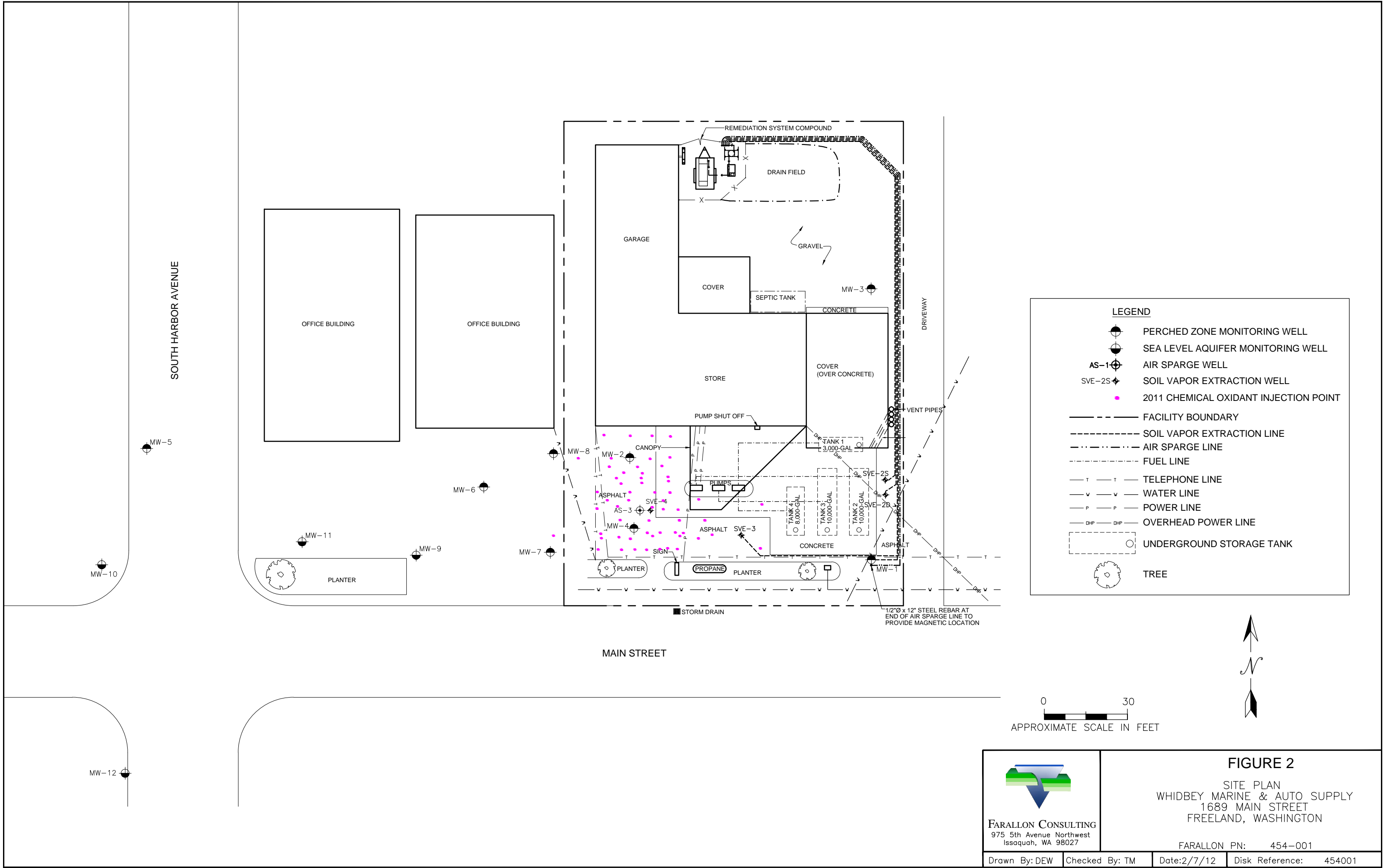
FARALLON PN: 454-001

Drawn By: DEW

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