MEMORANDUM

Project No.: 110207-007-04

May 12, 2017

To:	Andy Kallus, Washington State Department of Ecology
cc:	Cindy Jernigan and Bryan Lust, Kimberly-Clark
From:	Carla Brock, LG and Steve Germiat, LHG
Re:	**RI/FS Work Plan Addendum: Log Pond Area Additional Investigation** Kimberly-Clark Worldwide Site Upland Area RI/FS, Everett, Washington

This Addendum to the Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Kimberly-Clark (K-C) Worldwide Site Upland Area (Aspect, 2013), prepared by Aspect Consulting, LLC (Aspect), proposes additional investigation of the historical Log Pond Area. The additional investigation is being conducted in response to concerns raised by the Washington State Department of Ecology (Ecology) (during an August 16, 2016 meeting to discuss the draft RI/FS) about the historical filling of the Log Pond and the representativeness of RI data collected in this area. Of special concern was information provided by a former Scott Paper employee stating that he had witnessed the placement of construction/demolition debris (originating outside the mill property), debris from the mill, and barrels (drums) within the former Log Pond in the late 1970s. Historical aerial photos show that the Log Pond filling was completed by 1982. The former employee believes that the eastern portion of the Log Pond was where most of this type of filling took place.

The scope of work for the geophysical survey and the proposed additional investigation work are described below. The investigation details are preliminary, and the number and locations of sample locations for the investigation will be developed based on the results of the geophysical survey. The exploration and sampling and analysis work, as well as all quality assurance/quality control and data validation, management, and reporting, will be conducted in accordance with the procedures documented in the Sampling and Analysis Plan (SAP), Appendix A of the RI/FS Work Plan. This includes groundwater sample preparation techniques, including reductive precipitation (EPA Method 1640) as needed (when the conductivity exceeds 1,000 µS/cm) to mitigate salinity interferences for trace metals analysis.

Geophysical Survey

A surface geophysical survey will be conducted across the entirety of the footprint of the Former Log Pond by a geophysical subcontractor, hydroGeophysics Inc.[1] (HGI), to identify and locate subsurface anomalies, focused on evaluating the presence or absence of reportedly buried drums (metallic or plastic), pipe or other preferential pathway voids. Figure 1 depicts the planned extent for the geophysical survey.

The geophysical survey will include an electromagnetic (EM) survey and a complementary magnetic survey. The EM survey is sensitive to ferrous and non-ferrous metal objects, as well as changes in soil moisture content and ground conductivity. The EM method has the capability of mapping changes in soil conductivity that are caused by changes in soil moisture, disruption, or other conductivity changes caused by physical property contrasts, which can identify subsurface anomalies (including plastic industrial containers). The EM survey will be completed using a GEM-2 portable ground conductivity meter, manufactured by Geophex Ltd. A transmitting coil induces an electromagnetic field and a receiving coil at a (usually) fixed separation measures the amplitudes of the in-phase and quadrature components of the electromagnetic field. The recorded electromagnetic field is separable into two sub-components; in-phase and conductivity (also referred to as quadrature). The in-phase component is most sensitive to metallic objects. The conductivity component is sensitive to soil condition variations. The EM survey will use the GEM's multi-frequency capabilities and record three different frequencies, including 5.3, 9.8 and 18.3 kHz. Because of interference from electromagnetic noise, the EM survey will not be completed for that portion of the historical Log Pond area that is currently developed as an electrical substation.

The magnetic method is highly sensitive to ferrous metal objects and tends to have a greater depth of investigation at typical sites when compared to other geophysical methods sensitive to metallic objects. A magnetic survey has the ability, depending on subsurface conditions, to detect a single 55-gallon drum at a burial depth of up to 25 feet. The Log Pond was reportedly about 12 to 14 feet deep in the area where drums were allegedly placed. Space weather reports will be checked before conducting the magnetic survey to detect the possibility for magnetic storm interference, which will be considered before completing the survey. The magnetic survey will be completed using a Geometrics, Inc. G-859 cesium-vapor magnetometer. The total magnetic field is collected, georeferenced, and stored on a field console at up to 5 samples per minute to provide high resolution information. A base station magnetometer will be set up on site to record the diurnal variations for correlation of the roving magnetometer data, which will indicate if the survey has been impacted by the large shifts associated with solar activity. Potential magnetic interference will be minimized by ensuring that the survey crews are devoid of metallic or other objects that could cause interference (such as cell phones, steel-toed boots, etc.) and limiting distance between other crew members during the survey.

The EM and magnetic data will be collected along parallel survey lines, with a spacing of approximately 5 feet across the roughly 600-foot-long survey area (east to west); the tight survey spacing is suitable to locating buried features and subsurface anomalies, and will vary based on site logistics. A grid for the EM data collection will be set up on a local basis by the geophysical

[1] http://www.hgiworld.com/

subcontractor using measuring tapes and survey paint before data acquisition begins, and will be surveyed in using a handheld GPS device. The magnetic data is integrated with a GPS system and measurements of the total magnetic field will be georeferenced automatically. The final spacing and total number of transects will be determined in the field by the geophysical subcontractor. Interferences from metallic infrastructure, such as buried utility lines, rebar in concrete, or other conductive materials, may limit the success of the geophysical survey to identify buried metallic objects. Potential buried metallic objects identified by the magnetic survey will be further investigated through subsurface explorations, as described below.

The EM and magnetic data will be edited to remove bad data followed by data interpretation and/or review by Dr. Nigel Crook, an in-house geophysicist with HGI. HGI will prepare a technical memorandum that briefly discusses details on the methodology, results, interpretation and conclusions of the geophysical survey. The memo will include figures of the interpreted geophysical data, including EM in-phase and conductivity results presented as plan view contour maps. This memo will be provided to Ecology along with Aspect's proposed locations and rationale for subsurface exploration based on the results of the geophysical survey. Based on the results of the EM and magnetic surveys, more detailed geophysical survey methods may be evaluated in consultation with Ecology if warranted to delineate soil conductivity with depth, including but not limited to an electrical resistivity survey. The pros and cons of additional geophysics will be evaluated relative to direct observation via subsurface explorations. Aspect and Ecology will discuss the results and recommendations prior to conducting the subsurface exploration program outlined below.

Subsurface Exploration

This section describes the methodology for subsurface exploration of the Log Pond fill following completion of the geophysical survey described above. Attachment A to this Addendum, prepared after completion of the geophysical survey, presents the proposed locations for subsurface exploration and their rationale based on the results of the geophysical survey and the objectives identified immediately below.

Subsurface exploration will be conducted in the Log Pond footprint to:

1) Investigate subsurface anomalies identified by the geophysical surveys.
2) Evaluate the nature and thickness of Log Pond fill material.
3) Install monitoring wells to evaluate groundwater conditions in the Log Pond fill.

The former Scott Paper employee indicated a Log Pond depth of 12 to 14 feet; however, we infer that referred to water depth, and the water surface was likely 5 to 6 feet below surrounding grade. As a result of post-demolition grading, current surface grade in this location is likely a few feet higher than the former mill grade. We therefore assume that the Log Pond fill may extend to a depth of 20 to 25 feet below current grade.

The subsurface exploration will be conducted using sonic drilling technology. Sonic drilling is generally considered the single best drilling method for obtaining representative cores for geologic logging, and will advance through concrete, steel, or most any other obstruction. Given the depth of exploration and site conditions, rotosonic (sonic) drilling is considered the best technology to employ for subsurface exploration of the Former Log Pond area, with several advantages over test pits. Because the Log Pond fill soils are saturated and quite silty based on available information, the sidewalls of a test pit would need to be sloped to advance to the intended depth, potentially sloped at 1:1, such that a 25-foot-deep test pit may create a 50-foot-diameter opening at the surface with potentially sloughing sidewalls and very limited visibility at the bottom of the pit. In contrast, sonic drilling produces a continuous 6-inch-diameter sampling core, extracted from a fully cased 8-inch borehole. Not only is sonic drilling more likely than test pits to achieve the total depth desired, despite the potential obstructions in fill material, the cores obtained are not compromised by sidewall sloughing and thus will provide soil samples representative of the intervals targeted for evaluation. Sonic drilling will also not require groundwater management, which would be a major effort for large test pits. Furthermore, we expect that that the saturated silty soils excavated could not be compacted if placed as backfill in a large test pit excavation. Therefore, in addition to providing better-quality data for this investigation, sonic drilling will greatly reduce the amount of investigation-derived waste requiring handling, transport, and off-site disposal compared to excavating test pit explorations.

Significant subsurface anomalies identified by the geophysical survey will be investigated through the completion of at least one boring at, or adjacent to, the identified location. Subsurface metallic targets with a significant electromagnetic or magnetic response, which are indicative of drums, will not be drilled into to avoid the potential for release of drum contents if they contained materials when placed. Instead, borings will be advanced within 5 feet west (downgradient) of the anomaly to evaluate subsurface conditions. More borings may be completed around an anomaly, depending on the size and interpretation, as agreed to by Ecology following completion of the geophysical survey and evaluation of the interpreted data. If, for some reason, soil borings are not feasible, test pits may be completed instead.

If materials encountered during subsurface exploration are determined to represent an imminent threat to human health or the environment, K-C and Ecology will discuss the scope and timing for a removal action. Otherwise, the Log Pond fill including debris within it will be evaluated in the draft final Feasibility Study and addressed as warranted during the final cleanup action, based on the soil and groundwater data and associated environmental risks.

Soil Boring

Each soil boring will be advanced to a depth corresponding to approximately 2 feet beneath the fill/native soil contact, as determined at the time of drilling by the field geologist, to observe the entire Log Pond fill thickness. For planning purposes, the total depths of the borings are anticipated to range from 20 to 30 feet bgs. Soil samples will be collected from beneath the crushed material, where present, at each soil boring for potential laboratory analysis. Where field screening identifies odors, soil staining, anthropogenic debris, concentrations of volatile organic vapors above background levels, measured using a calibrated (calibrated in the field daily) photoionization detector (PID), or other indications of potential contaminants in any given soil boring, the potentially contaminated material will be sampled and submitted for laboratory analysis. If there are no field screening indications of potential contaminants, one soil sample will be collected right below the observed water table depth (i.e., fill/saturated zone interface), or at the top of the fill soil if crushed material extends below the water table, and a second sample will be collected at approximately 1 foot below the top of the native soil to ensure that the sample that is collected is representative of native material. The soil cores will be logged and photographed by an Aspect geologist.

The soil samples will be submitted for laboratory analysis of gasoline-range total petroleum hydrocarbons (TPH-Gx), diesel- plus oil-range total petroleum hydrocarbons (TPH D+O) with silica gel cleanup, semivolatile organic compounds (SVOCs) with low-level polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), priority pollutant metals, and polychlorinated biphenyl (PCB) Aroclors. PCB congener analysis (using EPA Method 1668 for the 209 congeners) will be performed on three soil samples with the highest total PCB Aroclor concentrations. If PCB Aroclors are not detected in soil, PCB congener analyses will not be conducted. If boiler ash is observed in the borings, a soil sample collected of that material will be submitted for laboratory analysis of dioxins/furans.

Investigation-derived waste (IDW) from these investigation activities, including soil cuttings and decontamination wash water, will be contained pending the results of the laboratory analysis. The laboratory data will be used to profile the IDW for transport and off-site disposal.

Monitoring Well Installation

Regardless of the outcome of the geophysical survey, up to four new monitoring wells will be installed to further evaluate groundwater quality within the Log Pond Area. The new wells will be installed following completion of the geophysical survey and the soil boring activities using direct push drilling technology. The number and location of these new monitoring wells will be proposed based on the results the geophysical survey and soil boring activities. Soil samples will be collected and analyzed from the new well borings if field screening indicates potential contamination, or if the well borings are positioned intentionally to collect soil quality data in addition to groundwater quality data, based on the information collected during the soil borings. The latter determination will be made when well locations are proposed, following completion of the soil borings described above. The soil cores will be logged and photographed by an Aspect geologist.

New monitoring wells will be constructed either with a well screen set to correspond to a potential source, indicated by a buried metallic object identified during the geophysical survey and confirmed via field screening results, or a 5-foot well screen with the base of the well set at the fill/native soil contact, as interpreted from soil classification conducted during drilling, to characterize groundwater quality at the bottom of the Former Log Pond.

Groundwater Sampling and Analysis

Following installation and development of the new monitoring wells, groundwater samples will be collected from those, as well as existing monitoring wells located within the Log Pond footprint, including LP-MW-1, and shoreline wells LP-MW-2, MW-6, and REC6-MW-2 (Figure 1). The groundwater samples collected from the eight wells will be submitted for laboratory analysis of TPH-Gx, TPH D+O with silica gel, SVOCs with low-level PAHs, VOCs, dissolved priority pollutant metals, PCB congeners (using EPA Method 1668 for the 209 congeners), ammonia, and sulfide.

In addition, a snapshot round of water level measurements will be collected from the wells within the Log Pond footprint and wells TM-MW-6, UST29-MW-101, UST29-MW-102, UST29-MW-

103, HBV-MW-101, HB-MW-1R, GF-MW-4, GF-MW-3, GF-MW-2, SHB-MW-101, and SHB-MW-102 located outside the perimeter of the Log Pond, to provide supplemental water level data for purposes of remedial alternative development and evaluation in the Feasibility Study.

Slug Testing to Estimate Hydraulic Conductivity of Log Pond Fill

Because tidal response was not observed in Log Pond shoreline wells, no hydraulic conductivity estimates specific to the Log Pond fill are available (see Section 2.4.4.2.3 of draft RI/FS). Therefore, as a final step to this investigation, slug tests will be performed to estimate the hydraulic conductivity of the Log Pond fill. Based on the collective Log Pond fill soil descriptions, and observed water level response during monitoring well development and purging, up to five wells within the Log Pond fill will be slug tested to represent a range of fill material types/permeabilities.

A slug test can consist of a “slug-in” or falling head test, where the water level in the well is rapidly raised and declines back to equilibrium, and a “slug-out” or rising head test, where the water level in the well is rapidly lowered and rises back to equilibrium. An electric well sounder will be used to determine the depth from the top of the casing to the water table. The static depth to water measurement will be compared to the well construction log to determine if the well screen and filter pack is fully saturated. Rising and falling head tests will be performed in wells where the screen section and filter pack is fully saturated. Only rising head tests will be conducted in wells with partially saturated screens.

Slug tests will be performed using a decontaminated solid PVC slug rod to displace the water level in the well. A pressure transducer and data logger will be used to measure and record displacement and recovery of the water level over time. For a falling head test, the slug rod will be rapidly lowered into the well and the water level allowed to re-equilibrate. For a rising head test, the slug rod will be removed from the well and the water level allowed to re-equilibrate. The slug test data will be analyzed to estimate hydraulic conductivity using the Bouwer and Rice Method for unconfined aquifers.

Reporting

Once validated (Level 2b per the SAP), the results of the investigation work in the Long Pond area will be provided to Ecology in a summary email and then reported as part of the draft final Upland Area RI/FS. The new analytical data will also be uploaded to Ecology’s Environmental Information Management (EIM) system.

References

Aspect Consulting, 2013, Work Plan for Remedial Investigation/Feasibility Study, Kimberly-Clark Worldwide Site Upland Area, Everett, Washington, November 22, 2013, Final.

Attachments

Figure 1 – Proposed Log Pond Area Additional Investigation

Attachment A – Proposed Subsurface Exploration Plan Based on Geophysical Results

Attachment A

Proposed Subsurface Exploration Plan Based on Geophysical Results

This attachment to the RI/FS Work Plan Addendum for Log Pond Area Additional Investigation (Addendum) presents the scope of work for additional subsurface exploration – trenching and soil borings - based on the results of the geophysical survey performed by HGI Inc. and documented in their Geophysical Site Clearance Investigation report (HGI, 2017), which was transmitted to Ecology on May 10, 2017. As outlined in the Addendum, subsurface exploration will be conducted to meet three specific objectives, and meet the requirements of MTCA to adequately characterize the site for developing and evaluating cleanup action alternatives (WAC 173-340-350). We propose the following scope of work for meeting the three stated objectives in the Addendum. Proposed trench and soil boring locations are overlain on the collective geophysical results on the attached Figure A-1. Monitoring well locations will be determined after completion of the trenching and soil borings.

In summary, HGI (2017) identified one primary geophysical anomaly within the footprint of the former log pond. This geophysical anomaly, identified in the HGI report as Anomaly (D), is in the south-central portion of the former log pond. The combined geophysical signature of this anomaly, based on electromagnetic (EM) and magnetometer data (Figure A-1), suggests that it contains ferrous iron and is likely located within the upper 10 to 15 feet. This anomaly appears to have the same length, width, and location as the former chip reclaim conveyor, and may represent the foundation for the conveyor. It is also the area where log pond filling started, from the south to north, which is shown in attached Photograph 1 taken in 1979. A historical design drawing of the chip reclaim conveyor foundation indicates that it was 66 feet long, and its metal-containing concrete foundation, which, if still present, would produce the geophysical response indicated in the survey results. However, the strong metallic response and dipolar magnetic anomaly could also indicate multiple metallic objects. Therefore, this anomaly warrants further investigation as described below.

The geophysical survey did not identify other magnetic anomalies within the log pond fill, away from the structures along the perimeter of the former log pond.

Outside of Anomaly D, the geophysical survey did not identify significant variability in electrical conductivity of the log pond fill material. Slight shallow subsurface conductivity variations are identified in the HGI report as anomalies (E) (labeled on Figure A-1). These areas have only slightly higher conductivity values than the background values observed across the rest of the former log pond area and do not have corresponding electromagnetic in-phase or metallic responses. According to HGI (2017), these combined results indicate that the response is likely due to small variation in soil type or slightly higher moisture content of soils very near to the surface. Nevertheless, these anomalies warrant further investigation to confirm subsurface conditions as described below.

Investigate identified geophysical anomalies and nature/thickness of fill material in the log pond

Two shallow trenches (LP-T-1 and LP-T-2; Figure A-1) will be excavated perpendicular to the length of anomaly D to confirm the presence or absence of the former chip reclaim conveyor foundation. If present, the foundation structure should be encountered in the upper few feet of fill material, beneath the 3- to 4-foot surface layer of crushed material (CM), therefore trenching is appropriate. If the foundation is encountered without visual or olfactory indications of contamination, we propose that no sampling would be completed for that location. If the geophysical anomaly is observed to be something other than a foundation, and that could be a potential source of contaminants to soil or groundwater, soil samples will be collected from the trenches for laboratory analysis of the analyte list outlined in the draft Addendum.

In addition, eight borings will be advanced by rotosonic methods through the fill material to the top of the native soil to both investigate geophysical anomalies and evaluate the nature and thickness of fill material. The proposed borings are as follows (Figure A-1):

- LP-B-1 will be completed on the northern edge of Anomaly D irrespective of presence or absence of the conveyor foundation encountered during trenching.

- LP-B-2, LP-B-3, LP-B-4, and LP-B-5 will be completed where the greatest electrical conductivity contrasts are identified within HGI anomaly areas (E), indicating the highest potential for non-soil materials.

- LP-B-6 will be completed within a conductivity anomaly area in the northeast corner of the log pond.

- LP-B-7 will be completed within the geophysical anomaly (conductivity and magnetic) located adjacent to the log pond bulkhead on the northern edge of the log pond.

- LP-B-8 will be completed within a conductivity anomaly along the north edge of the log pond.

Each of the borings will be advanced to the base of the log pond fill material/top of the native soil as interpreted in the field to observe the nature of fill material present. Soil sampling and analysis will be conducted in each boring in accordance with the approach outlined in the Addendum. If these explorations encounter materials representing contaminant sources, then additional targeted exploration would be conducted.

Evaluate groundwater conditions in the former log pond fill material

As identified in the Addendum, additional characterization of groundwater quality and hydraulic conductivity within the log pond fill will be conducted after completion of the trenching and soil boring explorations described above. Aspect will consult with Ecology regarding proposed locations of the monitoring wells.

References for Attachment A

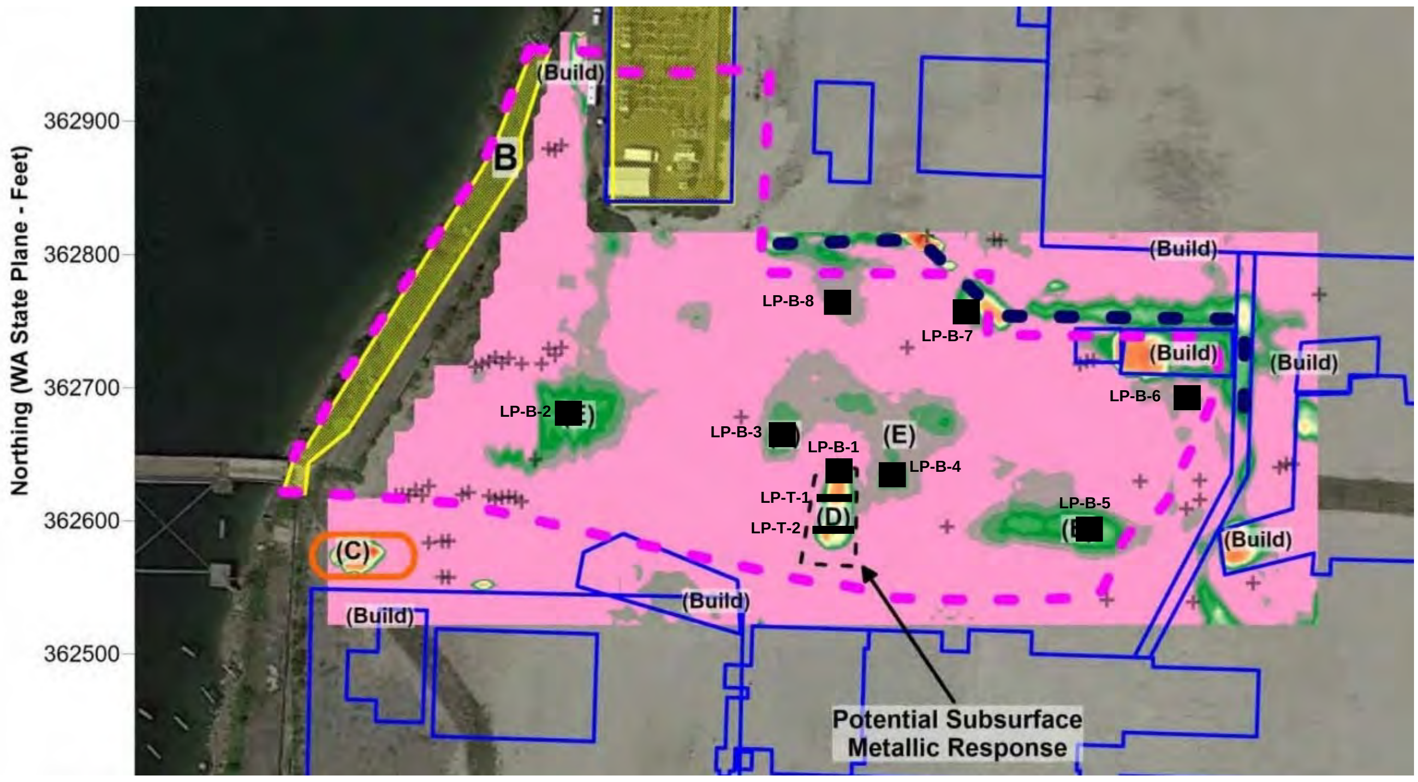
Hydrogeophysics Inc. (HGI), 2017, Geophysical Site Clearance Investigation – Kimberly Clark Worldwide Site Upland Area, Everett, WA, April 2017.

Photograph 1. Initial filling of Log Pond, viewed from the north (ca. 1979). The initial wedge of fill visible is also where geophysical anomaly (D) is located (refer to Attachment A text).

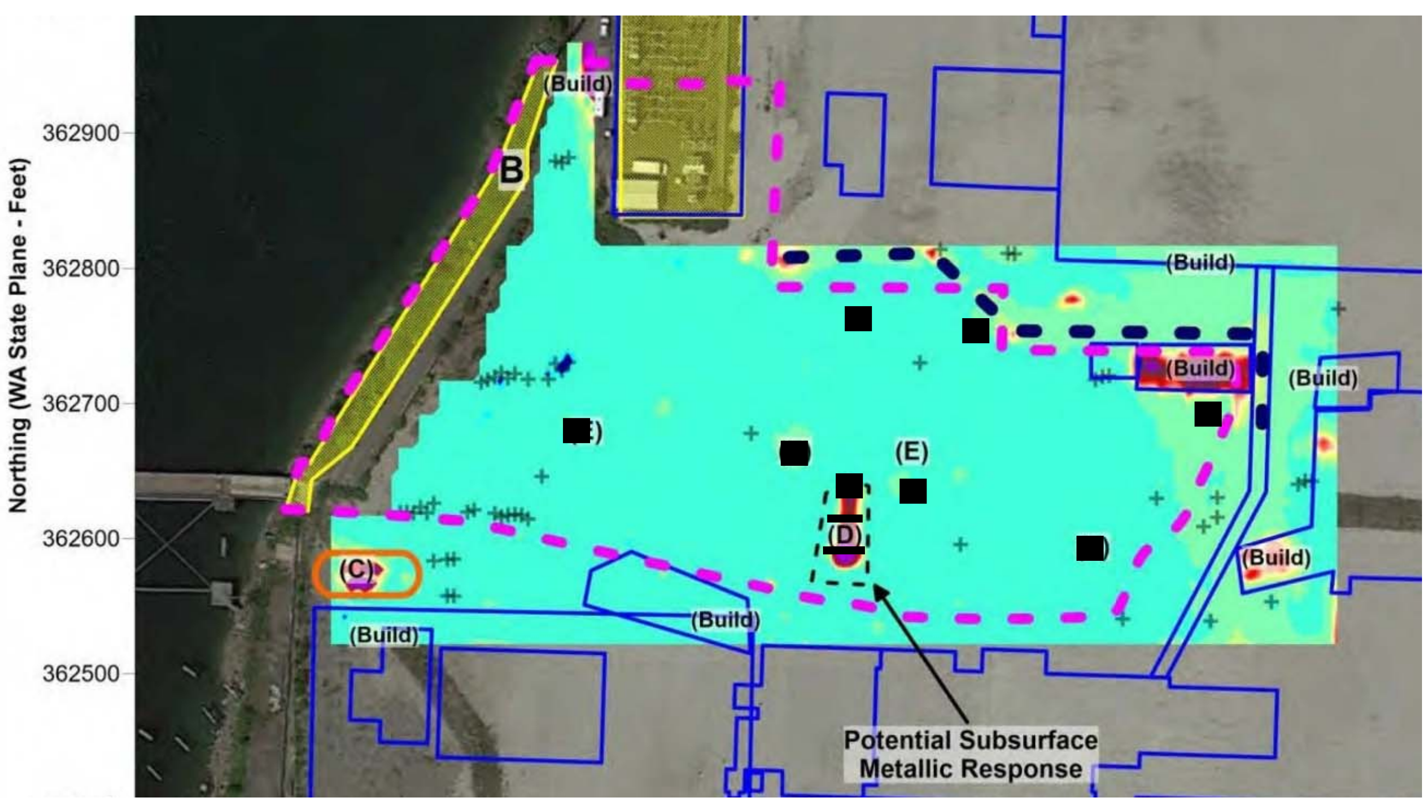
Figure A-1 - Proposed Subsurface Explorations Overlain on Geophysical Results

■ Proposed Boring ▬ Proposed Trench

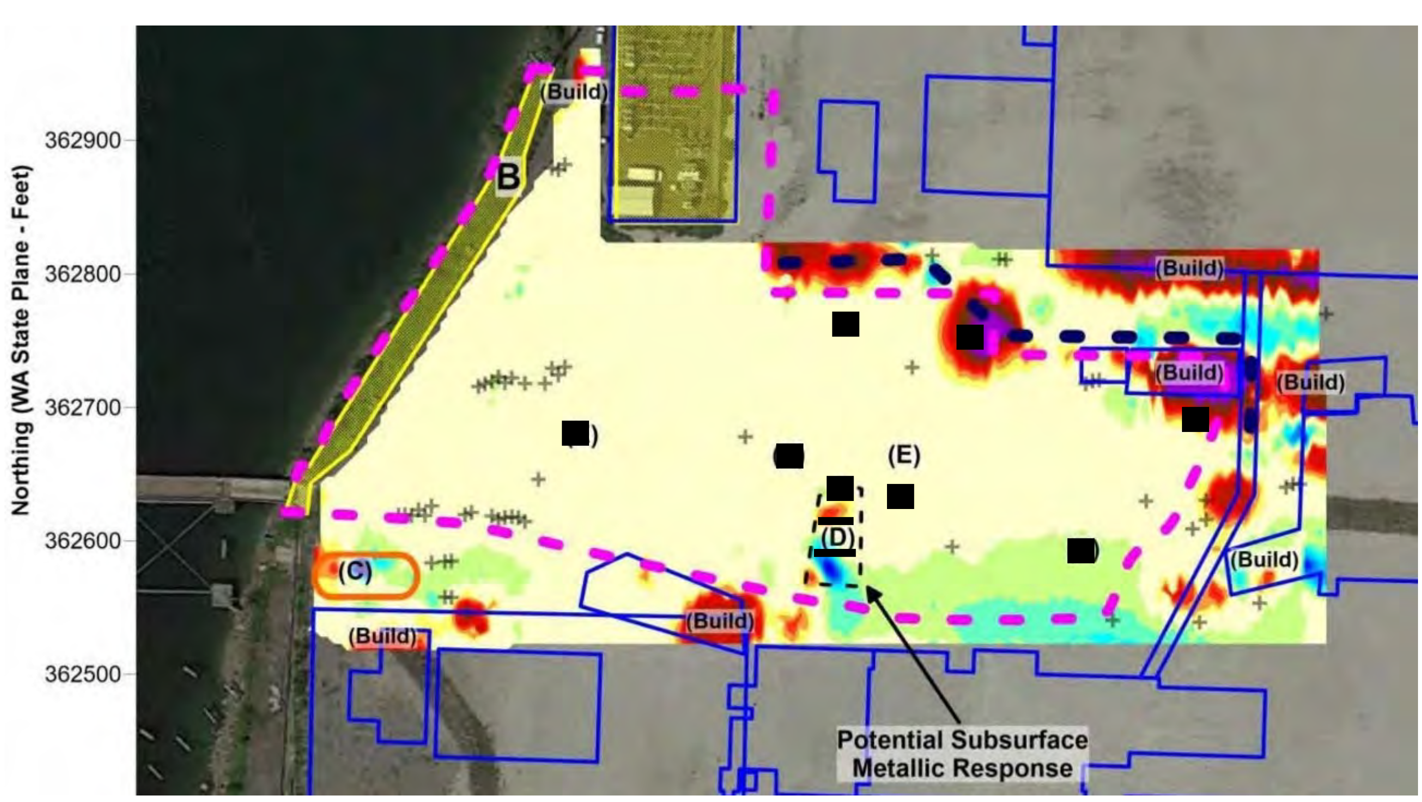
Electromagnetic Conductivity Results (cropped from Figure 10 of HGI, 2017)



Electromagnetic In-Phase Results (cropped from Figure 11 of HGI, 2017)



Magnetometer Results (cropped from Figure 12 of HGI, 2017)



Refer to HGI (2017) for additional discussion of these geophysical results.