MOTT MACDONALD

Sunnyside Municipal Airport Pesticide Spray Shed

Revised Focused Feasibility Study
Sunnyside, Washington

June 2025

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SIGNATURE

This report, and Mott MacDonald's work contributing to this report, were reviewed by the undersigned and approved for release.

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Licensed Geologist
Washington State Geologist No. 413

Executive summary

Pacific Groundwater Group (now part of Mott MacDonald) is pleased to submit this Focused Feasibility Study to the Washington Department of Ecology. This Focused Feasibility Study presents five remedial alternatives to address pesticide and nitrate impacts at the Sunnyside Municipal Airport Pesticide Spray Shed site in Sunnyside, Washington. Historic spray operator use is believed to have resulted in releases of pesticides resulting in soil and groundwater concentrations above state cleanup levels. Nitrate concentrations in groundwater are also above background at the site but appear to be at background concentrations at the downgradient property boundary. The extent of contamination above cleanup and background levels is limited to the Sunnyside Municipal Airport property based on existing data.

Remediation at the site is required by the Model Toxics Control Act (MTCA) to reduce risk to human health and the environment. The routes of potential exposure are direct contact with contaminated soil, and offsite migration to groundwater receptors. The screening of remedial technologies for pesticide contamination finds that no individual cleanup technology is likely to be completely effective at the site. This is due to the diversity of chemical characteristics of the site contaminants, access limitations presented by buildings over contaminated areas, logistical challenges presented by excavating below the water table, and low hydraulic conductivity of the silty sand at the water table. Therefore, the considered remedial alternatives incorporate combinations of technologies to achieve remediation goals. The five remedial alternatives and estimated planning-level costs are:

- Alternative 1: Excavation with Groundwater Treatment ($1.8 million)
- Alternative 2: Targeted Excavation with Groundwater Treatment ($1.3 million)
- Alternative 3: Containment with Groundwater Monitoring ($0.7 million)
- Alternative 4: Containment with Groundwater nZVI Treatment ($1.2 million)
- Alternative 5: Targeted Excavation with Containment ($1.3 million)

All of the alternatives leave some contaminant mass in place that will likely require 60 to 90 years to naturally decrease to cleanup levels. Therefore, all alternatives include long-term compliance groundwater monitoring to track changes in groundwater concentrations and to confirm that the site remains protective of potential downgradient receptors.

Alternative 3 is the preferred remedial action based on the relative costs and environmental benefits, as evaluated through the MTCA disproportionate cost analysis process. Alternative 3 includes limited excavation of impacted soils concurrent with installation of an asphalt cap over contamination that would be left in place. Natural degradation of remaining contaminants may take on the order of 90 years, during which time groundwater monitoring would be required. With Ecology concurrence, Alternative 3 will be further developed in the draft Cleanup Action Plan (dCAP).

1 Introduction

The Sunnyside Municipal Airport serves the City of Sunnyside and surrounding agricultural areas and is located on the eastern edge of the city (Figures 1 and 2). It is owned by the City of Sunnyside. Portions of the airport have been used since the 1940s for crop duster operations including tank filling and aircraft spray down. Ecology confirmed the presence of pesticide-impacted soil in 2010 near a former pesticide storage shed. Pacific Groundwater Group conducted a Remedial Investigation for the City of Sunnyside, which was accepted by Ecology on December 8, 2014 (PGG, 2014; Ecology, 2014).

The primary objective of the Focused Feasibility Study (FFS) is to describe remedial alternatives to address contamination at the site and select a preferred remedial alternative consistent with the Model Toxics Control Act (MTCA). The remedial alternatives are described and compared in Sections 3 through 6 with Cost Estimates provided as Appendix A. Pending Ecology concurrence, the preferred alternative will form the basis for development of a Cleanup Action Plan and remedial action.

The City presents this draft FFS in accordance with Agreed Order DE 9746, as amended effective September 1, 2015.

This work was performed, our findings obtained, and this report prepared, using generally accepted environmental practices used at this time and in this vicinity, for exclusive application to this study, and for the exclusive use of the City of Sunnyside. This in lieu of other warranties, express or implied.

1.1 General Facility Information

Site Name:	Sunnyside Municipal Airport Pesticide Spray Shed
Site Address:	3318 Edison Road, Sunnyside, WA 98944
Parcel Number:	23102924003
Facility/Site ID:	20367
Cleanup Site ID:	11423
Agreed Order Number:	DE 9746

2 Site Background

Sunnyside Municipal Airport has been active since at least the 1940s. The airport was originally a dirt strip with later paving of the runway and taxiways. The site is currently used for civilian aviation including support for crop dusting operations and operation of other small aircraft. The site is level and is not paved beyond the edges of the asphalt taxiway.

A remedial investigation (RI) was conducted at the site in response to a citizen report to Ecology and subsequent confirmation of pesticide impacts at the site. The RI delineated an area of impacted soil and groundwater at and around a former pesticide spray shed and aircraft spray down area (PGG, 2014). Anecdotal reports also indicate that there may be buried debris at the site including pesticide storage cans and other metal debris. What are likely pesticide cans were observed during excavation at the site in 2010 and were left in-place. A geophysical survey of the site conducted during the RI is consistent with the presence of pockets of buried metal. Supplemental groundwater sampling conducted in 2015 to confirm groundwater pesticide concentrations also discovered elevated nitrate concentrations in groundwater above background levels (Section 2.1).

Constituents of concern and the nature and extent of soil and groundwater contamination are summarized in Tables 1 through 3 and Figure 3.

2.1 Supplemental Data Collection

Additional monitoring and investigation were conducted after the RI, including:

- A supplemental groundwater monitoring event was conducted on August 26, 2015 at groundwater monitoring wells SMW-1, SMW-2, and SMW-3 to supplement data on groundwater pesticide and herbicide concentrations. A non-petroleum odor was noted during sampling at SMW-3 and nitrate (an added analyte) was detected above expected background and above the screening level (10 mg/L) based on the maximum contaminant limit.
- A supplemental nitrate investigation was conducted in December 2015 including installation of monitoring well SMW-4 at the southern property boundary. Direct push groundwater sampling was also used to investigate the extent of elevated nitrate in groundwater and background concentrations. Sampling and analytical details are included in the September and December 2015 monthly progress reports (PGG 2015, 2016a, 2016b).
- An additional upgradient direct-push groundwater sample was collected in the sand and gravel unit on August 25, 2016.
- Four test pits were excavated on August 25, 2016 at the locations of geophysical anomalies identified during the RI. The purpose of the test pits was to determine if the geophysical anomalies were related to buried pesticide containers.
- The first quarter of the interim groundwater monitoring was conducted on April 12, 2017 (PGG, 2017).

The supplemental investigations confirmed pesticide and herbicide concentrations above screening levels at the water table in SMW-1, SMW-2, and SMW-3 and at concentrations consistent with the RI findings. Analytical results at SMW-4, which is completed in the deeper sand and gravel unit, included a single detection above screening levels. This suggests that groundwater impacts do not extend beyond the southern property boundary, consistent with the conceptual model in the RI.

Nitrate was not included as a constituent of concern in the RI and thus the supplemental investigations are used to update site characterization for this FFS. Nitrate concentrations range from 3.3 to 190 mg/L at the site, with the highest concentrations detected at SMW-3. Groundwater nitrate concentrations are regionally elevated and background at the site appears to be somewhat variable between 10 and 20 mg/L (PGG, 2016). The extent of nitrate groundwater impacts appears to be centered near what is now the location of the metal building and extends west of the pesticide extent of contamination. Groundwater samples collected at the southern property boundary at the water table in the silt unit and in the deeper sand and gravel unit were at background concentrations. Nitrate is added to the site constituents of concern based on the results of the supplemental investigations.

The August 2016 groundwater sample collected in the sand and gravel unit was below reporting limits for all constituents of concern except nitrate. Nitrate was detected at 35 mg/L, which is similar to other upgradient groundwater samples and within an expected range for regional background. The groundwater sample provides an upgradient bound on the extent of groundwater impacts.

The August 2016 test pitting did not find evidence of pesticide containers. Buried metallic debris was identified at each of the locations. The buried debris appeared to be household items that had been partially burned and buried. The two eastern test pits exposed foundation footings from historic structures.

In addition, a round of monitoring well sampling is scheduled for the week of April 14, 2025. This and future monitoring will specify that laboratories achieve reporting limits at or below screening levels, however analytical methods and sample matrix interferences may not allow on a case-by-case basis and these elevated reporting limits will be discussed. Upon receipt of the analytical data, a data quality review will be performed, and the data will be reported to Ecology with tables and maps.

2.2 Constituents of Concern

The RI and supplemental data collection confirmed the presence of impacts to soil and groundwater. Constituents of concern (COCs) at the site are constituents that exceeded the screening levels in soil or groundwater, and include:

- Organochlorine Pesticides
- Organophosphorous Pesticides
- Chlorinated Herbicides
- Nitrate

Table 1 summarizes soil and groundwater exceedances for individual constituents. Tables 2 and 3 summarize soil and groundwater results and screening levels. Screening levels in the RI that were below the practical quantitation limit (PQL) have been revised to the PQL (PGG, 2014)(provided in Appendix B of this document). This adjustment to PQLs is consistent with Washington Administrative Code (WAC) 173-340-720(7)(c) and does not alter the estimated extent of contamination. Constituent-specific maximum exceedance ratios and average values in Table 1 include non-detect values at half the reporting limit.

2.3 Extent of Contamination

The extents of contamination in soil and groundwater were investigated in the Remedial Investigation and updated following the December 2015 supplemental investigation (PGG, 2014; 2015). Figure 3 shows the revised extent of contamination in soil and groundwater. Key features of the extent of contamination include:

- Shallow soil (less than 5 feet) contamination is concentrated in former use areas, as inferred from historic air photos (PGG, 2014). Pesticide impacts below 5 feet primarily occur at the location of the former pesticide spray shed. An additional, smaller area is also present in the southwest corner of the site.
- Pesticide groundwater impacts near the water table appear to be similar in extent to the soil impacts. In the deeper sand and gravel unit, limited impacts above the screening levels were observed at location SP-32, and all pesticides were below screening levels at SMW-4 except nitrate and dinoseb, which is at the south (downgradient) property boundary. Nitrate measured at SMW-4 is significantly lower than other monitoring wells and is likely associated with agricultural sources outside the Site. Dinoseb observed in SMW-4 warrants additional monitoring to assess trends and possibly the installation of a new groundwater monitoring well if trends show increasing concentrations. The proposed 2025 sampling event will provide additional information regarding dinoseb and other contaminant concentrations.
- Based on groundwater and soil sampling events from 2015 to 2018, there was no clear trend of degradation within that short timeframe. Conditions are such that there should be degradation occurring for a number of Site contaminants; the proposed 2025 sampling will provide additional information. Overall, pesticide impacts do not appear to extend beyond the southern property boundary at the water table or in the deeper sand and gravel unit. The nitrate extent of contamination is mapped (Figure 3) as concentrations above background (15 mg/L). The extent of exceedance near the water table is similar to the pesticide extent but extends further to the west. Groundwater nitrate concentrations do not appear to exceed background at the southern property boundary.

2.4 Fate and Transport

The fate and transport of contaminants is discussed in the RI (PGG, 2014) and is summarized and updated here where relevant to the evaluation of remedial alternatives. There is substantial variability in sorption, solubility, and biodegradation rates among constituents detected at the Site. Partitioning coefficients (K_{oc}) provided in the Remedial Investigation imply retardation factors (R) span three orders of magnitude.

The fate and transport of pesticides and herbicides are chemical-specific and based on the chemical properties of each pesticide or herbicide. These fate and transport characteristics are a hybrid of the soil and chemical properties. The shallow silt unit is part of the glacial outburst flood slackwater deposits (Touchet Beds). These soil units are well characterized for both research and agricultural purposes and literature values are sufficient for the requested information (i.e. Chan, 2003).

Table 4 is a table of partitioning coefficients from the Cleanup Levels and Risk Calculation (CLARC) database. To provide further information, in the event of the installation of a new groundwater monitoring well, soil samples will be collected from the boring to analyze for characteristics such as soil surface area, cation exchange capacity, bulk density, porosity, and soil organic matter to further refine chemical fate and transport properties.

The measurement of Site-specific soil properties is informative, however empirical (monitoring) evidence of degradation is the most compelling data to indicate degradation and describe the fate and transport for this site. The planned April 2025 groundwater sampling will provide additional information regarding trends in contaminant degradation.

2.5 Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements (ARARs) are state and federal regulations that apply to the site and may influence selection and implementation of remedial actions. The MTCA (Chapter 70.105D Revised Code of Washington [RCW]) requires that cleanup actions comply with applicable state and federal laws (WAC 173-340-360(2)a(iii)), which include legally applicable requirements, as well as requirements that the department determines are relevant and appropriate. ARARs for cleanup actions often include various construction-related permits, air emission requirements, offsite disposal requirements, and other issues related to impacts in and around the site. Specific regulations applicable to the site include:

- Model Toxics Control Act (MTCA)(WAC 173-340), which authorizes Ecology to adopt cleanup standards for groundwater and soil where hazardous substances are present
- Washington Hazardous Waste Management Act (Chapter 70.105 RCW; Chapter 173 303 WAC)
- General Occupational Health Standards (Chapter 296-62 WAC)
- Safety Standards for Construction Work (Chapter 296-155 WAC)
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC)
- Underground Injection Control Program (Chapter 173-218 WAC)
- The State Environmental Policy Act (SEPA) (RCW 43.21C; WAC 197-11)
- Toxic Substances Control Act (15 United States Code [USC] §2601 et seq. 40 CFR 761.61)
- The federal Clean Water Act (33 USC Section 1251)
- Federal Aviation Administration (FAA) Airport Compliance Program (FAA Order 5190.6A)
- Construction and/or site use permits from City of Sunnyside and Yakima County

2.5.1 Terrestrial Ecological Evaluation

Terrestrial ecological evaluations (TEE) are conducted to determine if contamination at a site presents risk to plants or animals that may inhabit or occupy the site. A TEE was conducted as part of the RI Work Plan (PGG, 2013) and is revisited here based on data collected during the RI and Ecology comments on the draft Feasibility Study (Ecology, 2017). The Site does not qualify for an exclusion under the simplified TEE evaluation due to the acreage of the adjacent agricultural parcel, which is classified as undeveloped land. However, no additional TEE is required under WAC 173-340-7491(1)(b) because the anticipated remedial action prevents contact with contamination. The relevant portions of MTCA are:

(1) Criteria for determining that no further evaluation is required. No further evaluation is required if the department determines that a site meets any of the criteria in (a) through (d) of this subsection:

And:

(1)(b) All soil contaminated with hazardous substances is, or will be, covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. To qualify for this exclusion, an institutional control shall be required by the department under WAC 173-340-440. An exclusion based on planned future

land use shall include a completion date for such future development that is acceptable to the department;

As discussed in Section 6, the anticipated remedial alternative includes a physical barrier and institutional controls that will prevent plants or wildlife from coming into contact with contaminated soil.

2.5.2 Environmental Justice

When identifying cleanup actions for this alternative, the threats posted by the site to human health and the environment, including likely vulnerable populations and overburdened communities was taken into account per WAC 173-340-351 and WAC 173-340-360.

3 Screening of Remedial Alternatives

This section describes the remedial action objectives and applicable remedial technologies. Remedial alternatives are described and ranked for feasibility in Sections 4 and 5.

The remedial action objectives (RAOs) identified for the site are:

- RAO-1: Prevent or limit risks from direct human contact with impacted soil or groundwater
- RAO-2: Prevent offsite migration of contaminants
- RAO-3: Protect environmental receptors, which are primarily burrowing animals and bioaccumulation in predators that would consume them

These RAOs can be achieved through a combination of remedial technologies, monitoring, and institutional controls.

3.1 Applicability of Remedial Technologies

This section describes the general function and applicability of remedial technologies at the site. The remedial alternatives in Section 4 include combinations of these remedial technologies to achieve remedial action objectives.

3.1.1 Excavation

Excavation is a commonly-implemented method for remediation of impacted soil. Impacted soil is excavated and disposed of at an appropriate offsite disposal facility. The excavation is then backfilled with clean fill material. The disposal facility is selected based on the concentrations present in the impacted soil, transport logistics, and cost. Hazardous waste classification would occur if soil samples tested using the U.S Environmental Protection Agency (US EPA) Toxicity Characteristic Leaching Procedure (TCLP) exceed criteria defined in CFR 40 §261.21 Table 1, or criteria defined by waste disposal sites.

Offsite disposal of soil classified as hazardous waste would require disposal at a hazardous waste facility (e.g. Subtitle C landfill), which would incur additional expense relative to disposal at an approved Subtitle D landfill. The closest Subtitle D landfill that accepts pesticide contaminated soil is the Roosevelt Regional Landfill in Klickitat County. The closest Subtitle C landfill is located in Arlington, Oregon. Yakima County does not accept pesticide contaminated soils at local landfills.

Roosevelt Regional Landfill, located approximately 60 miles from the site, accepts pesticide contaminated soil below set criteria based on TCLP and dry soil concentrations. Approximately 10% of soil samples from the site exceed the dry soil criteria for toxaphene (10 mg/kg) and would not be accepted at the Roosevelt Regional Landfill. Additional soil volume may be classified as hazardous waste based on TCLP results and would also not be accepted at Roosevelt. The Waste Management facility in Arlington, Oregon includes both Subtitle D and Subtitle C landfills and can accept soil that is classified as hazardous waste. Neither the Waste Management nor the Roosevelt facilities accept soils with free liquid present (i.e., no saturated soils).

TCLP analyses have not been conducted at the site but would be conducted as part of the Cleanup Action Plan (CAP) to support excavation and disposal remedial design. Partitioning calculations based on maximum observed soil concentrations suggest that a portion of the soil would require disposal at a Subtitle C facility.

Excavation is most applicable above the water table. Excavation below the water table is unlikely to be feasible due to dewatering requirements prior to loading and offsite transport.

3.1.2 Institutional Controls

Institutional controls are applicable to both soil and groundwater. Institutional controls for soil would include deed restrictions restricting excavation at the site to prevent direct-contact and/or ingestion of impacted soils. Institutional controls would be coupled with other remedial options to prevent contact with impacted soils near the ground surface that could be exposed through incidental site use. Institutional controls for groundwater would prohibit the installation of groundwater wells within the site (parcel #23129-23404) and neighboring parcel to the south (parcel #231029-24002) other than those installed for monitoring purposes. Institutional controls would likely specify a surveyed area within the property rather than encumber the much larger entire airport property. Institutional controls for groundwater will also include a depth limitation and apply only to the near-surface aquifer (to 76 feet below ground surface [bgs]) and the next deeper aquifer (to 106 feet bgs) because deeper aquifers below the first two regional confining layers are unlikely to be affected. MTCA requires that tenants be informed of the institutional controls and that control elements be incorporated into applicable lease or rental agreements.

Institutional controls are likely to be a component of the selected remedy at this site due to the inferred presence of impacted soil beneath onsite structures.

3.1.3 Capping

Capping is the installation and maintenance of a physical barrier between contaminated soil and the surface. This barrier prevents direct contact and can also be designed to reduce leaching of contamination from vadose zone soils. Capping will also control dust at the site, which could otherwise migrate offsite.

Capping design elements applicable at this site include: placement of a layer of clean fill; geotextile barriers to reduce infiltration and as a visual indicator of the contact with impacted soils; and asphalt or concrete paving as a physical barrier to prevent contact and reduce infiltration. The use of paved surfaces for containment typically includes a maintenance and inspection program to ensure continued function as a physical barrier.

3.1.4 Nanoscale Zero-Valent Iron

Nanoscale zero-valent iron (nZVI) is used to catalyze in-situ chemical degradation. nZVI has demonstrated ability to degrade nitrate, pesticides, and herbicides. nZVI is mixed with aquifer materials or emplaced as a permeable reactive barrier. The nZVI reduces contaminant concentrations by inducing reductive dechlorination (Cook, 2009; Thompson and Bezbaruah, 2008). Bench-scale studies of nZVI effectiveness indicate substantial variability in effectiveness ranging from rapid degradation to little or no degradation depending on the target pesticide compound. nZVI is unlikely to be effective for all COCs at the site. Effectiveness is also controlled by ability to bring contaminants into contact with nZVI particles, which would be challenging in the study area due to the silty aquifer materials and low groundwater flow velocities. Implementation of nZVI should be coupled with bench-scale testing to assess actual contaminant reduction ability.

nZVI is available in several commercial formulations, some of which are coupled with carrier solutions that enhance biodegradation (Section 3.1.7).

3.1.5 In-Situ Chemical Oxidation

In situ-chemical oxidation (ISCO) has variable effectiveness in reducing pesticide concentrations depending on the selected oxidant, application method, and specific pesticide being oxidized. ISCO will not be effective in reducing nitrate concentrations. ISCO typically requires multiple applications to achieve target concentration reductions. Of the available oxidizers, ozone, potassium/sodium permanganate and sodium persulfate[1] have a strong enough oxidizing potential to reduce pesticide concentrations, with ozone being the strongest oxidizer of the three. The low permeability of the site favors slower-reacting oxidants to allow time to bring the oxidant into contact with contaminated soil and groundwater.

- Ozone is applied by sparging gas through injection wells and is active in the subsurface for minutes to hours. Ozone is not a feasible option at this site due to the low permeability of the site and rapid reaction rate.
- Potassium or sodium permanganate is applied as liquid to injection wells or infiltration galleries. The solutions have a density similar to sea water and will typically sink rather than move horizontally with groundwater flow. Given the vertical gradients at the site, the density of the permanganate is a benefit because it would encourage vertical transport into/through the contaminated zone.
- Persulfate is applied as a liquid with or without a catalyst, which is typically either an iron filing, or an alkaline solution to raise pH to the 8-12 range. Persulfate could be useful for injection in areas with buried metal containers. However, because the conditions in the areas with buried metal containers are unknown, the reactions may or may not be adequately controlled and excess heat and reaction gasses (CO2 and water vapor) may be generated. Excess gas production could cause health and safety issues during injection. Persulfox is a proprietary compound that utilizes persulfate chemistry.
- RegenOx is a commonly used oxidant and, in principle, should be able to degrade pesticide and herbicide compounds in groundwater. However, because RegenOx has not been thoroughly studied for effectiveness with a broad range of pesticides, and the possibility that degradation could produce recalcitrant (persistent) compounds, the current Regenesis policy is that RegenOx is not recommended at pesticide sites. Therefore, while it is likely to be effective at degrading some site contaminants, the overall effectiveness is not well understood at present.

With proper design, ISCO has the potential to reduce pesticide and herbicide concentrations in soil and groundwater. However, due to the low permeability of the sandy silts at the site, bringing oxidants into full contact with contaminants is likely to be challenging and it is unlikely that cleanup levels could be achieved through the full soil and groundwater volume through ISCO alone. A realistic expectation for chemical oxidation is a reduction in most, but not all, constituents and that some constituents would remain above cleanup levels within the treatment zone. The technology is most likely to be useful when used as an intermediate step to reduce pesticide and herbicide concentrations followed by institutional controls and long-term monitoring.

An additional concern is that the toxicity of reaction byproducts is not well understood. The toxicity and specific chemical pathways are still being researched (Chiron, 2000). Subsequent toxicological research may demonstrate risk associated with the toxicology or fate and transport behavior of the reaction products. These technical concerns reduce confidence in the technical and regulatory implementability of an ISCO remedy at the site. Bench testing prior to design would improve understanding of the effectiveness of reductions in pesticide and herbicide

[1] Hydrogen peroxide is not listed because of health and safety concerns.

concentrations but would not address concerns related to reaction byproducts. Based on the technical difficultly of implementing ISCO at the site and potential for adverse secondary chemical effects, ISCO is not a preferred technology for the site and is not included in remedial alternatives.

3.1.6 Natural Attenuation

Natural attenuation (NA) includes a range of processes that reduce contaminant concentrations in the subsurface including advection, dispersion, and chemical and biologic degradation processes. The presence of 1,4-DDE indicates that DDT is degrading, suggesting that biodegradation of at least some COCs is occurring at the site. Typical literature degradation half-lives[2] for DDT and toxaphene in soil and groundwater of 10 to 15 years in soil under aerobic conditions and significantly faster under anaerobic conditions with half-lives on the order of 1 to 2 months are reported in the literature (EPA, 2005; FAO, 2000). A parcel of soil impacted with contaminants with an exceedance ratio of 10 and a 10-year half-life would take 30 to 40 years to reach cleanup levels; a 15-year half-life would extend that to 45 to 60 years. Assuming similar decay rates, the final cleanup time will be limited by the time required for the highest exceedance ratio to reach cleanup levels. Detected exceedance ratios at the site are as high as 275 in groundwater and 462 in soil (RI Table 3; PGG, 2014). Assuming a 10-year degradation half-life yields an estimated natural attenuation time of 80 to 90 years. In practice, degradation rate is likely to vary between constituents with some constituents decreasing to cleanup levels over shorter time periods.

NA processes in conjunction with the low mobility of the constituents appear to be currently protective of groundwater receptors downgradient of the airport property but alone are unlikely to achieve cleanup levels in hotspot areas in less than 50 to 100 years. NA is likely to be necessary after completion of any more aggressive action, because the aggressive actions are unlikely to result in complete removal or destruction of contamination sources, particularly in the silty sand unit. Although formal NA is not listed as an element of the alternatives, NA processes should be considered a part of each during compliance monitoring.

3.1.7 Enhanced Biodegradation

This technology reduces pesticide and herbicide concentrations by enhancing naturally occurring metabolic pathways. Naturally occurring bacteria in the subsurface metabolize and degrade pesticides and herbicides. These metabolic degradation pathways vary by specific compound, but are often rate-limited by electron-donor compounds required to complete the reactions. These reactions are enhanced by adding electron donor compounds to the subsurface to “feed” the naturally occurring bacterial populations and accelerate degradation of the target compounds. Examples of electron donor compounds include vegetable oil, molasses, and proprietary compounds such as Daramend and 3-D Microemulsion. Some compounds function best under specific oxidizing or reducing conditions. For example, optimal application of Daramend includes cycling between oxygen-rich and oxygen-poor reaction cycles through tilling or mixing of the soil. Compounds that function best under reducing conditions typically only require application and monitoring to check progress. Given the technical difficulty of aerating the saturated zone at this site, compounds that require intensive soil mixing are not recommended.

[2] Degradation half-lives are the time required for degradation mechanisms to reduce constituent concentrations by 50%. Microbes biodegrading contaminants are often empirically observed to follow a first-order (half-life) decay trend.

3.1.8 Soil Mixing and Amendment

This technology uses rotary mixing bits to amend soils above and below the water table with remediation compounds. All soils are left in place. Soil mixing amendments can be selected to either stabilize and immobilize compounds through mixing of bentonite, or cement into the subsurface, or distribute reactive compounds that will degrade or immobilize contaminants in place.

At the Sunnyside site, targeted excavations to remove or confirm the absence of buried metal debris would be required prior to implementation; larger pieces of metal could interfere with mixing operations. Specialty auger equipment would be required to reach the vertical extent of contamination at the site. Implementation would require either working around or removing existing structures and paved surfaces.

Soil mixing would nominally be conducted to 20 to 35 feet below ground surface at this site to reach the lower extent of groundwater impacts within the silt unit. Stabilization implementation would include adding a bentonite or bentonite grout amendment to reduce the hydraulic conductivity of the soil mass. Chemical treatment implementation would focus on amendment with nZVI and/or anaerobic biodegradation enhancers. Some sites implementing chemical degradation require multiple rounds of soil mixing to be effective. The primary benefit of immobilization is prevention of offsite migration along the groundwater pathway. However, because the site is currently protective, the technology offers little risk reduction. Soil mixing is significantly less cost effective than injection for application of chemical agents on a per-yard basis. Because homogeneous mixing is not a critical design requirement for the considered chemical alternatives, injection is preferred over soil mixing in development of remedial alternatives.

3.1.9 Groundwater Pump and Treat

Pump and treat systems extract groundwater from a network of wells, process the water to reduce contaminant concentrations to below cleanup levels and then either reinject the water to the aquifer or otherwise dispose of the groundwater. These systems can be designed to provide hydraulic control of groundwater to prevent offsite migration of contaminants. System effectiveness is a function of contaminant solubility and partitioning coefficients, and the ability to effectively flush groundwater through the target aquifer volume.

Water treatment would likely include either granular activated carbon filtration, or degradation in a reaction vessel by chemical oxidation to address pesticide and herbicide contamination. Nitrate could then be addressed through ion exchange or another commercial water treatment technology.

Pump and treat is not recommended for application at this site. The low permeability of the sandy silt aquifer would significantly limit extraction, and there are limited water disposal options; there is no sewer in the area. The high sorption coefficients of the pesticides and herbicides would likely result in extended treatment times. The primary application would be as a contingency measure to achieve hydraulic control of offsite migration, which has not occurred.

4 Remedial Alternatives

This section describes five remedial alternatives for the site incorporating selected remedial technologies described in Section 3.1. The alternatives are:

- Alternative 1: Excavation with Groundwater Treatment
- Alternative 2: Targeted Excavation with Groundwater Treatment
- Alternative 3: Containment with Groundwater Monitoring
- Alternative 4: Containment with Groundwater nZVI Treatment
- Alternative 5: Targeted Excavation with Containment

Alternative implementation including a brief description of the logistics, fulfillment of RAOs, alternative-specific data gaps, schedule, and estimated cost are discussed below and summarized in Table 5. Planning-level cost estimate details are included in Appendix A. Alternative schematic layouts are included in Figures 4 through 8. A disproportionate cost analysis is included in Table 6 and Section 6.

4.1 Common Assumptions

This section describes considerations and assumptions that are common to multiple remedial alternatives.

4.1.1 Excavation

All of the alternatives include excavation either as a primary contaminant mass removal technology or to facilitate construction of an asphalt cap. The primary intent of these actions is to reduce the direct contact and ingestion pathways from contaminated soil early in the remediation process and significantly improve the overall site protectiveness.

Excavation may require location, and possibly temporary removal and replacement of buried infrastructure including existing monitoring wells, power supply to existing buildings, and an east-west oriented City water supply line located near the north edge of the gravel access road. This may result in local service interruptions. A survey benchmark adjacent to SMW-1 will also have to be maintained or replaced at the conclusion of excavation.

Approximately 25% of excavated soils are expected to classify as hazardous waste, requiring special disposal. Soils with concentrations below hazardous waste criteria would be disposed of off-site at a Subtitle D landfill. Soils above hazardous waste criteria would be disposed of at the Columbia Ridge Subtitle C landfill in Arlington, Oregon. Soils would be transported to the landfills in trucks with covers to provide dust control. Hazardous waste designation is based on toxicity characteristic leaching protocol (TCLP) testing results and comparison to state criteria listed in WAC 173-303-090.

Excavation is likely to encounter metallic debris in areas with geophysical anomalies as identified in the RI and subsequent test pit explorations (Figure 3, and PGG, 2014). This material may include empty pesticide containers, building fragments, or other metal debris. If pesticide containers are encountered, they would either be stockpiled separately for separate disposal or included with excavated soils after communication with the disposal facility.

4.1.2 Groundwater Monitoring

All remedial alternatives assume a 60- or 90-year groundwater monitoring period that would be terminated when monitoring data indicate achievement of cleanup levels[3]. Groundwater monitoring would follow a schedule including:

- Quarterly: 1 year
- Semi-Annual: 3 years
- Annual: 2 years
- Biennial: to 1 year from completion of monitoring
- Quarterly compliance monitoring in final year

Groundwater monitoring would conclude when 4 consecutive monitoring events are below applicable cleanup levels, and it is assumed that the final year of monitoring will be conducted on a quarterly basis. It is expected that some constituents may be recalcitrant requiring longer monitoring times even for the more aggressive remedies. 60 years of monitoring is assumed for costing of Alternatives 1, 2 and 4. For Alternative 3 and 5, monitoring is costed assuming 90 years. While it is possible that groundwater objectives will be achieved in a shorter period of time, the longer timeframe is adopted to remain conservative for costing purposes given the uncertainty in degradation times for inaccessible contaminant mass. A conditional point of compliance for groundwater may be established in the Cleanup Action Plan as a part of the compliance monitoring program.

Groundwater cost estimates are calculated using the US EPA net present value (NPV) approach (EPA, 2000). The NPV calculation estimates how much money would need to be set aside in current day dollars to pay for a future cost. This allows estimation of the cost of a long-term, recurring expense in current dollars for more realistic comparison of alternatives with different cleanup times and cost distributions. The NPV calculation assumes that the money has a rate of return at a discount rate published by the Federal Office of Management and Budget. NPV calculations assume a 2.5% discount rate. NPV calculation discounts liabilities far in the future because less money needs to be set aside for an event far in the future than one in the near future.

4.1.3 Institutional Controls

Institutional controls are a component of all remedial alternatives. These institutional controls will include restrictions on groundwater use, construction or excavation activity, and notification requirements for the site. Institutional controls would be attached to the site title documents and filed with the County and City, as appropriate. Because of the large size of the airport property relative to the site, the institutional controls would be established for the entire airport parcel (#23129-23404) and for the adjoining parcel to the south (#231029-24002). Site restrictions include:

- Groundwater within shallow and deep aquifers above the first and second confining layers would be restricted to installation of monitoring wells only. The first confining layer is at approximately 35 feet bgs and the second at approximately 75 feet bgs in the log for a nearby water supply well[4].

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[3] See Section 5.2.1 for a comparison to the MTCA requirement for a reasonable timeframe.

[4] See well tag ID AAR996 at: https://appswr.ecology.wa.gov/WellConstruction/Map/WCLSWebMap/TextSearch.aspx

- Excavation and construction would require environmental review and may include oversight. The intent is to prevent construction workers from contacting impacted soil, and to manage and verify that excavated soil is properly handled and disposed of.
- Lease and other rental agreements would be amended to include the institutional controls and notify tenants of the site conditions.

Specifics of the institutional controls would be further developed after the CAP has been completed. Institutional controls would likely be implemented after the primary construction phase of the selected alternative has been completed.

4.2 Alternative 1: Excavation with Groundwater Treatment

This alternative consists of excavation and disposal of all accessible vadose zone soils exceeding screening levels coupled with in-situ groundwater pesticide mass reduction via enhanced biodegradation (Figure 4). Institutional controls would be implemented for inaccessible soils beneath existing structures or infrastructure.

Soil excavation would include removal of approximately 4,200 cubic yards of soil (6,300 tons), of which approximately 25% is expected to classify as hazardous waste. Soils with concentrations below hazardous waste criteria would be disposed of off-site at a Subtitle D landfill, likely either the Waste Management Columbia Ridge facility or Roosevelt Regional Landfill. Soils above hazardous waste criteria would be disposed of at the Subtitle C portion of the Columbia Ridge landfill in Arlington, Oregon. Soils would be transported to the landfills in lined trucks with covers to provide dust control. Existing pavement in aircraft areas would be replaced after conclusion of excavation and backfill activities.

Groundwater treatment would include 3 annual injections of 3-D Microemulsion, Daramend, or another equivalent enhanced biodegradation compound. Costing assumes application of 3-D Microemulsion by direct push (Appendix A). The initial treatment area is a 25,000 square foot area with injections between 9 and 24 feet bgs (to 15 feet below the water table). The depth and extent of subsequent injections are assumed to be the same for all three events but may be reduced or adjusted for area and/or depth based on groundwater monitoring results.

Long-term groundwater monitoring would monitor compliance with RAOs. Institutional controls would be put in place for soil and groundwater remaining above cleanup levels. Institutional controls would restrict the use of groundwater at the site, and would place restrictions on excavation, which could impact future construction, as discussed in Section 3.1.2.

4.2.1 Comparison to Remedial Action Objectives

This alternative would meet RAOs 1 and 2.

4.2.2 Estimated Cost and Schedule

Excavation and backfilling would take 2 months assuming 10-15 truckloads per day and 5-day work weeks. Groundwater enhanced bioremediation injections would be completed within 18 months of the conclusion of excavation with an additional 6-month waiting period prior to the beginning of groundwater monitoring. Groundwater concentration reduction to cleanup levels is estimated at 20 to 40 years assuming enhanced degradation rates two to four times as fast as literature biodegradation half-lives. Residual hot spots are likely to remain, and groundwater monitoring is therefore assumed to continue for 60 years.

The estimated cost for Alternative 1 is $1,847,000. Cost details are included in Appendix A Table A1. This cost estimate does not include removal of existing structures and source material below those structures.

4.2.3 Alternative-Specific Data Gaps

Alternative-specific data gaps include waste characterization profiling for soil disposal and treatability study for groundwater enhanced biodegradation.

Soil profiling includes collection of representative soil samples for TCLP testing. The TCLP results will be compared to state hazardous and dangerous waste criteria to determine which soils are disposed at Subtitle D (solid waste) and Subtitle C (hazardous waste) landfills. Approximately 25% of the excavated soils (those from hotspot areas) are expected to test as hazardous waste requiring disposal at a Subtitle C landfill. Waste profiling is a required component of offsite disposal.

Enhanced biodegradation treatability testing compares the effectiveness of treatment compounds on impacted soils from the site. The tests are conducted by collecting a homogenized composite soil sample from impacted areas of the site, combining with candidate treatment compounds, 3-D Microemulsion and Daramend, and comparing the resulting changes in constituent concentrations for effectiveness. This data is used to select or disregard candidate biodegradation compounds.

4.3 Alternative 2: Targeted Excavation with Groundwater Treatment

This alternative includes excavation and disposal of soils that exceed screening levels, within 3 feet of ground surface, coupled with in-situ groundwater treatment (Figure 5). Excavation to 3 feet provides separation between the ground surface and impacted soils reducing the risk of direct contact and removing contaminant mass from the site to an engineered disposal facility. The total excavated volume is expected to be approximately 3,100 cubic yards of soil (4,600 tons), of which approximately 25% is assumed to classify as hazardous waste. Groundwater treatment by enhanced biodegradation would reduce groundwater cleanup times and reduce offsite migration risk.

Groundwater treatment would include 3 annual injections of 3-D Microemulsion, Daramend, or another equivalent enhanced biodegradation compound. Costing assumes application of 3-D Microemulsion. The initial treatment area is a 25,000 square foot area with injections between 9 and 24 feet bgs (to 15 feet below the water table). The depth and extent of subsequent injections are assumed to be the same for all three events but may be reduced or adjusted for area and/or depth based on groundwater monitoring results. The institutional controls impact future redevelopment and new construction at the site. Any construction within that area would have to either not extend below 3 ft bgs or address contaminated soils encountered below that depth during construction and would include review for compatibility with ongoing remediation. Injections conducted after installation of the containment layer would include a specification for asphalt repair and borehole sealing across the geotextile barrier.

Long-term groundwater monitoring would monitor compliance with RAOs. Institutional controls would be put in place for soil and groundwater remaining above cleanup levels. Institutional controls would restrict the use of groundwater at the site, and would place restrictions on excavation, which could impact future construction.

4.3.1 Comparison to Remedial Action Objectives

This alternative would meet RAOs 1, 2, and 3.

4.3.2 Estimated Cost and Schedule

Direct push groundwater injections would take approximately 1 month to complete and would precede excavation. Subsequent annual injection events would be conducted after excavation and paving. Excavation and backfilling is expected to take approximately 2 months. Groundwater monitoring is assumed to continue for approximately 60 years, similar to the remediation time assumptions for Alternative 1.

The estimated cost for Alternative 2 is $1,337,000. Details are included in Appendix A Table A2.

4.3.3 Alternative-Specific Data Gaps

Alternative-specific data gaps include waste characterization profiling for soil disposal and treatability study for groundwater enhanced biodegradation, similar to Alternative 1.

4.4 Alternative 3: Containment with Groundwater Monitoring

This alternative uses a containment remedy to prevent direct contact with contaminated soils and reduce infiltration. Long-term groundwater monitoring is used to confirm site groundwater protectiveness (Figure 6). Groundwater sampling in both the silt unit and sand and gravel unit indicate that current groundwater concentrations are below screening levels for pesticides and herbicides and at or below background concentrations for nitrate at the property boundary (PGG, 2016).

The containment remedy would consist of an asphalt slab over the impacted soil area and repair of damaged pavement within the existing paved aircraft tarmac. The asphalt would provide a physical barrier preventing contact with impacted soils and would require concurrent institutional controls to address potential future site redevelopment/construction or other excavation work. The asphalt cap would also provide a low permeability barrier to reduce infiltration and leaching of contaminants in the vadose zone. Installation of the asphalt cap would include excavation of 1 foot of soil to provide room to install 1 foot of base fill material to support the asphalt layer. Contaminated soil would be disposed of at an appropriate facility following the same screening as described for Alternative 1. For costing purposes, 25% of the excavated soil is assumed to require Subtitle C disposal.

Long-term groundwater monitoring would monitor compliance with RAOs. Institutional controls would be put in place for soil and groundwater remaining above cleanup levels. Institutional controls would restrict the use of groundwater at the site, and would place restrictions on excavation, which could impact future construction.

An operation and maintenance plan (OMP) would be implemented for inspection and maintenance of the containment layer. OMPs for this type of containment typically include annual inspection of the paved surface for cracks greater than 1/8-inch or other obvious damage, and for vegetation growing in the containment surface with repair within 60 or 90 days of observation. Sites using engineered containment systems may also be required to demonstrate financial assurance for maintenance of engineered control elements. Site tenants would also be required to be notified of site restrictions associated with the remedy and have the remedy incorporated into lease agreements (Ecology, 2007).

4.4.1 Comparison to Remedial Action Objectives

This alternative would meet RAOs 1, 2 and 3. The asphalt cap would prevent direct contact with impacted soils and prevent offsite transport of soils. Offsite migration of impacted groundwater would be addressed through groundwater monitoring.

4.4.2 Estimated Cost and Schedule

Paving and pavement repair would take approximately 1 month to implement assuming 2 weeks for excavation, and 2 weeks for backfill and pavement installation/repair work. Groundwater monitoring is assumed to occur for 90 years.

The estimated cost for Alternative 3 is $674,000. Details are included in Appendix A Table A3.

4.4.3 Alternative-Specific Data Gaps

Profiling of excavated materials as described in Alternative 1 would be required.

4.5 Alternative 4: Containment with Groundwater nZVI Treatment

This alternative uses a containment remedy to prevent direct contact with contaminated soils and reduce infiltration, coupled with injection of nZVI to prevent offsite migration of contaminants in groundwater (Figure 7).

The containment remedy would consist of an asphalt slab over the impacted soil area and repair of damaged pavement within the existing paved aircraft tarmac. The asphalt would provide a physical barrier preventing contact with impacted soils and would require concurrent institutional controls to address potential future site redevelopment/construction or other excavation work. The asphalt cap would also provide a low impermeability barrier to reduce infiltration and leaching of contaminants in the vadose zone. Installation of the asphalt cap would include excavation of 1 foot of soil to provide room to install 1 foot of base fill material to support the asphalt layer. Contaminated soil would be disposed of at an appropriate facility following the same screening as described for Alternative 1. For costing purposes, 25% of the excavated soil is assumed to require Subtitle C disposal.

Groundwater treatment would include injection of nZVI along the downgradient edge of the site and immediately downgradient of soil hotspots at the former spray shed and reported buried debris. The injections would form a permeable reactive barrier zone intended to reduce concentrations of pesticides, herbicides and nitrate in groundwater. The nZVI treatment barriers shown in Figure 7 include approximately 1,780 cubic yards of aquifer assuming a 10-foot thickness. nZVI would degrade mobile pesticides and herbicides and reduce nitrate concentrations through denitrification. The objective would not be to reduce overall site groundwater concentrations but to improve the groundwater pathway protectiveness of the containment remedy.

Long-term groundwater monitoring would monitor compliance with RAOs. Institutional controls would be put in place for soil and groundwater remaining above cleanup levels. Institutional controls would restrict the use of groundwater at the site, and would place restrictions on excavation, which could impact future construction.

4.5.1 Comparison to Remedial Action Objectives

This alternative would meet RAOs 1, 2, and 3. The asphalt cap would prevent direct contact with impacted soils and prevent offsite transport of soils. Offsite migration of impacted groundwater would be addressed through groundwater treatment and monitoring.

4.5.2 Estimated Cost and Schedule

Groundwater treatment injections would occur in 1 mobilization taking approximately 3 weeks. Paving and pavement repair would take approximately 1 month and would occur after the first groundwater injections were complete. Groundwater monitoring is assumed to occur for 60 years.

The estimated cost for Alternative 4 is $1,217,000. Details are included in Appendix A Table A4.

4.5.3 Alternative-Specific Data Gaps

Alternative-specific data gaps include treatability study bench testing for groundwater contaminant reduction. This information would be incorporated into the final remedial design.

4.6 Alternative 5: Targeted Excavation with Containment

This alternative consists of excavation and disposal of soil that exceeds screening levels within 3 feet of ground surface coupled with a containment remedy to prevent direct contact with contaminated soils and reduce infiltration (Figure 8). Excavation to 3 feet provides separation between the ground surface and impacted soils reducing the risk of direct contact and removing contaminant mass from the site to an engineered disposal facility. Groundwater sampling in both the silt unit and sand and gravel unit indicate that current groundwater concentrations are below screening levels for pesticides and herbicides and at or below background concentrations for nitrate at the property boundary (PGG, 2016).

Soil excavation would include removal of approximately 3,100 cubic yards of soil (4,600 tons), of which approximately 25% is expected to classify as hazardous waste. Soils with concentrations below hazardous waste criteria would be disposed of off-site at a Subtitle D landfill, likely either the Waste Management Columbia Ridge facility or Roosevelt Regional Landfill. Soils above hazardous waste criteria would be disposed of at the Subtitle C portion of the Columbia Ridge landfill in Arlington, Oregon. Soils would be transported to the landfills in lined trucks with covers to provide dust control. Existing pavement in aircraft areas would be replaced after conclusion of excavation and backfill activities.

The containment remedy would consist of an asphalt slab over the impacted soil area and repair of damaged pavement within the existing paved aircraft tarmac. The asphalt would provide a physical barrier preventing contact with impacted soils and would require concurrent institutional controls to address potential future site redevelopment/construction or other excavation work. The asphalt cap would also provide a low permeability barrier to reduce infiltration and leaching of contaminants in the vadose zone. Installation of the asphalt cap would include 1 foot of base fill material to support the asphalt layer. Contaminated soil would be disposed of at an appropriate facility following the same screening as described for Alternative 1. For costing purposes, 25% of the excavated soil is assumed to require Subtitle C disposal.

Long-term groundwater monitoring would monitor compliance with RAOs. Institutional controls would be put in place for soil and groundwater remaining above cleanup levels. Institutional controls would restrict the use of groundwater at the site, and would place restrictions on excavation, which could impact future construction, as discussed in Section 3.1.2.

An operation and maintenance plan (OMP) would be implemented for inspection and maintenance of the containment layer. OMPs for this type of containment typically include annual inspection of the paved surface for cracks greater than 1/8-inch or other obvious damage, and for vegetation growing in the containment surface with repair within 60 or 90 days of observation. Sites using engineered containment systems may also be required to demonstrate financial assurance for maintenance of engineered control elements. Site tenants would also be required to be notified of site restrictions associated with the remedy and have the remedy incorporated into lease agreements (Ecology, 2007).

4.6.1 Comparison to Remedial Action Objectives

This alternative would meet RAOs 1, 2, and 3. The asphalt cap would prevent direct contact with impacted soils and prevent offsite transport of soils. Offsite migration of impacted groundwater would be addressed through groundwater monitoring.

4.6.2 Estimated Cost and Schedule

Excavation and backfilling would take 2 months assuming 10-15 truckloads per day and 5-day work weeks. Paving and pavement repair would take approximately 1 month and would occur after the excavation and backfilling is complete. Groundwater monitoring is assumed to occur for 90 years.

The estimated cost for Alternative 5 is $1,324,000. Cost details are included in Appendix A Table A5. This cost estimate does not include removal of existing structures and source material below those structures.

4.6.3 Alternative-Specific Data Gaps

Profiling of excavated materials as described in Alternative 1 would be required.

4.7 Contingency

The CAP will include contingency actions to be implemented in the event that remediation objectives are not met. Contingency actions may include supplemental groundwater treatment to mitigate offsite migration, installation of filtration or other water treatment at downgradient wells, or modification/repair of the asphalt cap, as applicable.

5 Evaluation of Alternatives

MTCA requires that cleanup alternatives be compared to criteria to evaluate the adequacy of achieving the intent of the regulations and as a basis for comparing their relative merits. The evaluation of each cleanup alternative against the MTCA criteria specified in WAC 173-340-360 is presented in the following sections. Consistent with MTCA, the cleanup alternatives were evaluated with respect to threshold requirements (Section 5.1) and other MTCA Criteria (Section 5.2). All remedial alternatives discussed in Section 4 are viable alternatives under MTCA. Each alternative achieves the applicable RAOs and meets MTCA threshold requirements.

5.1 Threshold Requirements

Under MTCA, a cleanup alternative must meet the following threshold requirements (WAC 173-340-360(2)(a)):

- Protect human health and the environment
- Comply with cleanup standards
- Comply with applicable state and federal laws
- Provide for compliance monitoring

Compliance with the threshold requirements under MTCA is presumed to be protective of human health and the environment once the cleanup standards are met for all affected media. Also, any cleanup action performed in accordance with the requirements of MTCA is assumed to be in compliance with cleanup standards and applicable state and federal laws. The following sections identify how each cleanup alternative complies with the threshold requirements.

5.1.1 Protect Human Health and the Environment

The proposed alternatives protect human health and the environment through containment and institutional controls during the remedial action, contaminant reduction, and groundwater compliance monitoring.

5.1.2 Comply with Cleanup Standards

Alternatives 1 through 4 all comply with MTCA cleanup standards through the various cleanup technologies employed, and achievement of the applicable remedial action objectives. All of the proposed alternatives will leave some contamination in place at the standard points of compliance for soil and groundwater in areas that are inaccessible or technically impractical to achieve cleanup levels. These areas are addressed through the use of institutional controls and compliance groundwater monitoring.

5.1.3 Comply with State and Federal Laws

Alternatives comply with state and federal laws through compliance with identified ARARs and compliance with MTCA regulations (Section 2.4).

5.1.4 Provide for Compliance Monitoring

Compliance monitoring requirements (WAC 173-340-410(1)) include: protection monitoring during construction, operation, and maintenance of the cleanup action; performance monitoring to confirm progress of the cleanup action; and confirmation monitoring to confirm the cleanup action has been attained and the long-term effectiveness of the cleanup action.

All of the alternatives include compliance monitoring.

5.2 Other MTCA Requirements

MTCA requires consideration of additional criteria for alternatives meeting the threshold requirements. The additional requirements include:

- Require that remediation be completed in a reasonable restoration timeframe
- Use permanent solutions to the extent practicable
- Consider public concerns

These additional MTCA criteria are discussed below.

5.2.1 Requirement for a Reasonable Restoration Timeframe

MTCA identifies a number of factors to be considered when establishing a reasonable restoration timeframe. A cleanup action is considered to have achieved restoration once cleanup standards have been met. The basis for considering if timeframes are reasonable is summarized in the bullets below:

- *Potential risks to human health and the environment*: The site currently presents a risk to human health and environment. The primary risk pathway is contact with impacted soils. There are no known impacted domestic wells. All remedial alternatives quickly reduce the potential for direct contact and prevent use of impacted groundwater through institutional controls during the remediation. Reduction of groundwater concentrations to below cleanup levels is variable between the alternatives, but generally slow because of the need to rely on NA processes to reduce concentration of inaccessible contaminant source mass.
- *Availability of alternative water supplies*: All onsite water is provided by a municipal supply owned and operated by the City of Sunnyside.
- *Current use of the site, surrounding areas, and associated resources that are, or may be, affected by releases from the site*: Current use of the site is not impacted by the presence of the contamination, but new construction and development would be limited by soil left in place. The City of Sunnyside is expected to own the airport property indefinitely and will be able to control site construction activities in the affected areas consistent with any applied institutional controls.
- *Likely effectiveness and reliability of institutional controls*: Institutional controls are likely to be effective at preventing direct contact with soil and consumption of groundwater.
- *Practicability of achieving a shorter restoration timeframe*: Some areas of contaminant mass are located under buildings and are inaccessible under existing conditions. Pesticides and herbicides in groundwater have significant variability in treatability and are relatively immobile due to both high sorption coefficients and silty lithologies near the water table. Even the more aggressive remedies are expected to leave contaminant mass in place and recalcitrant compounds may persist. NA and monitoring is conservatively estimated for 60 to 90 years at the site.
- *Ability to control and monitor migration of hazardous substances from the site*: Monitoring wells can provide adequate monitoring for potential offsite migration, though no such migration has been detected.

- *Toxicity of the hazardous substances at the site*: Soil and groundwater have pesticide concentrations with exceedance ratios up to 462 and 275 times their respective cleanup levels (PGG, 2014). The most likely receptor pathway is through direct contact or ingestion of near-surface soils. Soils within the upper 18 inches have exceedance ratios up to 130.

All of the considered remedial alternatives include excavation or containment elements to significantly reduce the direct contact pathway during the initial phase of the remediation. Once the excavation and/or containment elements have been completed, the contamination at the site will represent a relatively low risk because the groundwater pathway is not complete beyond the property boundary. Because of the technical difficulty of accessing and treating all of the contaminant mass, remediation times ranging from 60 to 90 years are expected for all of the considered alternatives. This is a conservative estimate for these timeframes, and actual time to restoration is likely to be significantly shorter. As discussed in the Draft Cleanup Action Plan (Mott MacDonald, 2025), April and May 2025 sampling analytical results indicate that concentrations have decreased since 2018 sampling. The decreasing trend may indicate a shorter restoration timeframe, to be confirmed in future remedial action and sampling.

Background nitrate concentrations exceed applicable MTCA cleanup levels. Therefore, reducing nitrate concentrations below background levels is not considered consistent with WAC 173-340-360(4)(d).

5.2.2 Permanent Solutions to the Maximum Extent Practicable

MTCA gives preference to permanent solutions to the extent possible. Permanent actions are those that do not require additional action over time to achieve remedial objectives.

The primary difference between the alternatives with respect to permanence is the requirement for containment layer maintenance and enforcement of institutional elements. The relative permanence of the remedial alternatives is evaluated in the disproportionate cost analysis (Section 6).

5.2.3 Requirement for Consideration of Public Concerns

Consideration of public concerns will be incorporated through the public review process. Formal public comments were not received on the RI report. Any additional comments will be considered and addressed as applicable in the final FFS or draft CAP.

6 Disproportionate Cost Analysis

The disproportionate cost analysis (DCA) ranks alternatives based on their relative costs and benefits. The evaluation criteria for the disproportionate cost analysis are specified in WAC 173-340-360(3)(f), and include the following:

- Overall protectiveness
- Permanence
- Long-term effectiveness
- Management of short-term risks
- Technical and administrative implementability
- Public concerns
- Cost (weighed against criteria above)

The following sections discuss the relative rankings of alternatives for each of the criteria. Each alternative is assigned a score from 1 to 10 with higher values reflecting fulfillment of the criteria. Values are assigned qualitatively based on professional judgement and the relative merits of each alternative. Scores for each criteria are summed to calculate the overall benefit score (Table 6).

6.1 Overall Protectiveness

The overall protectiveness criterion considers how much existing risks are reduced, the time required to reach cleanup standards, onsite and offsite risk and impacts associated with implementation, and overall improvement in environmental quality.

All of the alternatives leave inaccessible contaminant mass in place and have similar remedial action components designed to reduce general public direct contact risk. All of the considered alternatives are likely to require 60 years or more to achieve remedial action objectives due to the inaccessibility and technical difficulty of accessing all known contamination. Aggressive excavation and treatment Alternatives 1 and 2 reduce the risk of offsite migration and reduce contaminant mass at the site but have increased short-term risks and still leave contamination in place. Less aggressive excavation coupled with containment and/or groundwater treatment (Alternatives 4 and 5) may reduce the risk of offsite groundwater migration, but there are potential issues with the effectiveness of treating a broad spectrum of pesticides and herbicides and leaves the majority of vadose zone contaminant mass in place. Alternative 3 has the lowest short-term risk and is the most straightforward to implement but does not actively attempt to reduce groundwater concentrations resulting in long compliance monitoring times. Given the maturity of the contamination at the site, and the generally low solubility and mobility of the pesticides and herbicides at the site, rapid changes in groundwater concentrations are unlikely and the site is likely to remain protective of groundwater receptors at the property boundary.

Based on these factors, the alternatives are assigned the following scores (Table 6):

- Alternative 1: 8
- Alternative 2: 8
- Alternative 3: 7
- Alternative 4: 8

- Alternative 5: 8

6.2 Permanence

Permanence criteria consider the degree to which the alternative permanently reduces the toxicity, mobility, or mass of hazardous substances. This includes consideration of the effectiveness of the alternative in destroying the hazardous substances, the reduction of source areas, and the potential for reversibility of the contaminant reductions.

The selected alternatives focus on either containment or offsite disposal, but all leave some source mass in place. Groundwater treatment is included as an additional measure to reduce the risk of offsite groundwater migration in Alternatives 1, 2 and 4. Containment elements require ongoing effort ranging from incorporation into lease agreements to inspection and repair of asphalt cover surfaces. Alternative 1 is the most permanent due to the removal of large quantities of source mass and lowest degree of ongoing effort.

Based on these factors, the alternatives are assigned the following scores (Table 6):

- Alternative 1: 8
- Alternative 2: 7
- Alternative 3: 6
- Alternative 4: 7
- Alternative 5: 7

6.3 Long-Term Effectiveness

The long-term effectiveness criterium considers the certainty that the alternative will be successful, the reliability of the alternative until cleanup levels are met, the magnitude of residual risk at alternative completion, and the effectiveness of controls required to manage contamination left in place. MTCA regulations specify a preference for cleanup action components in descending order of reuse/recycling, destruction or detoxification, immobilization/solidification, offsite disposal in an engineered facility, onsite isolation or containment with attending engineering controls, and institutional controls and monitoring. This does not consider the time required to meet the objective.

All considered alternatives include offsite disposal and containment components with secondary emphasis of groundwater treatment to reduce the source mass and risk of offsite migration. None of the alternatives achieve complete source removal, and suspected high-concentration areas under the metal building will remain in place in all alternatives. All alternatives include compliance monitoring to track effectiveness. Therefore, alternative long-term effectiveness is limited by the ability to reduce source mass. Alternative 3 has the lowest long-term effectiveness because it is the least aggressive approach to reducing soil and groundwater concentrations but will still remain protective of the site receptors.

Based on these factors, the alternatives are assigned the following scores (Table 6):

- Alternative 1: 8
- Alternative 2: 8
- Alternative 3: 6
- Alternative 4: 8
- Alternative 5: 8

6.4 Management of Short-Term Risks

The management of short-term risks criterion considers the risk to human health and the environment during construction and implementation, and the effectiveness of the measures that will be taken to manage such risks.

Short-term risks vary between the alternatives. Excavation and hauling of the contaminated soil significantly increase the potential for human exposure through direct contact, inhalation, and ingestion due to dust generation, tracking and hauling. Therefore, the management of short-term risks are ranked based on their relative excavation quantities and placement of a protective cap to prevent direct contact.

Based on these factors, the alternatives are assigned the following scores (Table 6):

- Alternative 1: 5
- Alternative 2: 6
- Alternative 3: 8
- Alternative 4: 7
- Alternative 5: 6

6.5 Technical and Administrative Implementability

The implementability criterion considers the relative difficulty and uncertainty of implementing the cleanup actions. Factors considered in this evaluation include use of innovative vs. mature technologies, the feasibility of implementing the technologies in the site conditions, and potential regulatory or permitting issues.

All considered alternatives incorporate a mix of mature technologies and technologies with mixed results in pesticide sites. Excavation and containment are demonstrated, mature technologies. Chemical treatment of pesticides in soil and groundwater is uncertain given the mix of constituents at the site prior to bench testing. Alternative 3 is the simplest to implement and relies on simple, proven approaches. Excavation is a mature technology, but careful implementation to prevent disruption to airport activities, human contact with impacted soils, and potentially challenging excavation conditions in the capillary zone could increase the difficulty of excavation at the site. Alternative 3 has the lowest level of effort and simplest implementation, followed by Alternative 5, Alternative 4, Alternative 2, and Alternative 1.

Based on these factors, the alternatives are assigned the following scores (Table 6):

- Alternative 1: 7
- Alternative 2: 7
- Alternative 3: 8
- Alternative 4: 7
- Alternative 5: 7

6.6 Public Concerns

Specific comments from the public have not been received on site documents. Therefore, all alternatives have similar consideration of public concerns. The alternatives are assigned the following scores (Table 6):

- Alternative 1: 9

- Alternative 2: 9
- Alternative 3: 9
- Alternative 4: 9
- Alternative 5: 9

6.7 Cost

Cost is not included in the MTCA benefit score but is instead weighed against the benefit score in a cost to benefit ratio for each alternative. The estimated costs for implementation of the alternatives rounded to the nearest hundred thousand dollars are (Table 6):

- Alternative 1: $1.8 million
- Alternative 2: $1.3 million
- Alternative 3: $0.7 million
- Alternative 4: $1.2 million
- Alternative 5: $1.3 million

Details supporting the cost estimate for each alternative are included in Appendix A and discussed in each alternative.

6.8 Ranking of Alternatives

Alternatives are ranked by their respective cost to benefit ratios (Table 6). Cost to benefit ratios are calculated as the costs divided by 10,000 and then divided by the benefit scores. Cost benefit ratios are also presented graphically in Figure 9. The cost to benefit ratios for the alternatives are:

- Alternative 1: 3.5
- Alternative 2: 3.0
- Alternative 3: 1.6
- Alternative 4: 2.6
- Alternative 5: 2.9

Alternative 3 is the preferred remedy based on the DCA ranking of alternatives.

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Table 1. Constituents of Concern
Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Soil Units	Soil Screening Level	Number of Soil Analyses	Number of Soil Detections	Number of Soil Exceedances [1]	Maximum Soil Value [1]	Maximum Exceedance Ratio
Chlorinated Herbicides							
2,4,5-T	ug/kg	9.5	70	0	0	6.5	0.7
2,4,5-TP (Silvex)	ug/kg	4979	70	1	0	13	0.0
2,4-D	ug/kg	9.4	70	6	5	31	3.3
2,4-DB	ug/kg	16179	70	1	0	140	0.0
Dalapon	ug/kg	959.2	70	0	0	155	0.2
Dicamba	ug/kg	3258	70	0	0	9	0.0
Dichlorprop	ug/kg	71	70	0	0	47	0.7
Dinoseb	ug/kg	687.6	70	11	1	9100	13
MCPA	ug/kg	940	70	0	2	1300	1.4
MCPP	ug/kg	940	70	1	1	1100	1.2
Pentachlorophenol	ug/kg	3.5	70	2	5	13	3.7
Organochlorine Pesticides							
4,4'-DDD	ug/kg	335.4	70	11	1	14000	42
4,4'-DDE	ug/kg	445.7	70	27	10	17000	38
4,4'-DDT	ug/kg	2941	72	29	8	150000	51
Aldrin	ug/kg	5	72	2	3	550	110
alpha-BHC	ug/kg	5	70	0	1	550	110
alpha-Chlordane	ug/kg	2857	70	2	0	1050	0.4
beta-BHC	ug/kg	5	70	0	1	550	110
delta-BHC	ug/kg	5	70	0	1	550	110
Dieldrin	ug/kg	10	72	14	13	4100	410
Endosulfan I	ug/kg	304683	70	9	0	5000	0.0
Endosulfan II	ug/kg	304683	70	13	0	7400	0.0
Endosulfan Sulfate	ug/kg	480000	70	7	0	1050	0.0
Endrin	ug/kg	440.4	72	8	1	1050	2.4
Endrin Aldehyde	ug/kg	24000	70	10	0	5900	0.2
Endrin Ketone	ug/kg	8560	70	8	0	1050	0.1
gamma-BHC	ug/kg	6.2	72	8	6	550	89
gamma-Chlordane	ug/kg	2857	70	4	0	1050	0.4
Heptachlor	ug/kg	5	72	2	3	550	110
Heptachlor Epoxide	ug/kg	8	70	7	6	550	69
Methoxychlor	ug/kg	64160	70	7	0	15000	0.2
Toxaphene	ug/kg	152.8	70	22	19	320000	2094
Organophosphorous Pesticides							
Azinphos-methyl	ug/kg	25	63	1	0	0.023	0.9
Bolstar (Sulprofos)	ug/kg	10300	63	0	0	0.0135	0.0
Chlorpyrifos	ug/kg	43900	63	0	0	0.0135	0.0
Coumaphos	ug/kg	65	63	0	0	0.0135	0.2
Demeton-S	ug/kg	25	63	0	0	0.0135	0.5
Diazinon	ug/kg	30	63	0	0	0.0135	0.5
Dichlorvos (DDVP)	ug/kg	3500	63	0	0	0.0135	0.0
Dimethoate	ug/kg	20	63	2	2	3.3	165
Disulfoton (Di-Syston)	ug/kg	95	63	2	1	0.11	1.2
EPN	ug/kg	24	63	1	1	0.025	1.0
Ethoprop	ug/kg	25	63	1	1	0.11	4.4
Fensulfothion	ug/kg	60	63	2	2	0.12	2.0
Fenthion	ug/kg	25	63	0	0	0.0135	0.5
Malathion	ug/kg	2520	63	0	0	0.0135	0.0
Merphos	ug/kg	2200	63	1	0	0.087	0.0
Methyl Parathion	ug/kg	447	63	0	0	0.0135	0.0
Monocrotophos	ug/kg	60	63	0	0	0.0335	0.6
Phorate	ug/kg	162	63	0	0	0.0135	0.1
Sulfotepp	ug/kg	1600	63	0	0	0.0135	0.0
Tetrachlorvinphos (Gardona)	ug/kg	41700	63	0	0	0.0135	0.0
Tokuthion	ug/kg	98200	63	0	0	0.0135	0.0
Trichloronate	ug/kg	169	63	0	0	0.0135	0.1
Inorganics							
Nitrate as N	--	--	--	--	--	--	--
Petroleum Compounds							
Benzene	--	--	--	--	--	--	--
Diesel Range Organics	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--
Lube Oil	--	--	--	--	--	--	--
m,p-Xylene	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--

Notes:
[1] Non-detect values included at half the reporting limit.
The maximum exceedance ratio is the maximum concentration dividied by the screening level; this includes use of half the reporting limit where a constituent was not detected.

Table 1. Constituents of Concern
Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Groundwater Units	Groundwater Screening Level	Number of Groundwater Analyses	Number of Groundwater Detections	Number of Groundwater Exceedances	Maximum Groundwater Value [1]	Maximum Exceedance Ratio
Chlorinated Herbicides							
2,4,5-T	ug/L	0.024	31	4	26	0.66	27.5
2,4-D	ug/L	70	31	6	0	2.5	0.0
2,4-DB	ug/L	128	31	4	0	2.3	0.0
Dalapon	ug/L	200	31	0	0	0.255	0.0
Dicamba	ug/L	480	31	13	0	9.4	0.0
Dichlorprop	ug/L	0.024	31	4	18	0.12	5.0
Dinoseb	ug/L	7	31	27	15	460	65.7
MCPA	ug/L	8	31	5	5	220	27.5
MCPP	ug/L	16	31	6	5	170	10.6
Pentachlorophenol	ug/L	0.219	31	2	0	0.041	0.2
Silvex	ug/L	50	31	8	0	0.24	0.0
Organochlorine Pesticides							
4,4'-DDD	ug/L	0.365	31	11	0	0.3	0.8
4,4'-DDE	ug/L	0.257	31	9	0	0.19	0.7
4,4'-DDT	ug/L	0.257	31	18	0	0.14	0.5
Aldrin	ug/L	0.005	31	8	8	0.08	16.0
alpha-BHC	ug/L	0.014	31	14	11	0.12	8.6
alpha-Chlordane	ug/L	0.25	31	13	0	0.14	0.6
beta-BHC	ug/L	0.049	31	0	0	0.00305	0.1
delta-BHC	ug/L	0.005	31	6	6	0.25	50.0
Dieldrin	ug/L	0.005	31	22	22	0.26	52.0
Endosulfan I	ug/L	96	31	13	0	1.6	0.0
Endosulfan II	ug/L	96	31	22	0	0.67	0.0
Endosulfan Sulfate	ug/L	96	31	8	0	0.21	0.0
Endrin	ug/L	2	31	8	0	0.087	0.0
Endrin Aldehyde	ug/L	2	31	9	0	0.24	0.1
Endrin Ketone	ug/L	2	31	9	0	0.17	0.1
gamma-BHC	ug/L	0.2	31	13	3	1.1	5.5
gamma-Chlordane	ug/L	0.25	31	3	0	0.085	0.3
Heptachlor	ug/L	0.019	31	6	2	0.19	10.0
Heptachlor Epoxide	ug/L	0.005	31	0	1	0.0235	4.7
Methoxychlor	ug/L	40	31	10	0	0.93	0.0
Toxaphene	ug/L	0.08	31	3	18	22	275.0
Organophosphorous Pesticides							
Azinphos-methyl	ug/L	0.5	31	0	0	0.345	0.7
Bolstar (Sulprofos)	ug/L	0.2	31	0	3	0.25	1.3
Chlorpyrifos	ug/L	48	31	0	0	0.25	0.0
Coumaphos	ug/L	0.2	31	0	3	0.25	1.3
Demeton-S	ug/L	0.64	31	1	1	1.4	2.2
Diazinon	ug/L	0.2	31	0	3	0.25	1.3
Dichlorvos (DDVP)	ug/L	0.2	31	0	3	0.25	1.3
Dimethoate	ug/L	3.2	31	1	0	1.4	0.4
Disulfoton (Di-Syston)	ug/L	0.64	31	4	3	3.56	5.6
EPN	ug/L	0.2	31	0	3	0.25	1.3
Ethoprop	ug/L	0.2	31	0	3	0.25	1.3
Fensulfothion	ug/L	0.5	31	0	0	0.345	0.7
Fenthion	ug/L	0.2	31	0	3	0.25	1.3
Malathion	ug/L	320	31	3	0	55	0.2
Merphos	ug/L	0.5	31	1	1	1.6	3.2
Methyl Parathion	ug/L	4	31	0	0	0.25	0.1
Monocrotophos	ug/L	0.5	31	0	0	0.345	0.7
Phorate	ug/L	3.2	31	0	0	0.25	0.1
Sulfotepp	ug/L	8	31	0	0	0.25	0.0
Tetrachlorvinphos (Gardona)	ug/L	3.65	31	0	0	0.25	0.1
Tokuthion	ug/L	0.2	31	0	3	0.25	1.3
Trichloronate	ug/L	0.2	31	0	3	0.25	1.3
Inorganics							
Nitrate as N	mg/L as N	10	29	29	27	190	19.0
Petroleum Compounds							
Benzene	ug/L	0.8	5	0	0	0.1	0.1
Diesel Range Organics	mg/L	0.5	10	2	2	0.67	1.3
Ethylbenzene	ug/L	6	5	0	0	0.1	0.0
Lube Oil	mg/L	0.5	10	0	0	0.23	0.5
m,p-Xylene	ug/L	9	4	0	0	0.2	0.0
o-Xylene	ug/L	9	4	0	0	0.1	0.0
Toluene	ug/L	640	5	0	0	0.5	0.0

Notes:

[1] Non-detect values included at half the reporting limit.

The maximum exceedance ratio is the maximum concentration dividied by the screening level; this includes use of half the reporting limit where a constituent was not detected.

Table 2. Summary of Soil Analytical Results
Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Table 749-3 Value	SL	SMA-S001-06	SMA-S001-12	SMA-S002-12	SMA-S003-16	SMA-S004-12	SMW-1-S	SMW-2-S	SP-1-18-S	SP-1-40-S	SP-2-18-S	SP-2-40-S	SP-3-18-S	SP-3-40-S	SP-4-18-S	SP-4-40-S	SP-5-18-S	SP-5-40-S	SP-6-18-S	SP-6-40-S	SP-7-18-S	SP-7-30-S	SP-7-40-S	SP-8-12-S	SP-8-18-S
Organochlorine Pesticides (EPA Method 8081A)																											
4,4'-DDD	ug/kg	750 *	335	160	180	0.4	63	200	U 13	U 12	U 13	26	U 11	U 12	U 11	U 11	U 12	U 11	170	U 12	U 12	U 11	U 12	U 11	U 11	U 12	37
4,4'-DDE	ug/kg	750 *	446	130	930	4.1	680	3400	U 13	U 12	U 13	47	U 11	U 12	U 11	U 11	U 12	U 11	3200	3200	13	U 11	U 12	670	U 11	U 12	1200
4,4'-DDT	ug/kg	750 *	2941	4700	4700	13	1600	4300	16	U 12	170	1200	110	31	U 11	U 11	U 12	U 11	3000	42000	50	U 11	U 12	910	U 11	U 12	880
Aldrin	ug/kg	100	2.52	U 1.1	U 1	U 1.1	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
alpha-BHC	ug/kg	6000	0.55	U 1.1	U 1	U 1.1	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
alpha-Chlordane	ug/kg	1000	2857	U 1.1	U 1	U 1.1	U 1.1	U 1.1	U 13	U 12	U 13	U 11	15	U 12	U 11	U 11	U 12	U 11	U 11	U 12	U 12	U 11	U 12	U 11	U 11	U 12	U 11
beta-BHC	ug/kg	6000	2.27	U 1.1	U 1	U 1.1	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
delta-BHC	ug/kg	6000	1.02	U 1.1	U 1	U 1.1	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
Dieldrin	ug/kg	70	2.82	30	180	8.1	U 2.1	U 2.2	U 13	U 12	180	1300	U 11	U 12	13	U 11	U 12	U 11	77	U 12	U 12	U 11	U 12	21	U 11	U 12	17
Endosulfan I	ug/kg		304683	5.2	15	U 1.1	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	30	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	25	300	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
Endosulfan II	ug/kg		304683	48	150	2.7	94	100	U 13	U 12	U 13	23	U 11	U 12	U 11	U 11	U 12	U 11	100	190	U 12	U 11	U 12	U 11	U 11	U 12	U 11
Endosulfan Sulfate	ug/kg		480000	U 2.1	U 2.1	U 2.2	U 2.1	U 2.2	U 13	U 12	U 13	13	U 11	U 12	U 11	U 11	U 12	U 11	190	320	U 12	U 11	U 12	U 11	U 11	U 12	34
Endrin	ug/kg	200	440	U 2.1	U 2.1	2.4	U 2.1	U 2.2	U 13	U 12	U 13	31	U 11	U 12	U 11	U 11	U 12	U 11	180	240	U 12	U 11	U 12	U 11	U 11	U 12	25
Endrin Aldehyde	ug/kg	200	24000	U 2.1	U 2.1	U 2.2	U 2.1	U 2.2	U 13	U 12	19	14	U 11	U 12	U 11	U 11	U 12	U 11	120	270	U 12	U 11	U 12	U 11	U 11	U 12	24
Endrin Ketone	ug/kg	200	8560	U 2.1	U 2.1	0.63	82	U 2.2	U 13	U 12	410	46	U 11	U 12	U 11	U 11	U 12	U 11	92	13	U 12	U 11	U 12	U 11	U 11	U 12	U 11
gamma-BHC	ug/kg	6000	6.21	2.3	6.1	2.7	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
gamma-Chlordane	ug/kg		2857	U 1.1	U 1	1.5	U 1.1	U 1.1	U 13	U 12	U 13	U 11	U 11	U 12	U 11	U 11	U 12	U 11	37	35	U 12	U 11	U 12	U 11	U 11	U 12	U 11
Heptachlor	ug/kg	400	3.78	U 1.1	U 1	U 1.1	U 1.1	U 1.1	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
Heptachlor Epoxide	ug/kg	400	8.02	5.3	18	U 1.1	7.9	12	U 6.3	U 6.1	U 6.3	U 5.6	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.7	U 5.6	U 5.8	U 5.8	U 5.5	U 6.2	U 5.5	U 5.4	U 6.2	U 5.5
Methoxychlor	ug/kg		64160	U 11	U 10	U 10	U 11	U 11	U 13	U 12	20	150	U 11	U 12	U 11	U 11	U 12	U 11	710	U 12	U 12	U 11	U 12	U 11	U 11	U 12	94
Toxaphene	ug/kg		153	2900	13000	77	7300	11000	U 63	U 61	870	1700	330	130	140	U 56	U 58	U 57	20000	43000	U 58	U 55	U 62	810	U 54	U 62	1800
Chlorinated Herbicides (EPA Method 8151A)																											
2,4,5-T	ug/kg		0.97	U 7.2	U 7.1	U 7.3	U 7.2	U 7.2	U 12	U 11	U 12	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 10	U 12	U 10	U 10	U 12	U 10
2,4,5-TP (Silvex)	ug/kg		4979	U 7.2	U 7.1	U 7.3	U 7.2	U 7.2	U 12	U 12	U 12	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 10	U 12	U 10	U 10	U 12	U 10
2,4-D	ug/kg		860	7	14	U 7.3	U 7.2	31	U 12	U 11	U 12	U 10	U 10	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 10	U 12	U 10	U 10	U 12	U 10
2,4-DB	ug/kg		16179	U 7.2	U 7.1	U 7.3	U 7.2	U 7.2	U 12	U 11	U 12	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 10	U 12	U 10	U 10	U 12	U 10
Dalapon	ug/kg		959	U 27	U 27	U 27	U 27	0	U 290	U 280	U 290	U 260	U 260	U 270	U 260	U 260	U 260	U 260	U 260	U 260	U 260	U 250	U 280	U 250	U 250	U 280	U 250
Dicamba	ug/kg		3258	U 18	U 18	U 18	U 18	U 18	U 12	U 11	U 12	U 10	U 10	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 10	U 12	U 10	U 10	U 12	U 10
Dichlorprop	ug/kg		0.98	U 7.2	U 7.1	U 7.3	U 7.2	U 7.2	U 89	U 86	U 89	U 79	U 79	U 82	U 80	U 79	U 82	U 80	U 80	U 81	U 82	U 78	U 88	U 78	U 77	U 88	U 77
Dinoseb	ug/kg		688	U 18	U 18	10	U 18	U 18	U 12	9100	110	19	57	86	U 11	U 11	U 11	U 11	U 11	U 11	U 11	U 10	U 12	U 10	U 10	U 12	U 10
MCPA	ug/kg		424	U 7.2	U 7.1	U 7.3	U 7.2	U 7.2	U 1200	U 1100	U 1200	U 1000	U 1000	U 1100	U 1100	U 1000	U 1100	U 1100	U 1100	U 1100	U 1100	U 1000	U 1200	U 1000	U 1000	U 1200	U 1000
MCPP	ug/kg		498	U 7.2	U 7.1	U 7.3	U 7.2	U 7.2	U 1200	U 1100	U 1200	U 1000	U 1000	U 1100	U 1100	U 1000	U 1100	U 1100	U 1100	U 1100	1100	U 1000	U 1200	U 1000	U 1000	U 1200	U 1000
Pentachlorophenol	ug/kg	3000	3.47	13	6.5	U 18	U 18	U 18	U 6	U 5.8	U 6	U 5.3	U 5.3	U 5.5	U 5.4	U 5.3	U 5.5	U 5.4	U 5.4	U 5.5	U 5.5	U 5.2	U 5.9	U 5.2	U 5.1	U 5.9	U 5.2
Organophosphorous Pesticides (EPA Method 8270D-SIM)																											
Azinphos-methyl/Guthion	mg/kg		0.005	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Bolstar/Sulprofos	mg/kg		10.28	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Chlorpyrifos/Dursban	mg/kg		43.89	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Coumaphos	mg/kg		0.06	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Demeton-S	mg/kg		3.2	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Diazinon	mg/kg		0.03	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Dichlorvos(DDVP)	mg/kg		3.45	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Dimethoate	mg/kg		0.013	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Disulfoton	mg/kg		0.095	--	--	--	--	--	U 0.025	0.11	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
EPN	mg/kg		0.024	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	0.025	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Ethoprophos	mg/kg		0.01	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Fenchlorphos/Ronnel	mg/kg		4000	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Fensulfothion	mg/kg		0.06	--	--	--	--	--	U 0.063	U 0.061	U 0.063	U 0.056	U 0.056	U 0.058	U 0.057	U 0.056	U 0.058	U 0.057	0.077	0.12	U 0.058	U 0.055	U 0.062	U 0.055	U 0.054	U 0.062	U 0.055
Fenthion	mg/kg		0.025	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Malathion	mg/kg		2.52	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Merphos&Merphos-oxone	mg/kg		2.21	--	--	--	--	--	U 0.063	U 0.061	U 0.063	U 0.056	U 0.056	U 0.058	U 0.057	U 0.056	U 0.058	U 0.057	U 0.056	U 0.058	U 0.058	U 0.055	U 0.062	U 0.055	U 0.054	U 0.062	U 0.055
Mevinphos/Phosdrin	mg/kg		0.025	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Monocrotophos	mg/kg		0.06	--	--	--	--	--	U 0.063	U 0.061	U 0.063	U 0.056	U 0.056	U 0.058	U 0.057	U 0.056	U 0.058	U 0.057	U 0.056	U 0.058	U 0.058	U 0.055	U 0.062	U 0.055	U 0.054	U 0.062	U 0.055
Naled	mg/kg		160	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Parathion-ethyl	mg/kg		10.72	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Parathion-methyl	mg/kg		0.45	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Phorate	mg/kg		1.62	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Stirofos/Tetrachlorvinphos	mg/kg		41.7	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Sulfotepp	mg/kg		1.56	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Tokuthion/Prothiofos	mg/kg		98.19	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Trichloronate	mg/kg		0.17	--	--	--	--	--	U 0.025	U 0.024	U 0.025	U 0.022	U 0.022	U 0.023	U 0.023	U 0.022	U 0.023	U 0.023	U 0.023	U 0.023	U 0.023	U 0.022	U 0.025	U 0.022	U 0.022	U 0.025	U 0.022
Petroleum Compounds (NWTPH and EPA Method 8260C)																											
Benzene	mg/kg		0.0045	--	--	--	--	--	--	--	U 0.001	--	U 0.0011	--	U 0.00097	--	--	--	U 0.001	--	U 0.00092	--	--	--	--	--	--
Toluene	mg/kg		0.052	--	--	--	--	--	--	--	U 0.0052	--	U 0.0054	--	0.034	--	--	--	U 0.0052	--	U 0.0046	--	--	--	--	--	--
Ethylbenzene	mg/kg		0.082	--	--	--	--	--	--	--	U 0.001	--	U 0.0011	--	0.0012	--	--	--	U 0.001	--	U 0.00092	--	--	--	--	--	--
m,p-Xylene	mg/kg		4.46	--	--	--	--	--	--	--	U 0.0021	--	U 0.0022	--	0.0041	--	--	--	U 0.0021	--	U 0.0018	--	--	--	--	--	--
o-Xylene	mg/kg		0.082	--	--	--	--	--	--	--	U 0.001	--	U 0.0011	--	0.0012	--	--	--	U 0.001	--	U 0.00092	--	--	--	--	--	--
Naphthalene	mg/kg		4.65	--	--	--	--	--	--	--	U 0.001	--	U 0.0011	--	U 0.00097	--	--	--	U 0.001	--	U 0.00092	--	--	--	--	--	--
Diesel Range Organics	mg/kg		2000	U 53	U 52	U 53	U 52	94	--	--	U 31	--	U 28	--	U 28	--	--	--	U 140	--	U 29	--	--	--	--	--	--
Lube Oil Range Organics	mg/kg		2000	U 110	U 100	U 110	U 100	710	--	--	U 63	--	U 56	--	U 57	--	--	--	400	--	U 58	--	--	--	--	--	--

Notes:
Additional data discussion in the Remedial Investigation Report (PGG, 2014)
* Total DDE, DDT, DDD based on Table 749-3 comments.

Table 2. Summary of Soil Analytical Results

Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Table 749-3 Value	SL	SP-8-40-S	SP-9-18-S	SP-10-18-S	SP-11-18-S	SP-12-122-S	SP-12-144-S	SP-12-18-S	SP-12-230-S	SP-12-40-S	SP-13-18-S	SP-13-40-S	SP-14-18-S	SP-14-40-S	SP-15-18-S	SP-15-40-S	SP-16-12-S	SP-16-18-S	SP-16-40-S	SP-17-18-S	SP-17-40-S	SP-18-2-S	SP-18-6-S
Organochlorine Pesticides (EPA Method 8081A)																									
4,4'-DDD	ug/kg	750 *	335	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	U 11	U 12	U 12	U 12
4,4'-DDE	ug/kg	**750 ***	446	U 12	100	43	18	U 13	U 13	U 11	U 12	U 12	260	U 12	20	U 12	U 11	12	U 13	U 11	U 12	420	U 12	48	U 12
4,4'-DDT	ug/kg	**750 ***	2941	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	96	U 12	U 11	U 12	22	66	U 13	U 11	U 12	1300	U 12	140	U 12
Aldrin	ug/kg	100	2.52	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	U 5.7	U 6.2	U 6.1	U 6.2
alpha-BHC	ug/kg	6000	0.55	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	U 5.7	U 6.2	U 6.1	U 6.2
alpha-Chlordane	ug/kg	1000	2857	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	U 11	U 12	U 12	U 12
beta-BHC	ug/kg	6000	2.27	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	U 5.7	U 6.2	U 6.1	U 6.2
delta-BHC	ug/kg	6000	1.02	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	U 5.7	U 6.2	U 6.1	U 6.2
Dieldrin	ug/kg	**70**	2.82	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	**33**	U 12	U 12	U 12
Endosulfan I	ug/kg		304683	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	13	U 6.2	150	U 6.2
Endosulfan II	ug/kg		304683	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	120	U 12	99	U 12
Endosulfan Sulfate	ug/kg		480000	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	150	U 12	U 12	U 12
Endrin	ug/kg	200	440	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	140	U 12	U 12	U 12
Endrin Aldehyde	ug/kg	200	24000	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	81	U 12	36	U 12
Endrin Ketone	ug/kg	200	8560	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	48	U 12	U 12	U 12
gamma-BHC	ug/kg	6000	6.21	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	**7.6**	U 6.2	**11**	U 6.2
gamma-Chlordane	ug/kg		2857	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	U 11	U 12	U 12	U 12
Heptachlor	ug/kg	400	3.78	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	U 5.7	U 6.2	U 6.1	U 6.2
Heptachlor Epoxide	ug/kg	400	8.02	U 6.1	U 5.5	U 5.4	U 5.6	U 6.4	U 6.4	U 5.7	U 6.2	U 5.8	U 5.7	U 5.9	U 5.6	U 6.1	U 5.6	U 5.9	U 6.5	U 5.5	U 6	**23**	U 6.2	U 6.1	U 6.2
Methoxychlor	ug/kg		64160	U 12	U 11	U 11	U 11	U 13	U 13	U 11	U 12	U 12	U 11	U 12	U 11	U 12	U 11	U 12	U 13	U 11	U 12	420	U 12	U 12	U 12
Toxaphene	ug/kg		153	U 61	U 55	U 54	U 56	U 64	U 64	U 57	U 62	U 58	**360**	U 59	U 56	U 61	U 56	U 59	U 65	U 55	U 60	**13000**	U 62	**1900**	U 62
Chlorinated Herbicides (EPA Method 8151A)																									
2,4,5-T	ug/kg		0.97	U 12	U 10	U 10	U 11	U 12	U 12	U 11	U 12	U 11	U 11	U 11	U 11	U 12	U 11	U 11	U 12	U 10	U 11	U 11	U 12	U 12	U 12
2,4,5-TP (Silvex)	ug/kg		4979	U 12	U 10	U 10	U 11	U 12	U 12	U 11	U 12	U 11	U 11	U 11	U 11	U 12	U 11	U 11	U 12	U 10	U 11	U 11	U 12	U 12	U 12
2,4-D	ug/kg		860	U 12	U 10	U 10	U 11	U 12	U 12	U 11	U 12	U 11	U 11	U 11	U 10	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 12	12	U 12
2,4-DB	ug/kg		16179	U 12	U 10	U 10	U 11	U 12	U 12	U 11	U 12	U 11	U 11	U 11	U 11	U 12	U 11	U 11	U 12	U 10	U 11	U 11	U 12	U 12	U 12
Dalapon	ug/kg		959	U 280	U 250	U 250	U 260	U 300	U 290	U 260	U 290	U 270	U 260	U 270	U 250	U 280	U 260	U 270	U 300	U 250	U 280	U 260	U 280	U 280	U 290
Dicamba	ug/kg		3258	U 12	U 10	U 10	U 11	U 12	U 12	U 11	U 12	U 11	U 11	U 11	U 10	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 12	U 11	U 12
Dichlorprop	ug/kg		0.98	U 87	U 78	U 77	U 79	U 91	U 90	U 81	U 88	U 83	U 81	U 83	U 79	U 86	U 80	U 84	U 92	U 78	U 85	U 81	U 88	U 86	U 88
Dinoseb	ug/kg		688	U 12	U 10	U 10	U 11	U 12	U 12	U 11	47	U 11	U 11	U 11	U 11	U 11	74	89	U 12	U 10	U 11	U 11	U 12	U 12	U 12
MCPA	ug/kg		424	U 1100	U 1000	U 1000	U 1000	U 1200	U 1200	U 1100	U 1200	U 1100	U 1100	U 1100	U 1000	U 1100	U 1100	U 1100	U 1200	U 1000	U 1100	U 1100	U 1200	U 1100	U 1200
MCPP	ug/kg		498	U 1100	U 1000	U 1000	U 1000	U 1200	U 1200	U 1100	U 1200	U 1100	U 1100	U 1100	U 1000	U 1100	U 1100	U 1100	U 1200	U 1000	U 1100	U 1100	U 1200	U 1100	U 1200
Pentachlorophenol	ug/kg	3000	3.47	U 5.8	U 5.2	U 5.2	U 5.3	U 6.1	U 6.1	U 5.4	U 5.9	U 5.5	U 5.5	U 5.6	U 5.3	U 5.8	U 5.4	U 5.6	U 6.1	U 5.2	U 5.7	U 5.4	U 5.9	U 5.8	U 5.9
Organophosphorous Pesticides (EPA Method 8270D-SIM)																									
Azinphos-methyl/Guthion	mg/kg		0.005	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Bolstar/Sulprofos	mg/kg		10.28	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Chlorpyrifos/Dursban	mg/kg		43.89	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Coumaphos	mg/kg		0.06	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Demeton-S	mg/kg		3.2	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Diazinon	mg/kg		0.03	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Dichlorvos(DDVP)	mg/kg		3.45	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Dimethoate	mg/kg		0.013	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Disulfoton	mg/kg		0.095	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
EPN	mg/kg		0.024	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Ethoprophos	mg/kg		0.01	U 0.025	U 0.022	U 0.022	U 0.022	**0.11**	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Fenchlorphos/Ronnel	mg/kg		4000	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Fensulfothion	mg/kg		0.06	U 0.061	U 0.055	U 0.054	U 0.056	U 0.064	U 0.064	U 0.057	U 0.062	U 0.058	U 0.057	U 0.059	U 0.056	U 0.061	U 0.056	U 0.059	U 0.065	U 0.055	U 0.06	U 0.057	U 0.062	U 0.061	U 0.062
Fenthion	mg/kg		0.025	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Malathion	mg/kg		2.52	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Merphos&Merphos-oxone	mg/kg		2.21	U 0.061	U 0.055	U 0.054	U 0.056	U 0.064	U 0.064	U 0.057	U 0.062	U 0.058	U 0.057	U 0.059	U 0.056	U 0.061	U 0.056	U 0.059	U 0.065	U 0.055	U 0.06	U 0.057	U 0.062	U 0.061	U 0.062
Mevinphos/Phosdrin	mg/kg		0.025	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Monocrotophos	mg/kg		0.06	U 0.061	U 0.055	U 0.054	U 0.056	U 0.064	U 0.064	U 0.057	U 0.062	U 0.058	U 0.057	U 0.059	U 0.056	U 0.061	U 0.056	U 0.059	U 0.065	U 0.055	U 0.06	U 0.057	U 0.062	U 0.061	U 0.062
Naled	mg/kg		160	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Parathion-ethyl	mg/kg		10.72	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Parathion-methyl	mg/kg		0.45	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Phorate	mg/kg		1.62	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Stirofos/Tetrachlorvinphos	mg/kg		41.7	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Sulfotepp	mg/kg		1.56	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Tokuthion/Prothiofos	mg/kg		98.19	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Trichloronate	mg/kg		0.17	U 0.025	U 0.022	U 0.022	U 0.022	U 0.026	U 0.026	U 0.023	U 0.025	U 0.023	U 0.023	U 0.024	U 0.022	U 0.024	U 0.023	U 0.024	U 0.026	U 0.022	U 0.024	U 0.023	U 0.025	U 0.024	U 0.025
Petroleum Compounds (NWTPH and EPA Method 8260C)																									
Benzene	mg/kg		0.0045	--	--	--	--	0.0032	0.0027	--	U 0.00096	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	mg/kg		0.052	--	--	--	--	U 0.0047	U 0.0048	--	U 0.0048	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	mg/kg		0.082	--	--	--	--	0.003	U 0.00096	--	U 0.00096	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	mg/kg		4.46	--	--	--	--	0.039	U 0.0019	--	U 0.0019	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	mg/kg		0.082	--	--	--	--	0.037	U 0.00096	--	U 0.00096	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg		4.65	--	--	--	--	0.16	0.042	--	U 0.00096	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	mg/kg		2000	--	--	--	--	220	U 32	--	U 31	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lube Oil Range Organics	mg/kg		2000	--	--	--	--	U 65	U 64	--	U 63	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Additional data discussion in the Remedial Investigation Report (PGG, 2014)

* Total DDE, DDT, DDD based on Table 749-3 comments.

Table 2. Summary of Soil Analytical Results

Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Table 749-3 Value	SL	SP-19-2-S	SP-19-5-S	SP-20-2-S	SP-20-6-S	SP-21-2-S	SP-21-6-S	SP-22-2-S	SP-22-5-S	SP-23-2-S	SP-23-6-S	SP-24-2-S	SP-24-5-S	SP-26-2-S	SP-26-5-S	SP-27-2-S	SP-27-6-S	SP-28-2-S	SP-29-2-S	SP-30-2-S	SP-30-5-S	SP-31-2-S	SP-31-5-S	SP-37-0.5	SP-38-0.5
Organochlorine Pesticides (EPA Method 8081A)																											
4,4'-DDD	ug/kg	750 *	335	U 11	U 12	U 11	U 11	U 12	U 11	63	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	180	**14000**
4,4'-DDE	ug/kg	**750 ***	446	U 11	U 12	23	U 11	U 12	U 11	**10000**	50	U 11	U 12	U 11	U 12	270	16	U 11	U 12	U 12	U 12	71	U 11	U 12	U 12	**790**	**17000**
4,4'-DDT	ug/kg	**750 ***	2941	U 11	U 12	U 11	U 11	U 12	U 11	**9900**	21	U 11	U 12	U 11	U 12	180	21	U 11	U 12	U 12	U 12	18	U 11	U 12	U 12	**3600**	**150000**
Aldrin	ug/kg	100	2.52	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	U 5.6	U 1100
alpha-BHC	ug/kg	6000	0.55	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	U 5.6	U 1100
alpha-Chlordane	ug/kg	1000	2857	U 11	U 12	U 11	U 11	U 12	U 11	U 11	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	P 15	U 2100
beta-BHC	ug/kg	6000	2.27	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	U 5.6	U 1100
delta-BHC	ug/kg	6000	1.02	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	U 5.6	U 1100
Dieldrin	ug/kg	**70**	2.82	U 11	U 12	U 11	U 11	U 12	U 11	U 11	U 12	U 11	U 12	U 11	U 12	U 12	U 13	**17**	U 12	U 12	U 12	U 12	U 11	U 12	U 12	U 11	**4100**
Endosulfan I	ug/kg		304683	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	79	5000
Endosulfan II	ug/kg		304683	U 11	U 12	U 11	U 11	U 12	U 11	55	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	190	7400
Endosulfan Sulfate	ug/kg		480000	U 11	U 12	U 11	U 11	U 12	U 11	71	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	P 82	U 2100
Endrin	ug/kg	200	440	U 11	U 12	U 11	U 11	U 12	U 11	U 11	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	U 11	U 2100
Endrin Aldehyde	ug/kg	200	24000	U 11	U 12	U 11	U 11	U 12	U 11	210	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	P 120	P 5900
Endrin Ketone	ug/kg	200	8560	U 11	U 12	U 11	U 11	U 12	U 11	27	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	U 11	U 2100
gamma-BHC	ug/kg	6000	6.21	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	**25**	U 1100
gamma-Chlordane	ug/kg		2857	U 11	U 12	U 11	U 11	U 12	U 11	U 11	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	P 22	U 2100
Heptachlor	ug/kg	400	3.78	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	U 5.5	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	U 5.6	U 1100
Heptachlor Epoxide	ug/kg	400	8.02	U 5.6	U 5.9	U 5.6	U 5.3	U 5.8	U 5.5	**10**	U 6	U 5.6	U 6.2	U 5.6	U 5.8	U 5.8	U 6.5	U 5.5	U 5.9	U 5.9	U 5.9	U 6.1	U 5.7	U 5.9	U 5.9	P 28	U 1100
Methoxychlor	ug/kg		64160	U 11	U 12	U 11	U 11	U 12	U 11	U 11	U 12	U 11	U 12	U 11	U 12	U 12	U 13	U 11	U 12	U 12	U 12	U 12	U 11	U 12	U 12	P 400	P 15000
Toxaphene	ug/kg		153	U 56	U 59	U 56	U 53	U 58	U 55	**7000**	U 60	U 56	U 62	U 56	U 58	**930**	U 65	**460**	U 59	U 59	U 59	U 61	U 57	U 59	U 59	**12000**	**320000**
Chlorinated Herbicides (EPA Method 8151A)																											
2,4,5-T	ug/kg		0.97	U 11	U 11	U 11	U 10	U 11	U 10	U 10	U 11	U 11	U 12	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 11	U 12	U 11	U 13	U 11	U 11	U 10
2,4,5-TP (Silvex)	ug/kg		4979	U 11	U 11	U 11	U 10	U 11	U 10	U 10	U 11	U 11	U 12	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 11	U 12	U 11	U 13	U 11	U 11	P 13
2,4-D	ug/kg		860	U 11	U 11	U 10	U 10	U 11	U 10	U 10	U 11	U 11	U 12	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 11	U 11	U 11	U 13	U 11	P 21	P 11
2,4-DB	ug/kg		16179	U 11	U 11	U 11	U 10	U 11	U 10	U 10	U 11	U 11	U 12	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 11	U 12	U 11	U 13	U 11	U 11	140
Dalapon	ug/kg		959	U 260	U 270	U 250	U 240	U 260	U 250	U 250	U 270	U 260	U 280	U 260	U 270	U 260	U 300	U 250	U 270	U 270	U 270	U 280	U 260	U 310	U 270	U 200	U 200
Dicamba	ug/kg		3258	U 11	U 11	U 10	U 10	U 11	U 10	U 10	U 11	U 11	U 12	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 11	U 11	U 11	U 13	U 11	U 10	U 10
Dichlorprop	ug/kg		0.98	U 80	U 84	U 79	U 75	U 82	U 78	U 78	U 85	U 79	U 88	U 80	U 82	U 81	U 91	U 78	U 83	U 84	U 83	U 86	U 81	U 94	U 84	U 79	U 75
Dinoseb	ug/kg		688	U 11	U 11	U 11	U 10	U 11	U 10	U 10	U 11	U 11	U 12	U 11	U 11	U 11	U 12	U 10	U 11	U 11	U 11	U 11	U 11	U 13	U 11	P 11	330
MCPA	ug/kg		424	U 1100	U 1100	U 1000	U 990	U 1100	U 1000	U 1000	U 1100	U 1000	U 1200	U 1100	U 1100	U 1100	U 1200	U 1000	U 1100	U 1100	U 1100	U 1100	U 1100	U 1200	U 1100	U 2600	U 2500
MCPP	ug/kg		498	U 1100	U 1100	U 1000	U 990	U 1100	U 1000	U 1000	U 1100	U 1000	U 1200	U 1100	U 1100	U 1100	U 1200	U 1000	U 1100	U 1100	U 1100	U 1100	U 1100	U 1200	U 1100	U 1000	U 1000
Pentachlorophenol	ug/kg	3000	3.47	U 5.3	U 5.6	U 5.3	U 5	U 5.5	U 5.2	U 5.2	U 5.7	U 5.3	U 5.9	U 5.4	U 5.5	U 5.5	U 6.1	U 5.2	U 5.6	U 5.6	U 5.6	U 5.8	U 5.4	U 6.3	U 5.6	U 5.3	U 5.1
Organophosphorous Pesticides (EPA Method 8270D-SIM)																											
Azinphos-methyl/Guthion	mg/kg		0.005	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Bolstar/Sulprofos	mg/kg		10.28	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Chlorpyrifos/Dursban	mg/kg		43.89	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Coumaphos	mg/kg		0.06	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Demeton-S	mg/kg		3.2	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Diazinon	mg/kg		0.03	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Dichlorvos(DDVP)	mg/kg		3.45	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Dimethoate	mg/kg		0.013	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	**0.4**	**3.3**	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Disulfoton	mg/kg		0.095	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	0.028	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
EPN	mg/kg		0.024	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Ethoprophos	mg/kg		0.01	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Fenchlorphos/Ronnel	mg/kg		4000	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Fensulfothion	mg/kg		0.06	U 0.056	U 0.059	U 0.056	U 0.053	U 0.058	U 0.055	U 0.055	U 0.06	U 0.056	U 0.062	U 0.056	U 0.058	U 0.058	U 0.065	U 0.055	U 0.059	U 0.059	U 0.059	U 0.061	U 0.057	U 0.067	U 0.059	--	--
Fenthion	mg/kg		0.025	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Malathion	mg/kg		2.52	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Merphos&Merphos-oxone	mg/kg		2.21	U 0.056	U 0.059	U 0.056	U 0.053	U 0.058	U 0.055	0.087	U 0.06	U 0.056	U 0.062	U 0.056	U 0.058	U 0.058	U 0.065	U 0.055	U 0.059	U 0.059	U 0.059	U 0.061	U 0.057	U 0.067	U 0.059	--	--
Mevinphos/Phosdrin	mg/kg		0.025	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Monocrotophos	mg/kg		0.06	U 0.056	U 0.059	U 0.056	U 0.053	U 0.058	U 0.055	U 0.055	U 0.06	U 0.056	U 0.062	U 0.056	U 0.058	U 0.058	U 0.065	U 0.055	U 0.059	U 0.059	U 0.059	U 0.061	U 0.057	U 0.067	U 0.059	--	--
Naled	mg/kg		160	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Parathion-ethyl	mg/kg		10.72	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Parathion-methyl	mg/kg		0.45	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Phorate	mg/kg		1.62	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Stirofos/Tetrachlorvinphos	mg/kg		41.7	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Sulfotepp	mg/kg		1.56	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Tokuthion/Prothiofos	mg/kg		98.19	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Trichloronate	mg/kg		0.17	U 0.022	U 0.024	U 0.022	U 0.021	U 0.023	U 0.022	U 0.022	U 0.024	U 0.022	U 0.025	U 0.023	U 0.023	U 0.023	U 0.026	U 0.022	U 0.023	U 0.024	U 0.024	U 0.024	U 0.023	U 0.027	U 0.024	--	--
Petroleum Compounds (NWTPH and EPA Method 8260C)																											
Benzene	mg/kg		0.0045	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	mg/kg		0.052	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	mg/kg		0.082	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	mg/kg		4.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	mg/kg		0.082	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg		4.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	mg/kg		2000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lube Oil Range Organics	mg/kg		2000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Additional data discussion in the Remedial Investigation Report (PGG, 2014)

* Total DDE, DDT, DDD based on Table 749-3 comments.

Table 3. Summary of Groundwater Monitoring Well Results

Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Screening Level	SMW-1 3/31/2014	SMW-1 8/26/2015	SMW-1 4/12/2017	SMW-1 7/31/2017	SMW-1 10/30/2017	SMW-1 1/31/2018	SMW-2 3/31/2014	SMW-2 8/26/2015	SMW-2 4/12/2017	SMW-2 7/31/2017	SMW-2 10/30/2017	SMW-2 1/31/2018
Field Parameters														
Depth to Water	feet		10.56	10.32	9.28	9.48	9.57	9.81	10.95	10.56	9.65	9.66	9.91	10.16
Oxidation-Reduction Potential	mV		159	145	--	--	7.09	-86.1	130	159	--	--	7.15	-22.2
pH, Field	std.		7.74	7.46	7.2	7.17	1141	7.54	7.69	7.37	6.8	7.23	943	7.11
Specific Conductivity	umhos/cm		926	904	--	1114	18.7	1389	1005	1010	--	837	17.6	1092
Temperature	degrees C		14.3	20.07	13.4	18.9	4.36	15	14.9	18.23	13.9	18	2.34	15.2
Nitrate Results														
Nitrate as N	mg/L as N	*10*	--	**39**	**100**	**120**	**110**	**120**	--	**28**	**54**	**41**	**47**	**64**
Nitrite as N	mg/L as N	*1*	--	0.02U	--		--	--	--	0.02U	--		--	--
Petroleum Compounds														
Benzene	ug/L	*0.8*	0.2U	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	mg/L	*0.5*	0.26U	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/L	*6*	0.2U	--	--	--	--	--	--	--	--	--	--	--
Lube Oil	mg/L	*0.5*	U	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	ug/L	*9*	0.4U	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/L	*9*	0.2U	--	--	--	--	--	--	--	--	--	--	--
Toluene	ug/L	*640*	1U	--	--	--	--	--	--	--	--	--	--	--
Organochlorine Pesticides														
4,4'-DDD	ug/L	*0.365*	0.043P	0.0048U	U 0.0047	0.0051UZ	0.0052 U	0.0048U	0.0047U	0.005U	0.04	0.019Z	0.045	0.028
4,4'-DDE	ug/L	*0.257*	0.058P	0.0048U	U 0.0047	0.0051UZ	0.13	0.0048U	0.03P	0.005U	0.034	0.005UZ	0.0052 U	0.0049U
4,4'-DDT	ug/L	*0.257*	0.034P	0.033	0.099	0.071PZ	0.1P	0.11	0.12P	0.08	0.061	0.022Z	0.0052 U	0.04
Aldrin	ug/L	*0.003*	0.01P	**0.011**	U 0.0047	**0.051Z**	0.0052 U	**0.053P**	0.0047U	**0.02**	U 0.0047	0.005UZ	0.0052 U	0.0049U
alpha-BHC	ug/L	*0.014*	0.018P	0.0048U	**0.041**	**0.036Z**	**0.06**	**0.047**	0.0047U	0.005U	0.0065	0.005UZ	0.0058P	0.0049U
alpha-Chlordane	ug/L	*0.25*	0.074P	0.023	U 0.0047	0.056PZ	0.09	0.14	0.0047U	0.005U	U 0.0047	0.0051PZ	0.0052 U	0.013P
beta-BHC	ug/L	*0.049*	0.005U	0.0048U	U 0.0047	0.0051UZ	0.0052 U	0.0048U	0.0047U	0.005U	U 0.0047	0.005UZ	0.0052 U	0.0049U
delta-BHC	ug/L	*0.005*	**0.25**	0.0048U	U 0.0047	**0.11PZ**	0.0052 U	0.0048U	**0.0054P**	0.005U	**0.0094**	**0.07PZ**	0.0052 U	0.0049U
Dieldrin	ug/L	*0.005*	**0.26**	**0.042**	**0.077**	**0.025PZ**	**0.055P**	**0.074P**	**0.11P**	0.005U	**0.044**	**0.016PZ**	**0.041**	**0.034**
Endosulfan I	ug/L	*96*	1.6	0.03	0.07	0.074Z	0.0052 U	0.067P	0.033P	0.005U	0.021	0.012PZ	0.0052 U	0.095P
Endosulfan II	ug/L	*96*	0.67	0.064	0.072	0.044Z	0.25	0.17P	0.085	0.019	0.031	0.017Z	0.053	0.036
Endosulfan Sulfate	ug/L	*96*	0.14	0.0071	U 0.0047	0.0051UZ	0.0052 U	0.0048U	0.0047U	0.026	U 0.0047	0.005UZ	0.0052 U	0.0049U
Endrin	ug/L	*2*	0.005U	0.0048U	0.03	0.058Z	0.06	0.061	0.0047U	0.005U	U 0.0047	0.005UZ	0.0052 U	0.0049U
Endrin Aldehyde	ug/L	*2*	0.099P	0.0048U	0.12	0.0051UZ	0.15P	0.0048U	0.033P	0.005U	U 0.0047	0.015PZ	0.0052 U	0.0049U
Endrin Ketone	ug/L	*2*	0.045P	0.019U	0.073	0.02UZ	0.021 U	0.019U	0.12P	0.17	0.11	0.097Z	0.17P	0.1P
gamma-BHC	ug/L	*0.2*	0.15P	0.0048U	U 0.0047	0.14PZ	**0.21P**	0.0048U	0.018P	0.005U	U 0.0047	0.013PZ	0.0052 U	0.025P
gamma-Chlordane	ug/L	*0.25*	0.039P	0.0048U	U 0.0047	0.0051UZ	0.0052 U	0.0048U	0.0047U	0.005U	U 0.0047	0.005UZ	0.0052 U	0.0049U
Heptachlor	ug/L	*0.019*	0.015	0.0067	U 0.0047	**0.028PZ**	0.0052 U	0.0048U	0.0047U	0.005U	U 0.0047	0.005UZ	0.0052 U	0.0049U
Heptachlor Epoxide	ug/L	*0.005*	0.005U	0.0048U	U 0.0047	0.0051UZ	0.0052 U	0.0048U	0.0047U	0.005U	U 0.0047	0.005UZ	0.0052 U	0.0049U
Methoxychlor	ug/L	*40*	0.01U	0.18	U 0.0094	0.01UZ	0.01 U	0.0095U	0.0094U	0.067	U 0.0093	0.051PZ	0.047P	0.0098U
Toxaphene	ug/L	*0.08*	**22**	0.048U	U 9.4	5.1UZ	10 U	4.8U	**9.2**	0.05U	U 7.5	2.5UZ	10 U	4.9U

Table 3. Summary of Groundwater Monitoring Well Results

Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Screening Level	SMW-1 3/31/2014	SMW-1 8/26/2015	SMW-1 4/12/2017	SMW-1 7/31/2017	SMW-1 10/30/2017	SMW-1 1/31/2018	SMW-2 3/31/2014	SMW-2 8/26/2015	SMW-2 4/12/2017	SMW-2 7/31/2017	SMW-2 10/30/2017	SMW-2 1/31/2018
Organophosphorous Pesticides														
Azinphos-methyl	ug/L	*0.5*	0.52U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.48U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**
Bolstar (Sulprofos)	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Chlorpyrifos	ug/L	*48*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Coumaphos	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Demeton-S	ug/L	*0.64*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Diazinon	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Dichlorvos (DDVP)	ug/L	*0.151*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Dimethoate	ug/L	*3.2*	0.52U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.48U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**
Disulfoton (Di-Syston)	ug/L	*0.64*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
EPN	ug/L	*0.16*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Ethoprop	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Fensulfothion	ug/L	*0.5*	0.52U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.48U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**
Fenthion	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Malathion	ug/L	*320*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Merphos	ug/L	*0.5*	0.52U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.48U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**
Methyl Parathion	ug/L	*4*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Monocrotophos	ug/L	*0.5*	0.52U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.48U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**
Phorate	ug/L	*3.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Sulfotepp	ug/L	*8*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Tetrachlorvinphos (Gardona)	ug/L	*3.65*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Tokuthion	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Trichloronate	ug/L	*0.2*	0.21U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U
Chlorinated Herbicides														
2,4,5-T	ug/L	*0.02*	0.05U	**0.1**	U 0.069	0.069U	0.074 U	0.074U	0.046U	0.047U	U 0.071	0.069U	0.074 U	0.074U
2,4-D	ug/L	*70*	1.1P	0.3	U 0.091	0.091U	0.098 U	0.098U	0.046U	0.046U	U 0.094	0.092U	0.098 U	0.098U
2,4-DB	ug/L	*128*	0.074U	0.071U	U 0.069	0.069U	0.074 U	0.074U	0.07U	0.078	U 0.071	0.069U	0.074 U	0.074U
Dalapon	ug/L	*200*	0.24U	0.46U	U 0.45	0.44U	0.48 U	0.48U	0.22U	0.45U	U 0.46	0.45U	0.48 U	0.48U
Dicamba	ug/L	*480*	0.025U	0.047U	U 0.046	0.046U	0.049 U	0.049U	0.023U	0.046U	U 0.047	0.046U	0.049 U	0.049U
Dichlorprop	ug/L	*0.025*	0.049U	0.047U	U 0.046	0.046U	0.049 U	0.049U	0.046U	0.046U	U 0.047	0.046U	0.049 U	0.049U
Dinoseb	ug/L	*7*	0.37	0.14	0.43	0.23	0.3	0.36	1.6	0.21	**460**	**48**	**180**	**32**
MCPA	ug/L	*8*	7.4U	7U	**28**	6.8U	7.3 U	7.3U	6.9U	6.9U	U 7	6.8U	7.3 U	7.3U
MCPP	ug/L	*16*	4.9U	4.7U	U 6.8	6.8U	7.3 U	7.3U	4.6U	4.6U	U 7	6.8U	7.3 U	7.3U
Pentachlorophenol	ug/L	*0.219*	0.01U	0.0095U	U 0.0092	0.0092U	0.0099 U	0.0099U	0.0093U	0.0093U	U 0.0095	0.0093U	0.0099 U	0.0099U
Silvex	ug/L	*50*	0.05U	0.1	U 0.046	0.046U	0.15	0.14	0.047U	0.047U	U 0.048	0.046U	0.05 U	0.05U

Notes:

Bold indicates exceedance of the screening level

Additional direct push data are available in the Remedial Investigation report (PGG, 2014)

Table 3. Summary of Groundwater Monitoring

Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Screening Level	SMW-3 3/31/2014	SMW-3 8/26/2015	SMW-3 4/12/2017	SMW-3 7/31/2017	SMW-3 10/30/2017	SMW-3 1/31/2018	SMW-4 12/23/2015	SMW-4 4/12/2017	SMW-4 7/31/2017	SMW-4 10/30/2017	SMW-4 1/31/2018
Field Parameters													
Depth to Water	feet		10.26	10.08	8.91	9.29	9.29	9.48	9.42	9.36	9.51	9.53	9.74
Oxidation-Reduction Potential	mV		185	135	--	--	7.07	-19.3	-20	--	--	7.45	-35.7
pH, Field	std.		7.5	7.33	6.8	7.18	1570	7.05	7.59	6.9	7.44	802	7.36
Specific Conductivity	umhos/cm		2580	2650	--	1529	17.3	2030	662.6	--	777	15.7	899.4
Temperature	degrees C		14.6	18.43	13.7	19	2.36	14.7	13.7	14.5	18.5	1.57	14.2
Nitrate Results													
Nitrate as N	mg/L as N	*10*	--	**190**	**160**	**150**	**170**	**60**	**11**	**20**	**13**	**17**	**14**
Nitrite as N	mg/L as N	*1*	--	0.65	--		--	--	0.086	--		--	--
Petroleum Compounds													
Benzene	ug/L	*0.8*	0.2U	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	mg/L	*0.5*	**0.67**	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/L	*6*	0.2U	--	--	--	--	--	--	--	--	--	--
Lube Oil	mg/L	*0.5*	0.41U	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	ug/L	*9*	0.4U	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/L	*9*	0.2U	--	--	--	--	--	--	--	--	--	--
Toluene	ug/L	*640*	1U	--	--	--	--	--	--	--	--	--	--
Organochlorine Pesticides													
4,4'-DDD	ug/L	*0.365*	0.04P	0.0049U	0.042	0.018PZ	0.028P	0.3P	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
4,4'-DDE	ug/L	*0.257*	0.074P	0.0049U	0.19	0.0048UZ	0.19P	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
4,4'-DDT	ug/L	*0.257*	0.042P	0.0049U	0.14	0.0048UZ	0.13P	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Aldrin	ug/L	*0.003*	0.0048U	0.0049U	U 0.0047	0.0048UZ	**0.08**	**0.053**	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
alpha-BHC	ug/L	*0.014*	**0.057**	**0.12**	**0.059**	**0.04Z**	0.0053 U	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
alpha-Chlordane	ug/L	*0.25*	0.045P	0.032	U 0.0047	0.022PZ	0.069P	0.032P	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
beta-BHC	ug/L	*0.049*	0.0048U	0.0049U	U 0.0047	0.0048UZ	0.0053 U	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
delta-BHC	ug/L	*0.005*	0.0048U	0.0049U	**0.029**	0.0048UZ	0.0053 U	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Dieldrin	ug/L	*0.005*	**0.099P**	**0.13**	**0.17**	**0.13Z**	**0.26**	0.15P	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Endosulfan I	ug/L	*96*	0.0048U	0.0049U	0.11	0.076PZ	0.0053 U	0.064P	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Endosulfan II	ug/L	*96*	0.14	0.083	0.12	0.0092PZ	0.47	0.27P	0.0048U	U 0.0047	0.0078	0.0053 U	0.0048U
Endosulfan Sulfate	ug/L	*96*	0.0048U	0.21	0.062	0.0048UZ	0.15P	0.0048U	0.0048U	0.0053	0.0064	0.0053 U	0.0048U
Endrin	ug/L	*2*	0.0048U	0.0049U	0.069	0.039PZ	0.081P	0.087P	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Endrin Aldehyde	ug/L	*2*	0.0048U	0.0049U	0.24	0.0048UZ	0.077P	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Endrin Ketone	ug/L	*2*	0.019U	0.02U	U 0.019	0.019UZ	0.021 U	0.019U	0.019U	U 0.019	0.02U	0.021 U	0.019U
gamma-BHC	ug/L	*0.2*	0.0048U	0.0049U	U 0.0047	0.11PZ	0.21P	0.14P	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0052P
gamma-Chlordane	ug/L	*0.25*	0.0048U	0.0099U	U 0.0047	0.0048UZ	0.0053 U	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Heptachlor	ug/L	*0.019*	0.0048U	**0.19**	U 0.0047	0.0048UZ	0.0053 U	0.0048U	0.0048U	U 0.0047	0.013P	0.0053 U	0.0048U
Heptachlor Epoxide	ug/L	*0.005*	0.0048U	0.0049U	U 0.047	0.0048UZ	0.0053 U	0.0048U	0.0048U	U 0.0047	0.0049U	0.0053 U	0.0048U
Methoxychlor	ug/L	*40*	0.0097U	0.15	U 0.0093	0.36Z	0.011 U	0.93P	0.0096U	U 0.0094	0.0099U	0.011 U	0.0096U
Toxaphene	ug/L	*0.08*	**9.8**	0.049U	U 19	4.8UZ	20 U	4.8U	0.048U	U 0.47	0.49U	0.53 U	0.048U

Table 3. Summary of Groundwater Monitoring
Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Units	Screening Level	SMW-3 3/31/2014	SMW-3 8/26/2015	SMW-3 4/12/2017	SMW-3 7/31/2017	SMW-3 10/30/2017	SMW-3 1/31/2018	SMW-4 12/23/2015	SMW-4 4/12/2017	SMW-4 7/31/2017	SMW-4 10/30/2017	SMW-4 1/31/2018
Organophosphorous Pesticides													
Azinphos-methyl	ug/L	*0.5*	0.47U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.087U	U 0.2	0.2U	0.2 U	**0.2U**
Bolstar (Sulprofos)	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Chlorpyrifos	ug/L	*48*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Coumaphos	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Demeton-S	ug/L	*0.64*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Diazinon	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Dichlorvos (DDVP)	ug/L	*0.151*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Dimethoate	ug/L	*3.2*	0.47U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.087U	U 0.2	0.2U	0.2 U	**0.2U**
Disulfoton (Di-Syston)	ug/L	*0.64*	**1.5**	**3.56**	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
EPN	ug/L	*0.16*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Ethoprop	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Fensulfothion	ug/L	*0.5*	0.47U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.087U	U 0.2	0.2U	0.2 U	**0.2U**
Fenthion	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Malathion	ug/L	*320*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Merphos	ug/L	*0.5*	0.47U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.087U	U 0.2	0.2U	0.2 U	**0.2U**
Methyl Parathion	ug/L	*4*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Monocrotophos	ug/L	*0.5*	0.47U	0.5U	U 0.2	0.2U	0.2 U	**0.2U**	0.087U	U 0.2	0.2U	0.2 U	**0.2U**
Phorate	ug/L	*3.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Sulfotepp	ug/L	*8*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Tetrachlorvinphos (Gardona)	ug/L	*3.65*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Tokuthion	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Trichloronate	ug/L	*0.2*	0.19U	0.5U	U 0.2	0.2U	0.2 U	0.2U	0.087U	U 0.2	0.2U	0.2 U	0.2U
Chlorinated Herbicides													
2,4,5-T	ug/L	*0.02*	0.047U	**0.15**	U 0.071	0.073U	0.074 U	0.075U	0.046U	U 0.071	0.07U	0.074 U	0.075U
2,4-D	ug/L	*70*	1.4	0.23	U 0.094	0.096U	0.097 U	0.099U	0.045U	U 0.093	0.092U	0.097 U	0.1U
2,4-DB	ug/L	*128*	2.3P	2.1	U 0.071	0.073U	0.074 U	0.075U	0.069U	U 0.07	0.07U	0.074 U	0.075U
Dalapon	ug/L	*200*	0.23U	0.45U	U 0.46	0.47U	0.47 U	0.49U	0.44U	U 0.45	0.45U	0.48 U	0.49U
Dicamba	ug/L	*480*	0.33	1.2	0.22	0.73	0.15	0.061P	0.045U	0.33	0.36	0.28	0.17
Dichlorprop	ug/L	*0.025*	**0.12P**	0.047U	U 0.047	0.048U	0.049 U	0.05U	0.046U	U 0.047	0.046U	0.049 U	0.05U
Dinoseb	ug/L	*7*	**210**	**340**	**19**	**87**	**12**	**7.8**	3	**21**	6.8	**9.2**	**8.2**
MCPA	ug/L	*8*	**20P**	**32**	U 7	7.2U	7.3 U	7.4U	6.8U	U 7	6.9U	7.3 U	7.4U
MCPP	ug/L	*16*	**130P**	**110**	U 7	7.2U	7.3 U	7.4U	4.5U	U 7	6.9U	7.3 U	7.4U
Pentachlorophenol	ug/L	*0.219*	0.029P	0.0094U	U 0.0095	0.0097U	0.0098 U	0.01U	0.0092U	U 0.0094	0.0093U	0.0098 U	0.01U
Silvex	ug/L	*50*	0.088P	0.24	U 0.047	0.049U	0.14P	0.11P	0.046U	U 0.047	0.047U	0.049 U	0.05U

Notes:
Bold indicates exceedance of the screening level
Additional direct push data are available in the Remedial Investig

Table 4. Soil Organic Carbon-Water Partitioning Coefficients

Sunnyside Municipal Airport, Sunnyside, Washington

Constituent	Koc (L/kg)
Chlorinated Herbicides	
2,4,5-T	107
2,4,5-TP (Silvex)	175.3
2,4-D	29.63
2,4-DB	--
Dalapon	3.231
Dicamba	29.01
Dichlorprop	--
Dinoseb	4294
MCPA	29.63
MCPP	48.51
Pentachlorophenol	592
Organochlorine Pesticides	
4,4'-DDD	45800
4,4'-DDE	86405
4,4'-DDT	677934
Aldrin	48685
alpha-BHC	1762
alpha-Chlordane	67540
beta-BHC	2139
delta-BHC	2807
Dieldrin	25546
Endosulfan I	6761
Endosulfan II	6761
Endosulfan Sulfate	9847
Endrin	10811
Endrin Aldehyde	3271
Endrin Ketone	10811
gamma-BHC	1352
gamma-Chlordane	67540
Heptachlor	9528
Heptachlor Epoxide	83200
Methoxychlor	80000
Toxaphene	95816
Organophosphorous Pesticides	
Azinphos-methyl	51.93
Bolstar (Sulprofos)	--
Chlorpyrifos	7283
Coumaphos	--
Demeton-S	--
Diazinon	3034
Dichlorvos (DDVP)	53.96
Dimethoate	12.77
Disulfoton (Di-Syston)	837.9
EPN	15470
Ethoprop	--
Fensulfothion	--
Fenthion	--
Malathion	31.27
Merphos	48970
Methyl Parathion	729.3
Monocrotophos	--
Phorate	459.8
Sulfotepp	265.6
Tetrachlorvinphos (Gardona)	1375
Tokuthion	--
Trichloronate	--
Inorganics	
Nitrate as N	--
Petroleum Compounds	
Benzene	62
Diesel Range Organics	--
Ethylbenzene	204
Lube Oil	--
m,p-Xylene	196 ; 311
o-Xylene	241
Toluene	140

Notes:

Table 5. Summary of Remedial Alternatives

Sunnyside Municipal Airport Pesticide Spray Shed, Sunnyside, Washington

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Excavation with Groundwater Treatment	**Targeted Excavation with Groundwater Treatment**	**Containment with Groundwater Monitoring**	**Containment with Groundwater nZVI Treatment**	**Targeted Excavation with Groundwater Monitoring**
	Figure 4	*Figure 5*	*Figure 6*	*Figure 7*	*Figure 8*
Remedial Alternative Components	- Excavation of soils - Groundwater enhanced bioremediation - Institutional controls for soils beneath existing structures	- Targeted excavation of soils - Groundwater enhanced bioremediation - Institutional controls for soils beneath existing structures	- Minimum excavation - Engineered containment layer - Institutional controls for site - Compliance Monitoring and Conditional Point of Compliance	- Minimum excavation - Asphalt containment layer - Zero-Valent Iron (ZVI) Injections - Institutional controls for soil and groundwater	- Targeted excavation of soils - Engineered containment layer - Institutional controls for soils beneath existing structures
Remedial Action by Media					
Soil	- Excavation - Institutional controls	- Targeted excavation - Institutional controls	- 1ft excavation - Asphalt containment layer - Institutional controls	- 1ft excavation - Asphalt containment layer - Institutional controls	- Targeted excavation - Asphalt containment layer - Institutional controls
Groundwater	- Enhanced biodegradation - Institutional controls - 60 years groundwater monitoring	- Enhanced biodegradation - Institutional controls - 60 years groundwater monitoring	- Asphalt containment layer (recharge prevention) - Institutional controls - 90 years groundwater monitoring	- Asphalt containment layer (recharge prevention) - ZVI groundwater control - Institutional controls - 60 years groundwater monitoring	- Asphalt containment layer (recharge prevention) - Institutional controls - 90 years groundwater monitoring
Remedial Alternative Costs	**$ 1,847,000**	**$ 1,337,000**	**$ 674,000**	**$ 1,217,000**	**$ 1,324,000**

Table 6. Disproportionate Cost Analysis
Sunnyside Municipal Airport Remedial Investigation, Sunnyside, Washington

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Excavation with Groundwater Treatment	**Targeted Excavation with Groundwater Treatment**	**Containment with Groundwater Monitoring**	**Containment with Groundwater nZVI Treatment**	**Targeted Excavation with Groundwater Monitoring**
Benefits Ranking for Disproportionate Cost Analysis (Score 1-10)					
Criteria	*Scores and Estimations:*				
Overall Protectiveness	8	8	6	8	8
Permanence	8	7	6	7	7
Long Term Effectiveness	8	8	6	8	8
Management of Short Term Risk	5	6	8	8	6
Implementability	7	7	8	7	7
Consideration of Public Concerns	9	9	9	9	9
Overall Benefit Score	**45**	**45**	**43**	**47**	**45**
Averaged Benefit Score	**7.5**	**7.5**	**7.2**	**7.8**	**7.5**
Disproportionate Cost Analysis					
Estimated Remedy Cost	$1,847,000	$1,337,000	$674,000	$1,217,000	$1,324,000
Relative Cost/Benefit Ratio (divided by 10,000)	4.1	3.0	1.6	2.6	2.9
Estimated Time	60	60	90	60	90

Notes:

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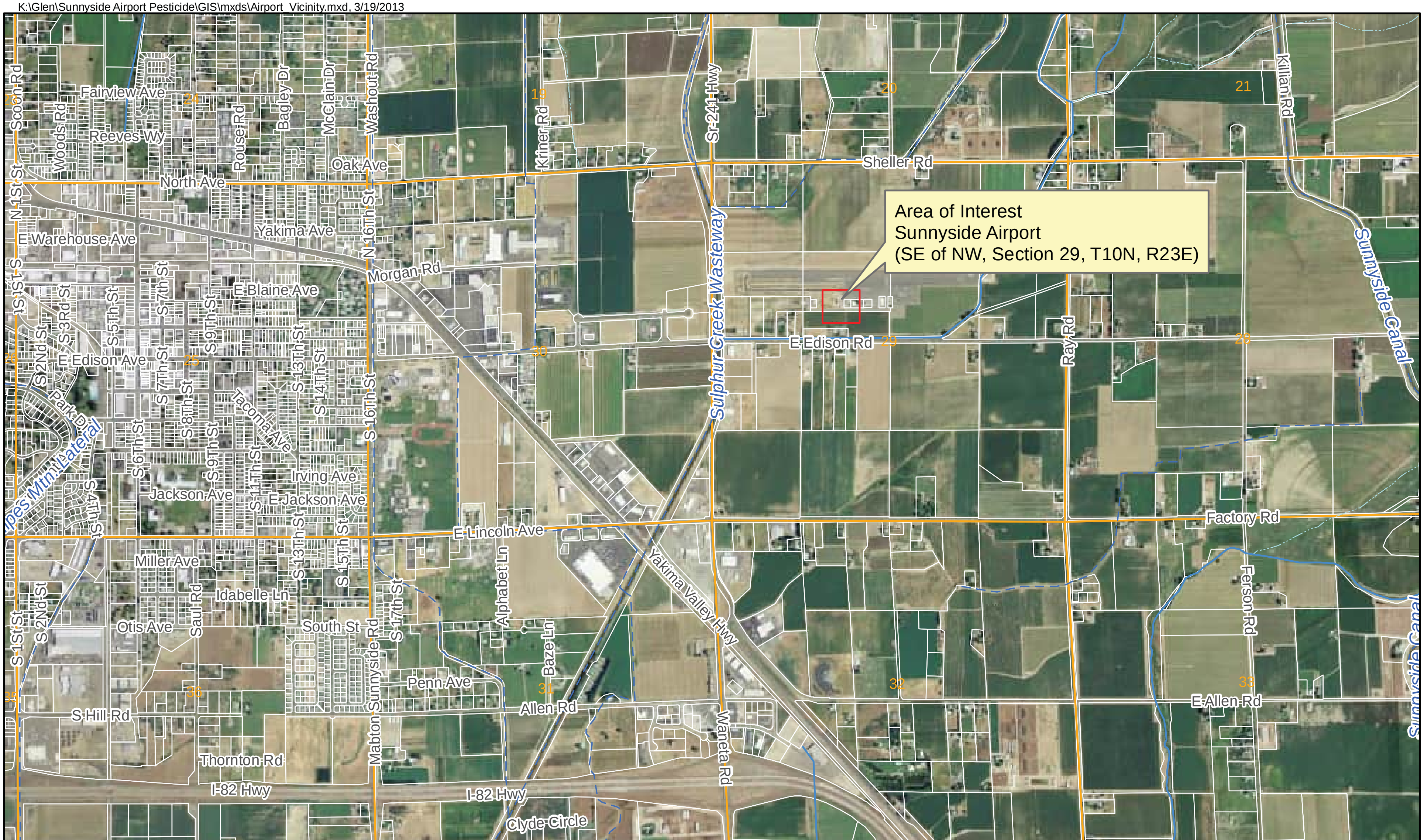

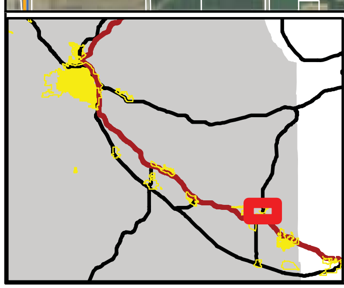

0 Feet 2,000

Figure 1

Sunnyside Airport Vicinity

Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Report

PGG

Figure 2
Site Layout

Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Study

PgG

Monitoring Well
Direct Push Location
Airport Parcels
Former Pesticide Shed
Existing & Historic Building Outlines
Debris Observed During Construction

0 Feet 50

Figure 3
Extent of Contamination

Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Study

PgG

- Monitoring Well
- Direct Push Location
- Airport Parcels
- Former Pesticide Shed
- Existing & Historic Building Outlines
- Anomaly Outline
- Debris Observed During Construction
- Extent of soil exceeding screeing levels 0-5 ft bgs
- Extent of soil exceeding screeing levels below 5 ft bgs
- Extent of groundwater exceeding pesticide and herbicide screeing levels.
- Extent of groundwater exceeding nitrate background levels. (approximate)

0 Feet 50

N

Aerial Photo from Yakima County 2011

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Figure 4
Remedial Alternative 1
Excavation with Groundwater Treatment
Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Study
PgG
Monitoring Well
Direct Push Location
Airport Parcels
Former Pesticide Shed
Existing & Historic Building Outlines
Anomaly Outline
Debris Observed During Construction
Extent of soil exceeding screeing levels 0-5 ft bgs
Extent of soil exceeding screeing levels below 5 ft bgs
Extent of groundwater exceeding pesticide and herbicide screeing levels.
Extent of groundwater exceeding nitrate background levels. (approximate)
Brown shaded areas indicate the extent of soil excavation areas. Excavation depths vary as labeled in each excavation area.
Extent of groundwater treatment area. Initial treatment depth interval between 9 and 24 feet bgs.
0
Feet
50
N
Aerial Photo from Yakima County 2011
Remove & Replace Asphalt Pavement
Excavate to 8 ft bgs
Excavate to 3 ft bgs
Excavate to 8 ft bgs
Excavate to 4 ft bgs
Deep contaminated interval below water table: Do not excavate.
SP-40
SP-30
SP-34
SP-28
SP-31
SP-27
SP-25 Archive
SP-18
SP-29
SP-38
SP-37
SP-21
SP-2
SMW-1
SP-1
SP-39
SP-24
SMA S002
SMA S001
SP-17
SP-3
SP-4
SP-15
SP-16
SP-6
SP-5
SMW-2
SP-19
SMW-3
SP-32
SP-35
SP-23
SP-22
SP-14
SP-13
SMA S003
SP-7
SP-20
SMA S004
SP-8
SP-12
SP-11
SP-10
SP-36
SMW-4
SP-9
K:\Glen\Sunnyside Airport Pesticide\GIS\mxds\Airport_SoilSampleLocations.mxd, 8/14/2014

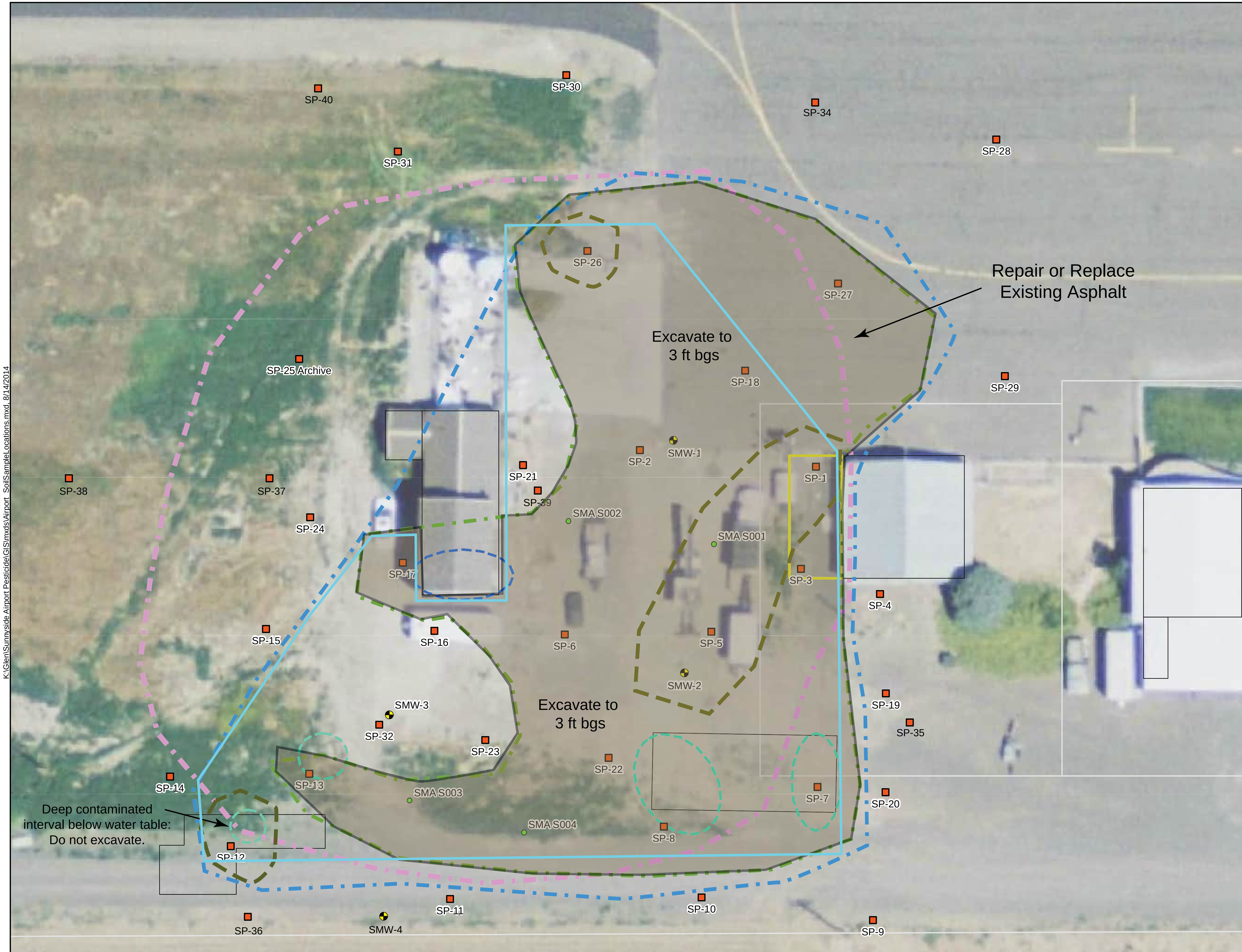
Figure 5

Remedial Alternative 2

Targeted Excavation with Groundwater Treatment

Sunnyside Airport Pesticide Spray Shed Focused Feasibility Study

PgG



Monitoring Well

Direct Push Location

Airport Parcels

Former Pesticide Shed

Existing & Historic Building Outlines

Anomaly Outline

Debris Observed During Construction

Extent of soil exceeding screeing levels 0-5 ft bgs

Extent of soil exceeding screeing levels below 5 ft bgs

Extent of groundwater exceeding pesticide and herbicide screeing levels.

Extent of groundwater exceeding nitrate background levels. (approximate)

Brown shaded areas indicate the extent of soil excavation areas. Excavation depths vary as labeled in each excavation area.

Extent of groundwater treatment area. Initial treatment depth interval between 9 and 24 feet bgs.

0 Feet 50

N

Aerial Photo from Yakima County 2011

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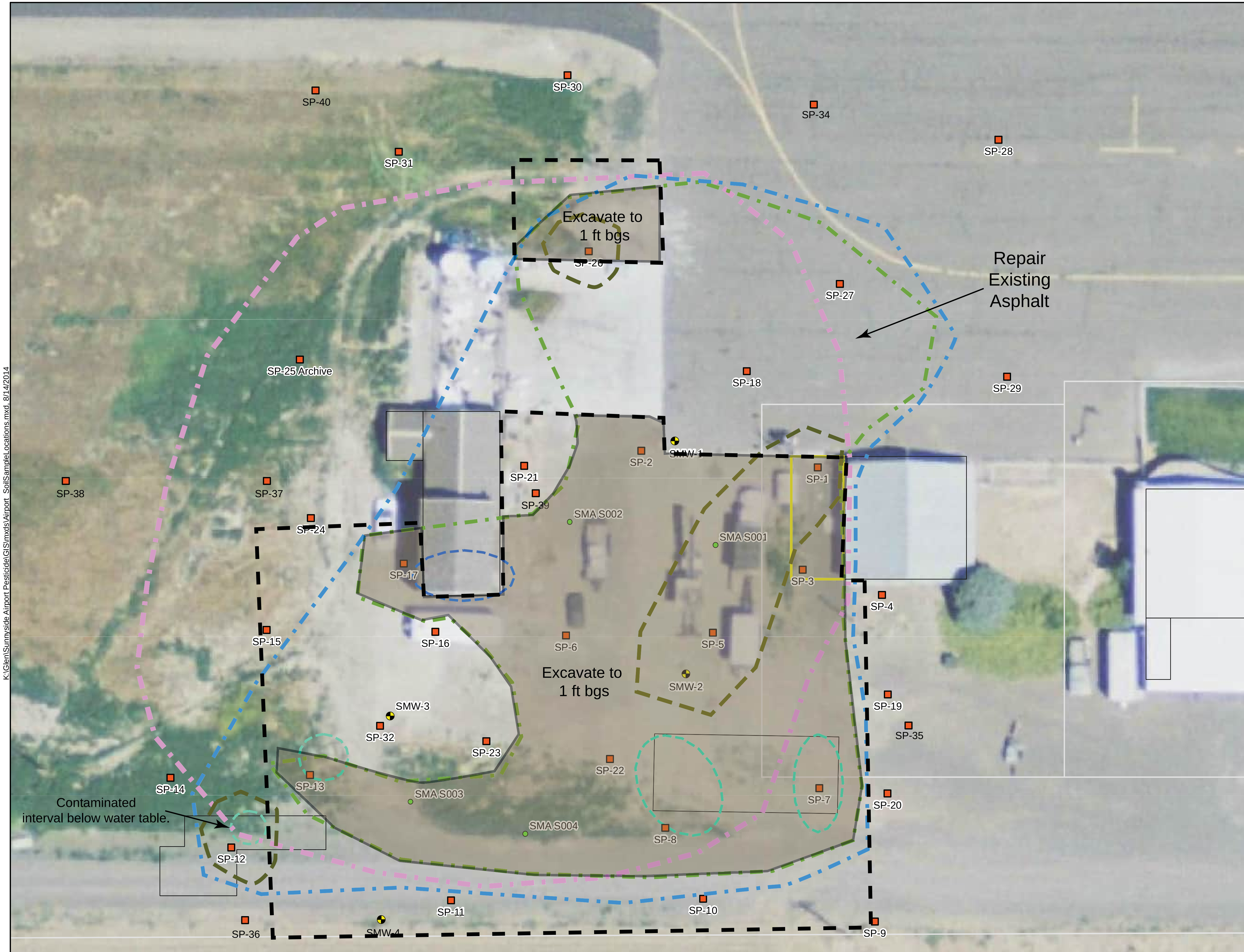
Figure 6
Remedial Alternative 3
Containment with Groundwater Monitoring

Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Study

PgG



- Monitoring Well
- Direct Push Location
- Airport Parcels
- Former Pesticide Shed
- Existing & Historic Building Outlines
- Anomaly Outline
- Debris Observed During Construction
- Extent of soil exceeding screeing levels 0-5 ft bgs
- Extent of soil exceeding screeing levels below 5 ft bgs
- Extent of groundwater exceeding pesticide and herbicide screeing levels.
- Extent of groundwater exceeding nitrate background levels. (approximate)
- Extent of new asphalt cap.

Brown shaded areas indicate the extent of soil excavation areas. Excavation depths vary as labeled in each excavation area.

0 Feet 50

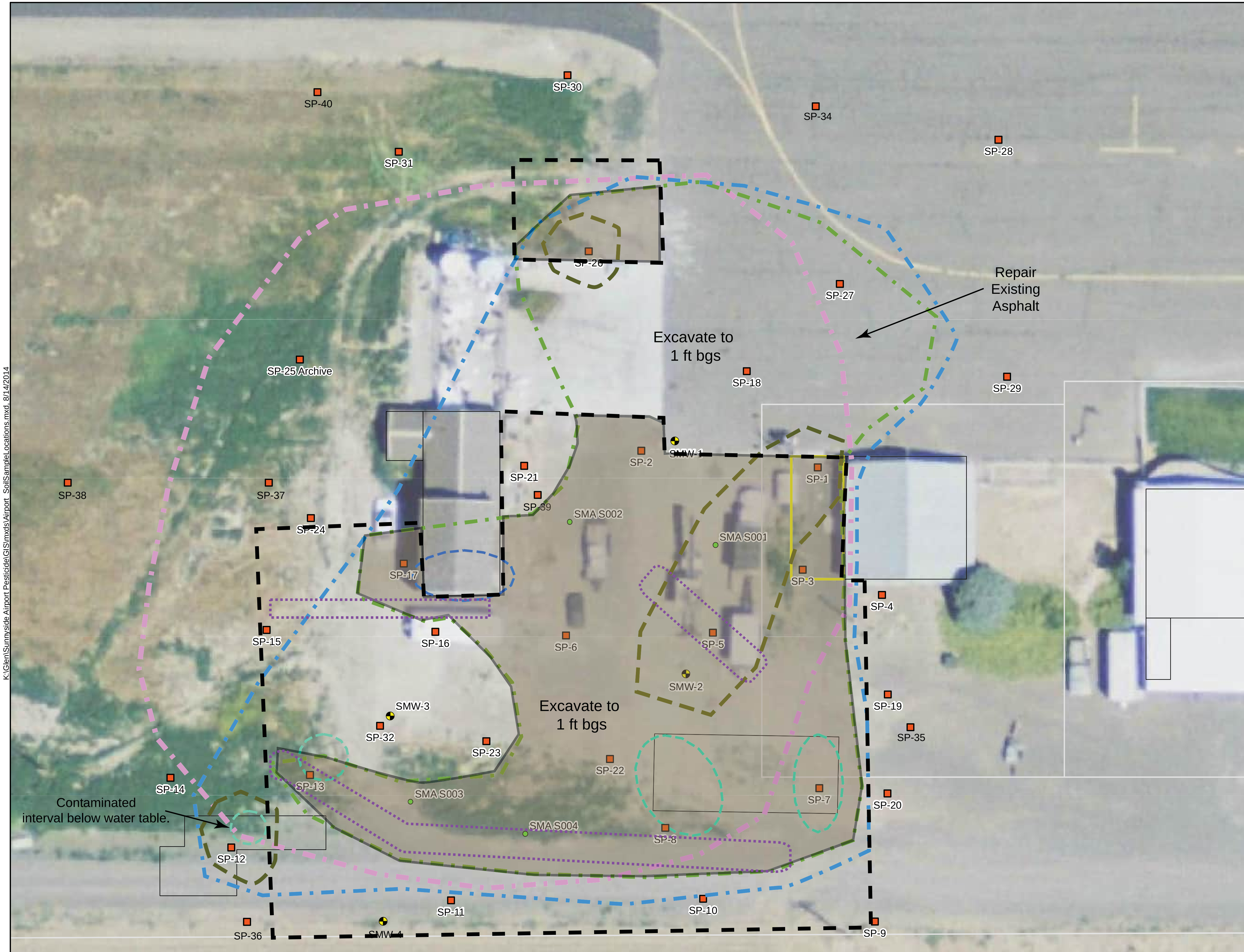
N

Aerial Photo from Yakima County 2011

K:\Glen\Sunnyside Airport Pesticide\GIS\mxds\Airport_SoilSampleLocations.mxd, 8/14/2014

Figure 7
Remedial Alternative 4
Containment with Groundwater nZVI Treatment

Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Study



- Monitoring Well
- Direct Push Location
- Airport Parcels
- Former Pesticide Shed
- Existing & Historic Building Outlines
- Anomaly Outline
- Debris Observed During Construction
- Extent of soil exceeding screeing levels 0-5 ft bgs
- Extent of soil exceeding screeing levels below 5 ft bgs
- Extent of groundwater exceeding pesticide and herbicide screeing levels.
- Extent of groundwater exceeding nitrate background levels. (approximate)
- Zero-Valent Iron (ZVI) application area
- Extent of new asphalt cap.

Brown shaded areas indicate the extent of soil excavation areas. Excavation depths vary as labeled in each excavation area.

0 Feet 50

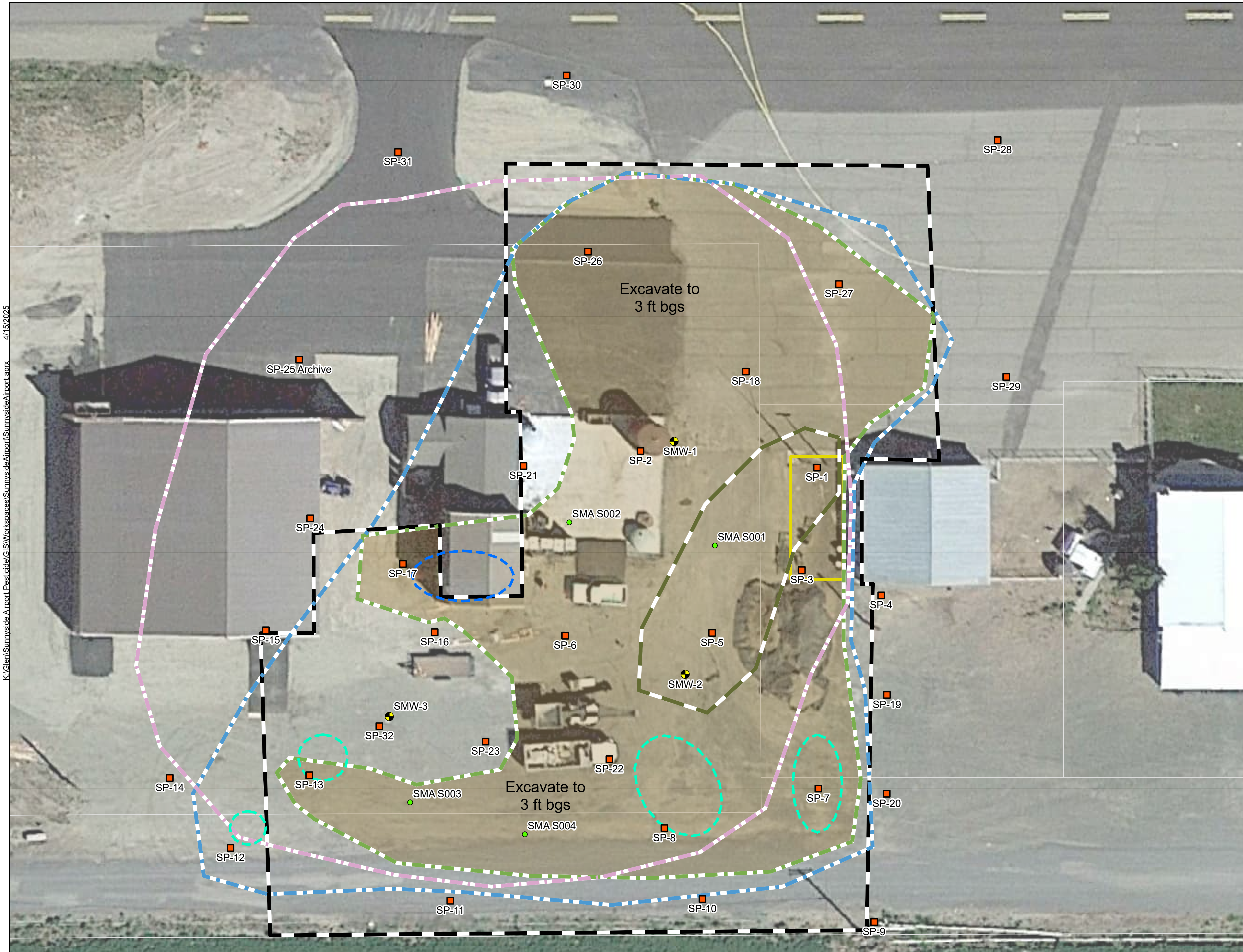
Aerial Photo from Yakima County 2011

Figure 8

Remedial Alternative 5
Targeted Excavation with
Groundwater Monitoring

Sunnyside Airport Pesticide Spray Shed
Focused Feasibility Study

MOTT MACDONALD



- Monitoring Well
- Direct Push Location
- Ecology Sample Locations
- Former Pesticide Shed
- Extent of groundwater exceeding nitrate background levels. (approximate)
- Extent of groundwater exceeding pesticide and herbicide screening levels.
- Extent of soil exceeding screening levels 0-5 ft bgs
- Extent of soil exceeding screening levels below 5 ft bgs
- Extent of new asphalt cap.

Type

- Extent of soil excavation area

- Anomaly Outline
- Debris Observed During Construction

0 Feet 50

N

Aerial Photo from Google Earth, 2021

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	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Averaged Benefit Score	7.5	7.5	7.2	7.8	7.5
Estimated Cost ($ Millions)	$1.8	$1.3	$0.7	$1.2	$1.3
Cost-Benefit Ratio	4.1	3.0	1.6	2.6	2.9

Averaged Benefit Score

Estimated Cost ($ Millions)

Cost-Benefit Ratio

Figure 9. MTCA Cost-Benefit Chart
Sunnyside Municipal Airport Pesticide Spray Shed
Focused Feasibility Study

PgG

Appendix A. Cost Estimates

Table A1. Alternative 1- Excavation with Groundwater Treatment
Sunnyside Municipal Airport Pesticide Spray Shed, Sunnyside, Washington

Reporting

Description	Unit	Value	Notes
Engineering Design Report / Bid Specs	lump	$20,000	Design documents
Compliance Monitoring Plan	lump	$10,000	Describes Groundwater Monitoring Plan
Remedial Action Report	lump	$20,000	Documentation of remedial action
Groundwater Monitoring Reports	lump	--	Included in Groundwater monitoring, below
Total Reporting Costs		**$50,000**	

Excavation

Description	Unit	Value	Notes
Excavation Quantities			
Shallow Area 1	sqft	17,650	Unpaved Area
Shallow Depth 1	feet	4	
Shallow Area 2		8,950	Paved Area
Shallow Depth 2		3	
Shallow Excavation Volume	cy	3,609	
Deep Area 1	sqft	3,164	Adjacent and below former shed
Deep Depth 1 (below Shallow depth interval)	feet	5	If shallow is 4 feet and deep is 5 ft, total depth is 9 ft bgs
Deep Area 2	sqft	400	NW corner of pavement
Deep Depth (below Shallow depth interval)	feet	6	If shallow is 3 feet and deep is 5 ft, total depth is 9 ft bgs
Deep Excavation Volume	cy	586	
Aggregate Excavation Volume	cy	4,195	Shallow and Deep Volumes
Cubic Yards to Tonnage Conversion Factor	tons/cy	1.5	
Aggregate Excavation Tonnage	tons	6,293	
Haz Waste Percentage	%	25%	Percentage to be refined based on TCLP results and profiling
Non-Hazardous Waste Percentage	%	75%	
Haz Waste Tonnage	tons	1,573	Disposal at Subtitle C landfill
Non-Hazardous Waste Tonnage	tons	4,720	Disposal at Subtitle D landfill
Excavation Costs			
Excavate and Load	$/ton	$10	Nominal Rate; includes contractor site control, dust control, standby,
Transport to Landfill (either Subtitle D or C)	$/ton	$28.75	Cost per ton to transport; see also load flat rate cost, below)
Tons per load	tons/load	12	estimated tons per truck load
Per load Transport cost (flat rate)	$/load	$465	
Pro-rated Transport Fee (based on flat-rate)	$/ton	$38.75	
Disposal Fees- Non-Hazardous Waste	$/ton	$22	Subtitle D landfill: Columbia Ridge
Disposal Fees- Hazardous Waste	$/ton	$75.63	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle D per ton cost	$/ton	$99	Subtitle D landfill: Columbia Ridge
Aggregate Subtitle D Disposal	$	$469,410	
Aggregate Subtitle C per ton cost	$/ton	$153	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle C Disposal	$	$240,900	
Backfill Procure and Place Backfill	$/cy	$25	Cost to procure and place clean backfill; no geotechnical stabilizatior
Backfill Cost	$	$104,880	
Utility Disconnect/Reconnect	$	$10,000	Cost to handle electrical and water utilities in excavation area
Total Soil Excavation & Disposal Cost	**$**	**$825,190**	
Disposal and Confirmation Characterization Costs			
Profile Review Fee		$750	At disposal landfill; $75 per profile; assume 10 profiles.
Confirmation Sampling Rate	cy/sample	24	1 sample per two truck loads at 12 cy/load
Number of Confirmation Samples	--	175	To be confirmed with disposal location
Confirmation Sample Cost	$/sample	$300	
Analytical costs		**$53,190**	
Excavation Observation Costs			
Geologist On Site	lump	$23,300	Assumes 3 weeks on site with office support

Groundwater

Description	Unit	Value	Notes
Monitoring Well Install and Remove			
Decommission Existing Wells	lump	$1,500	Chip in place by licensed driller
Install Replacement Wells (4)	lump	$24,000	Wells for long term monitoring
Total Well Costs		**$25,500**	
Groundwater Treatment Cost			
Average Treatment cost per unit volume	$/event	$116,558	Based on Regenesis quote pro-rated to 26,000 sqft area
Treatment Events	#	3	Anticipated number of events to reach treatment objective
Aggregate Groundwater Treatment Cost	**$**	**$349,674**	
Long Term Groundwater Monitoring			
60 Years Groundwater Monitoring		**$145,039**	NPV Adjusted, see Table A6 for details

Institutional Controls

Description	Unit	Value	Notes
Institutional Controls			
Draft and File Environmental Covenant	Lump	$5,000	
Amend Lease Language	Lump	$1,000	Does not include chagne in lease rate or other possible costs
Sum of Institutional Controls		**$6,000**	

Cost Summary

Description	Unit	Value	Notes
Sum of Direct Expenses	$	$1,477,892	
Contingency	%	25%	
Contingency Amount	$	$369,473	
Total Estimated Alternative Cost	**$**	**$1,847,000**	Rounded to nearest thousand dollars

Notes:

Estimated costs do not adjust for inflation or net present value (NPV) unless specifically stated.

Table A2. Alternative 2- Targeted Excavation with Groundwater Treatment
Sunnyside Municipal Airport Pesticide Spray Shed, Sunnyside, Washington

Reporting

Description	Unit	Value	Notes
Engineering Design Report / Bid Specs	lump	$15,000	Design documents
Compliance Monitoring Plan	lump	$5,000	Describes Groundwater Monitoring Plan
Remedial Action Report	lump	$20,000	Documentation of remedial action
Groundwater Monitoring Reports	lump	--	Included in Groundwater monitoring, below
Total Reporting Costs		**$40,000**	

Excavation

Description	Unit	Value	Notes
Excavation Quantities			
Shallow Area	sqft	27,500	
Shallow Depth	feet	3	
Shallow Excavation Volume	cy	3,056	
Aggregate Excavation Volume	cy	3,056	
Cubic Yards to Tonnage Conversion Factor	tons/cy	1.5	
Aggregate Excavation Tonnage	tons	4,583	
Haz Waste Percentage	%	25%	Percentage to be refined based on TCLP results and profiling
Non-Hazardous Waste Percentage	%	75%	
Haz Waste Tonnage	tons	1,146	Disposal at Subtitle C landfill
Non-Hazardous Waste Tonnage	tons	3,438	Disposal at Subtitle D landfill
Excavation Costs			
Excavate and Load	$/ton	$10	Nominal Rate; includes contractor site control, dust control, standby,
Transport to Landfill (either Subtitle D or C)	$/ton	$28.75	Cost per ton to transport; see also load flat rate cost, below)
Tons per load	tons/load	12	estimated tons per truck load
Per load Transport cost (flat rate)	$/load	$70	Total estimated number of truck trips
Pro-rated Transport Fee (based on flat-rate)	$/ton	$5.83	
Disposal Fees- Non-Hazardous Waste	$/ton	$22	Subtitle D landfill: Columbia Ridge
Disposal Fees- Hazardous Waste	$/ton	$75.63	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle D per ton cost	$/ton	$67	Subtitle D landfill: Columbia Ridge
Aggregate Subtitle D Disposal	$	$228,743	
Aggregate Subtitle C per ton cost	$/ton	$120	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle C Disposal	$	$137,742	
Backfill Procure and Place Backfill	$/cy	$25	Cost to procure and place clean backfill; no geotechnical stabilization
Backfill Cost	$	$76,389	
Utility Disconnect/Reconnect	$	$10,000	Cost to handle electrical and water utilities in excavation area
Total Soil Excavation & Disposal Cost	**$**	**$452,874**	
Disposal and Confirmation Characterization Costs			
Profile Review Fee		$750	At disposal landfill; $75 per profile; assume 10 profiles.
Confirmation Sampling Rate	cy/sample	24	1 sample per two truck loads at 12 cy/load
Number of Confirmation Samples	--	127	To be confirmed with disposal location
Confirmation Sample Cost	$/sample	$300	
Analytical costs		**$38,944**	
Excavation Observation Costs			
Geologist On Site	lump	$20,300	Assumes 3 weeks on site with office support

Groundwater

Description	Unit	Value	Notes
Monitoring Well Install and Remove			
Decommission Existing Wells	lump	$1,500	Need to remove wells inside excavation area
Install Replacement Wells (4)	lump	$15,000	Wells for long term monitoring
Total Well Costs		**$16,500**	
Groundwater Treatment Cost			
Average Treatment cost per unit volume	$/event	$116,558	Based on Regenesis quote pro-rated to 26,000 sqft area
Treatment Events	#	3	Anticipated number of events to reach treatment objective
Aggregate Groundwater Treatment Cost	**$**	**$349,674**	
Long Term Groundwater Monitoring			
60 Years Groundwater Monitoring		**$145,039**	NPV Adjusted, see Table A6 for details

Institutional Controls

Description	Unit	Value	Notes
Institutional Controls			
Draft and File Environmental Covenant	Lump	$5,000	
Amend Lease Language	Lump	$1,000	
Sum of Institutional Controls		**$6,000**	

Cost Summary

Description	Unit	Value	Notes
Sum of Direct Expenses	$	$1,069,331	
Contingency	%	25%	
Contingency Amount	$	$267,333	
Total Estimated Alternative Cost	**$**	**$1,337,000**	Rounded to nearest thousand dollars

Notes:
Estimated costs do not adjust for inflation or net present value (NPV) unless specifically stated.

Table A3. Alternative 3: Containment with Groundwater Monitoring
Sunnyside Municipal Airport Pesticide Spray Shed, Sunnyside, Washington

Remediation Costs

Reporting

Description	Unit	Value	Notes
Engineering Design Report / Bid Specs	lump	$15,000	Design documents
Compliance Monitoring Plan	lump	$5,000	Describes Groundwater Monitoring Plan
Remedial Action Report	lump	$20,000	Documentation of remedial action
Groundwater Monitoring Reports	lump	--	Included in Groundwater monitoring, below
Total Reporting Costs		**$40,000**	

Excavation

Description	Unit	Value	Notes
Excavation Quantities			
Shallow Area	sqft	20,000	Contaminated soil within paved area
Shallow Depth	feet	1	
Shallow Excavation Volume	cy	741	
Aggregate Excavation Volume	cy	741	
Cubic Yards to Tonnage Conversion Factor	tons/cy	1.5	
Aggregate Excavation Tonnage	tons	1,111	
Haz Waste Percentage	%	75%	Percentage to be refined based on TCLP results and profiling
Non-Hazardous Waste Percentage	%	25%	
Haz Waste Tonnage	tons	833	Disposal at Subtitle C landfill
Non-Hazardous Waste Tonnage	tons	278	Disposal at Subtitle D landfill
Excavation Costs			
Excavate and Load	$/ton	$10	Nominal Rate; includes contractor site control, dust control, standby,
Transport to Landfill (either Subtitle D or C)	$/ton	$28.75	Cost per ton to transport; see also load flat rate cost, below)
Tons per load	tons/load	12	estimated tons per truck load
Per load Transport cost (flat rate)	$/load	$70	Total estimated number of truck trips
Pro-rated Transport Fee (based on flat-rate)	$/ton	$5.83	
Disposal Fees- Non-Hazardous Waste	$/ton	$22	Subtitle D landfill: Columbia Ridge
Disposal Fees- Hazardous Waste	$/ton	$75.63	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle D per ton cost	$/ton	$67	Subtitle D landfill: Columbia Ridge
Aggregate Subtitle D Disposal	$	$18,484	
Aggregate Subtitle C per ton cost	$/ton	$120	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle C Disposal	$	$100,176	
Backfill Procure and Place Backfill	$/cy	$25	Cost to procure and place clean backfill; no geotechnical stabilizatior
Backfill Cost	$	$18,519	
Total Soil Excavation & Disposal Cost	**$**	**$137,179**	
Disposal and Confirmation Characterization Costs			
Profile Review Fee		$750	At Landfill; $75 per profile
Confirmation Sampling Rate	cy/sample	24	1 sample per two truck loads at 12 cy/load
Number of Confirmation Samples	--	31	To be confirmed with disposal location
Confirmation Sample Cost	$/sample	$300	
Analytical costs		**$10,009**	
Excavation Observation Costs			
Geologist On Site	lump	$21,800	Assumes 3 weeks on site with office support

Containment Physical Elements

Description	Unit	Value	Notes
Containment Physical Elements			
Pavement Area	sf	28,500	See extent on Figure 3-3. Extends beyond contaminated area
Asphalt Install Rate	$/sf	$4.50	Rate assuming 4 inch cover
Asphalt Install Cost	$	$128,250	
Geotextile Barrier below clean fill	$/sf	$0.80	
Geotextile Area	sf	76	
Geotextile Area Cost	$	$61	
Patch Aircraft Tarmac Cracks	lump	$5,000	
Sum of Containment Elements		**$133,311**	
Asphalt Maintenance			
Maintenance Elements	**Total**	**$49,671**	NPV adjusted value over 90 years.

Groundwater Monitoring

Description	Unit	Value	Notes
Monitoring Well Install and Remove			
Install additional wells (2)	lump	$20,000	Assume 2 additional wells.
Total Well Costs		**$20,000**	
Long Term Groundwater Monitoring			
90 years groundwater monitoring	ref	$156,129	Includes NPV adjustment; se Table A6 for details

Institutional Controls

Description	Unit	Value	Notes
Institutional Controls			
Draft and File Environmental Covenant	Lump	$10,000	
Amend Lease Language	Lump	$1,000	Does not include possible adjustment to lease rate.
Sum of Institutional Controls		**$11,000**	

Description	Unit	Value	Notes
Sum of Direct Expenses	$	$539,099	
Contingency Rate	%	25%	
Contingency Amount	$	$134,775	
Total Estimated Alternative Cost	**$**	**$674,000**	Rounded to nearest thousand dollars

Notes:

Estimated costs do not adjust for inflation or net present value (NPV) unless specifically stated.

Table A4. Alternative 4: Containment with Groundwater nZVI Treatment
Sunnyside Municipal Airport Pesticide Spray Shed, Sunnyside, Washington

Remediation Costs

Reporting

Description	Unit	Value	Notes
Engineering Design Report / Bid Specs	lump	$15,000	Design documents
Compliance Monitoring Plan	lump	$5,000	Describes Groundwater Monitoring Plan
Remedial Action Report	lump	$20,000	Documentation of remedial action
Groundwater Monitoring Reports	lump	--	Included in Groundwater monitoring, below
Total Reporting Costs		**$40,000**	

Excavation

Description	Unit	Value	Notes
Excavation Quantities			
Shallow Area	sqft	20,000	Contaminated soil within paved area
Shallow Depth	feet	1	
Shallow Excavation Volume	cy	741	
Aggregate Excavation Volume	cy	741	
Cubic Yards to Tonnage Conversion Factor	tons/cy	1.5	
Aggregate Excavation Tonnage	tons	1,111	
Haz Waste Percentage	%	75%	Percentage to be refined based on TCLP results and profiling
Non-Hazardous Waste Percentage	%	25%	
Haz Waste Tonnage	tons	833	Disposal at Subtitle C landfill
Non-Hazardous Waste Tonnage	tons	278	Disposal at Subtitle D landfill
Excavation Costs			
Excavate and Load	$/ton	$10	Nominal Rate; includes contractor site control, dust control, standby
Transport to Landfill (either Subtitle D or C)	$/ton	$28.75	Cost per ton to transport; see also load flat rate cost, below)
Tons per load	tons/load	12	estimated tons per truck load
Per load Transport cost (flat rate)	$/load	$70	Total estimated number of truck trips
Pro-rated Transport Fee (based on flat-rate)	$/ton	$5.83	
Disposal Fees- Non-Hazardous Waste	$/ton	$22	Subtitle D landfill: Columbia Ridge
Disposal Fees- Hazardous Waste	$/ton	$75.63	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle D per ton cost	$/ton	$67	Subtitle D landfill: Columbia Ridge
Aggregate Subtitle D Disposal	$	$18,484	
Aggregate Subtitle C per ton cost	$/ton	$120	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle C Disposal	$	$100,176	
Backfill Procure and Place Backfill	$/cy	$25	Cost to procure and place 8 inches clean backfill;
Backfill Cost	$	$13,889	no geotechnical stabilization incl.
Total Soil Excavation & Disposal Cost	**$**	**$132,549**	
Disposal and Confirmation Characterization Costs			
Profile Review Fee		$750	At Landfill; $75 per profile
Confirmation Sampling Rate	cy/sample	24	1 sample per two truck loads at 12 cy/load
Number of Confirmation Samples	--	31	To be confirmed with disposal location
Confirmation Sample Cost	$/sample	$300	
Analytical costs		**$10,009**	
Excavation Observation Costs			
Geologist On Site	lump	$21,800	Assumes 3 weeks on site with office support

Containment Physical Elements

Description	Unit	Value	Notes
Containment Physical Elements			
Pavement Area	sf	28,500	See extent on Figure 7. Extends beyond contaminated area
Asphalt Install Rate	$/sf	$4.50	Install 4-inch asphalt surface
Asphalt Install Cost	$	$128,250	
Geotextile Barrier below clean fill	$/sf	$0.80	
Geotextile Area	sf	76	
Geotextile Area Cost	$	$61	
Patch Aircraft Tarmac Cracks	lump	$10,000	Existing large cracks in airport parking area
Sum of Containment Elements		**$138,311**	
Asphalt Maintenance			
Inspection and Maintenance	Total	**$49,671**	90 year NPV-adjusted estimate

Groundwater Treatment

Description	Unit	Value	Notes
Zero Valent Iron Bench Testing			
Collect Samples	lump	$6,000	Assume coring methods by direct push.
Analytical and Reporting	lump	$15,000	Test with multiple types ZVI, and analytical, letter report
Total Well Costs		**$21,000**	
Zero Valent Iron Implementation			
Final dosing design	lump	$2,500	See Note 1. Years 1-30
Drilling/Injection	lump	$27,000	15 days at $1800/day (assumes 3 locations/day)
Injection Materials	$/lb	$20	Nominal cost per pound based on Gavaskar et al. (2005)
Dosing Rate	lbs ZVI/cy	12.08	Target is 0.4% by mass
Volume	cy	1778	Approximately 10 by 350 by 10 ft volume as barrier
Material Cost	**$**	**$429,511**	Estimated cost assuming 12 lbs ZVI per cy
Observation and Technical Support			
Geologist observation & support	lump	$5,000	Assumes 2 trips to site and other support by phone
Implementation Cost	**$**	**$450,511**	Not adjusted for inflation or net present value

Groundwater Monitoring

Description	Unit	Value	Notes
Monitoring Well Install and Remove			
Install additional wells (2)	lump	$20,000	Assume 2 sand and gravel aquifer wells screened 35 to 45 feet
Total Well Costs		**$20,000**	
Long Term Groundwater Monitoring			
60 years groundwater monitoring	ref	**$145,039**	NPV adjusted, see Table A6

Institutional Controls

Description	Unit	Value	Notes
Institutional Controls			
Draft and File Environmental Covenant	Lump	$5,000	
Amend Lease Language	Lump	$1,000	Does not include possible adjustment to lease rate.
Sum of Institutional Controls		**$6,000**	

Description	Unit	Value	Notes
Sum of Direct Expenses	$	$973,890	
Contingency Rate	%	25%	
Contingency Amount	$	$243,472	
Total Estimated Alternative Cost	**$**	**$1,217,000**	*Rounded to nearest thousand dollars*

Notes:

Estimated costs do not adjust for inflation or net present value (NPV) unless specifically stated.

Table A5. Alternative 5: Targeted Excavation with Containment

Sunnyside Municipal Airport Pesticide Spray Shed, Sunnyside, Washington

Remediation Costs

Reporting

Description	Unit	Value	Notes
Engineering Design Report / Bid Specs	lump	$15,000	Design documents
Compliance Monitoring Plan	lump	$5,000	Describes Groundwater Monitoring Plan
Remedial Action Report	lump	$20,000	Documentation of remedial action
Groundwater Monitoring Reports	lump	--	Included in Groundwater monitoring, below
Total Reporting Costs		**$40,000**	

Excavation

Description	Unit	Value	Notes
Excavation Quantities			
Shallow Area	sqft	27,500	
Shallow Depth	feet	3	
Shallow Excavation Volume	cy	3,056	
Aggregate Excavation Volume	cy	3,056	
Cubic Yards to Tonnage Conversion Factor	tons/cy	1.5	
Aggregate Excavation Tonnage	tons	4,583	
Haz Waste Percentage	%	25%	Percentage to be refined based on TCLP results and profiling
Non-Hazardous Waste Percentage	%	75%	
Haz Waste Tonnage	tons	1,146	Disposal at Subtitle C landfill
Non-Hazardous Waste Tonnage	tons	3,438	Disposal at Subtitle D landfill
Excavation Costs			
Excavate and Load	$/ton	$10	Nominal Rate; includes contractor site control, dust control, standby,
Transport to Landfill (either Subtitle D or C)	$/ton	$28.75	Cost per ton to transport; see also load flat rate cost, below)
Tons per load	tons/load	12	estimated tons per truck load
Per load Transport cost (flat rate)	$/load	$70	Total estimated number of truck trips
Pro-rated Transport Fee (based on flat-rate)	$/ton	$5.83	
Disposal Fees- Non-Hazardous Waste	$/ton	$22	Subtitle D landfill: Columbia Ridge
Disposal Fees- Hazardous Waste	$/ton	$75.63	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle D per ton cost	$/ton	$67	Subtitle D landfill: Columbia Ridge
Aggregate Subtitle D Disposal	$	$228,743	
Aggregate Subtitle C per ton cost	$/ton	$120	Subtitle C landfill: Chemical Waste Management
Aggregate Subtitle C Disposal	$	$137,742	
Backfill Procure and Place Backfill	$/cy	$25	Cost to procure and place clean backfill; no geotechnical stabilization
Backfill Cost	$	$76,389	
Utility Disconnect/Reconnect	$	$10,000	Cost to handle electrical and water utilities in excavation area
Total Soil Excavation & Disposal Cost	**$**	**$452,874**	
Disposal and Confirmation Characterization Costs			
Profile Review Fee		$750	At disposal landfill; $75 per profile; assume 10 profiles.
Confirmation Sampling Rate	cy/sample	24	1 sample per two truck loads at 12 cy/load
Number of Confirmation Samples	--	127	To be confirmed with disposal location
Confirmation Sample Cost	$/sample	$300	
Analytical costs		**$38,944**	
Excavation Observation Costs			
Geologist On Site	lump	$20,300	Assumes 3 weeks on site with office support

Containment Physical Elements

Description	Unit	Value	Notes
Containment Physical Elements			
Soil Stabilization Mobilization Costs	lump	$40,000	Assumed cost for mobilization and contractor PM expenses
Pavement/Amendment Area	sf	40,444	See extent on Figure 3-3. Extends beyond contaminated area
Amendment Depth	ft	1	
Amendment Volume	cy	1,498	
Amendment Rate	%	5.0%	Assumed rate to be confirmed by geotechnical engineer
Amendment Quantity	tons	127.3	at 1.7 tons/cy
Amendment Unit Cost	$/ton	$130	
Amendment Cost	$	$16,552	
Amendment Application Cost	$/sy	$15	
Amendment Application Cost	$	$67,407	
		$123,959	
Asphalt Install Rate	$/sf	$3.50	Rate assuming 2 inch cover
Asphalt Install Cost	$	$141,554	
Patch Aircraft Tarmac Cracks	lump	$5,000	
Sum of Containment Elements		**$146,554**	
Asphalt Maintenance			
Maintenance Elements	**Total**	**$49,671**	NPV adjusted value over 90 years.

Groundwater Monitoring

Description	Unit	Value	Notes
Monitoring Well Install and Remove			
Install additional wells (2)	lump	$20,000	Assume 2 additional wells.
Total Well Costs		**$20,000**	
Long Term Groundwater Monitoring			
90 years groundwater monitoring	ref	$156,129	Includes NPV adjustment; see Table A6 for details

Institutional Controls

Description	Unit	Value	Notes
Institutional Controls			
Draft and File Environmental Covenant	Lump	$10,000	
Amend Lease Language	Lump	$1,000	Does not include possible adjustment to lease rate.
Sum of Institutional Controls		**$11,000**	

Description	Unit	Value	Notes
Sum of Direct Expenses	$	$1,059,431	
Contingency Rate	%	25%	
Contingency Amount	$	$264,858	
Total Estimated Alternative Cost	**$**	**$1,324,000**	Rounded to nearest thousand dollars

Notes:

Estimated costs do not adjust for inflation or net present value (NPV) unless specifically stated.

Appendix B. Supplemental Materials

Data Summary

This appendix summarizes data collected during the Remedial Investigation with comparison to revised screening levels, and expanded discussion of reporting limits, detection frequency, and exceedance of screening levels. This section also responds to select Ecology comments on the draft Focused Feasibility Study (FFS) that were not appropriate to discuss in the main FFS text (Ecology, 2017; PGG, 2015).

Revised Screening Levels

Screening levels were revised to practical quantitation limits (PQLs) for constituents where the Applicable or Relevant and Appropriate Requirement (ARAR) based level was below the PQL. These values were then used to update exceedances in summary tables. ARAR values were not adjusted. Revised screening level tables are attached.

Laboratory data reports include sample-specific reporting limits. Reporting limits vary between samples based on matrix interferences and analytical configuration; labs periodically update their PQLs based on analysis of standards and control samples to reflect actual ongoing results. The laboratory reporting limit varied both above and below the PQL used to assign screening levels. In some cases, reporting limits were above the standard laboratory PQL and also above screening levels.

Field Logs

Field logs for borings almost exclusively log sandy silt in the upper silt unit. Therefore, boring logs were not produced for each field location during the Remedial Investigation (PGG, 2014). Boring logs and well construction diagrams were prepared for monitoring wells and included in the RI. Field logs for borings and subsequent sampling are included as supplemental materials to this FFS.

References

Ecology, 2017. *Ecology Comments on DRAFT Feasibility Study for Sunnyside Municipal Airport Pesticide Spray Shed*. January 20, 2017.

Pacific Groundwater Group, 2014. *Sunnyside Municipal Airport Pesticide Spray Shed Remedial Investigation*. Prepared for the City of Sunnyside. December 8, 2014.

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Boring Location: **SP-1**

2/5/14

Boring ____ Date 2/5/14 Sheet __ of __
Job 561201 ____ Job No ____
Logged by GSV Weather Cold
Drilled by/Method GSV
Sampling Method ________

Water Content	Color	Size % G (Max)	Size % S (Range)	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
						0			[illegible] GRAVEL. Brown Damp to Moist v.fine sandy SILT.	0
						1				1
					▨	2	0			2
							60%			
						3				3
						4				4
					▨	5				5
							0		Brown Damp to Moist v.fine sandy SILT.	
						6				6
						7				7
						8				8
									BOH	
						9				9
						10				0
						1				1
						2				2
						3				3
						4				4
						5			SP-1-2 - 1335	5
									SP-1-5 - 1340	
						6				6
						7				7
						8				8
						9				9
						0				0

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Boring Location:

SP-2

Boring ____ Date 3/5/11 Sheet __ of __
Job JG1201 Job No.
Logged by Weather
Drilled by/Method
Sampling Method

REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.

SUMMARY LOG

Water Content	Color	Size % G	S	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	Remarks
						0			Sandy GRAVEL
						2			Brown Damp v.fine sandy SILT
						5			Damp brown v.fine sandy SILT
						7			Moist
						8			BOH

SP-2-1.8 - 1130
SP-2-4 - 1135

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[illegible] FAX [illegible]

Ground Water

Boring Location: **SP-3**

Boring ______ Date [illegible] Sheet __ of __
Job [illegible] Job No. [illegible]
Logged by [illegible] Weather Cold
Drilled by/method ______
Sampling method ______

Water Content	Color	Size % G (Max.)	Size % S (Range)	Size % F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
						0			Brown Gravel	0
						1			Brown Damp to Moist Fine Sandy SILT	1
						2				2
						3				3
						4				4
						5				5
						6				6
						7				7
						8			Soil	8
						9				9
						0			Soil screen 8-18ft	0
						1			1 inch PVC temp. Screen	1
						2				2
						3				3
						4			Screening Sample	4
						5				5
						6				6
						7			SP-3-8 - 1055	7
						8			SP-3-16 - 1105	8
						9				9
						0				0

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Boring Location:

SP-4

Boring ___ Date ___ Sheet ___ of ___
Job ___ Job No. ___
Logged by ___ Weather ___
Drilled by/Method ___
Sampling Method ___

Water Content	Color	Size % (Gr S F, Max. Range)	Sample Number	Depth	Sample Recovery	Penetration resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
D	Br			0–2			Gravelly SILT. Brown, low plastic, w/ fine sandy SILT. Dry, no odor or sheen.	SILT
M				2–4				
W				5			Moist/wet	
M				6			Brown Moist Silt w/ fine SAND	Silt Sand
				9			Bott	
				16			SP-4 1.5 = 1300 SP-4 4.0 = 1305	

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Boring Location:

Boring ____ Date ____ Sheet ___ of ___
Job ____ Job No. ____
Logged by ____ Weather ____
Drilled by/Method ____
Sampling Method ____

SP-5

Water Content	Color	Size % G S F (Max. Range)	Sample Number	Depth	Sample Recovery	Penetration resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
				0			Brown, Damp v. fine sandy SILT w/ ...	0
				2				2
				5			Brown Moist ... sandy SILT ...	5
				6				6
				10				0
				12			1725 = ... / 250 = ...	2
				20				0

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Boring Location:

SP-6

Boring ____ Date ____ Sheet ____ of ____
Job ____ Job No. ____
Logged by ____ Weather ____
Drilled by/Method ____
Sampling Method ____

Water Content	Color	Size % G S F (Max. Range)	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
				0				0
				1			Brown, Damp, fine sandy SILT	1
				2				2
				3				3
				4				4
				5				5
				6	O		Damp / as above	6
				7				7
				8			Moist	8
				9				9
				0				0
				1				1
				2				2
				3				3
				4				4
				5				5
				6			SP-6-13 - 1225	6
				7			SP 6 - U 1 - 1240	7
				8			2/5/14	8
				9				9
				0				0

PgG

Boring Location:

Sp-7

Boring ___ Date ___ Sheet ___ of ___
Job ___ Job No. ___
Logged by ___ Weather ___
Drilled by/Method ___
Sampling Method ___

Water Content	Color	Size % G S F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
Damp	lt brown			0			damp, light brown, fine sandy, gravelly SILT	SILT
				1			Damp light brown, fine sandy SILT	
	oxides		X	2			debris, metal, ceramics, discoloring oxides	
	lt brown			3–4				
			X	5				
			X	6–7			Damp, light brown fine SAND	fine SAND
				8			BOH 8'	

Sp-7-18-S @ 13:40 and 50"
Sp-7-40-S @ 13:45 and 76"
Sp-7-30-S @ 13:50 and 30"

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Boring Location: **SP-8**

Grand View

Boring ____ Date ____ Sheet __ of __
Job ____ Job No. ____
Logged by ____ Weather ____
Drilled by/Method ____
Sampling Method ____

REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.

SUMMARY LOG

Water Content	Color	Size % G, S, F	Sample Number	Depth	Description	Summary Log
dry lt				0	dry, lt brown, silty, sand, GRAVEL	FILL
damp brown				1	damp lt brown (mottled) (debris) gravelly, fine sandy SILT	FILL
brown			X	2	damp light brown fine sandy, SILT gravel observed locally	SILT
damp to moist	lt brown	60 40		5	Damp light brown, silty, fine SAND	SAND
		40 60	X	6	Damp light to brown, fine sand, SILT to moist	SILT
wet		40 60		10	wet lt brown, fine sand, SILT	
damp		75 25	X	12	damp lt brown silty fine SAND	SAND
wet		40 60		13	wet lt brown sandy, SILT	SILT
damp		45 55		14	damp, lt brown, fine sandy SILT	
wet		75 25		15	wet lt brown silty fine SAND	SAND
		10 90		18	damp to moist, lt brown, fine sandy, SILT	SILT

SP-8-S-18 @ 09:26 and 18"
SP-8-S-40 @ 09:30 and 72"
SP-8-S-#44 @ 9:

BOH - 20 Ft

Screen 11-21' 1" Sch 80 10 slot natural pack

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Boring Location:

Sp-9

Boring ____ Date ____ Sheet ____ of ____

Job ____ Job No. ____

Logged by ____ Weather ____

Drilled by/Method ____

Sampling Method ____

Water Content	Color	Size % G S F (Max Range)	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
	lt brown			0			Damp, light brown gravelly, SILT	0
Damp			X	1			Damp light brown fine sandy, SILT increasing sand with depth	1
				2				2
				3				3
				4				4
Moist			X	5				5
				6				6
				7				7
				8			BOH	8
				9				9
				10				0
				1				1
				2			Sp-9-S-.8 13:30 @ 18"	2
				3			Sp-9-S-40 13:35 @ 6'	3
				4				4
				5				5
				6				6
				7				7
				8				8
				9				9
				20				0

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Boring Location:

Sp-10

Boring ____ Date ____ Sheet ___ of ___

Job ____ Job No. ____

Logged by ____ Weather ____

Drilled by/Method ____

Sampling Method ____

Water Content	Color	Size % G	S	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
		20	50	30		0			Damp, lt brown, gravelly, silty, fine SAND	0
			15	85	^	1			Damp light brown, fine sandy, SILT	1
						2				2
						3				3
						4				4
damp	lt brown		55	45		5			Damp, lt brown, silty, fine SAND	5
			20	80	X	6			Damp lt brown, fine sandy, SILT	6
						7				7
						8			Bott 8'	8
						9				9
						0			Sp-10-S-18 @ 14:00 @ 18"	0
						1			Sp-10-S-40 @ 14:05 @ 72"	1
						2				2
						3				3
						4				4
						5				5
						6				6
						7				7
						8				8
						9				9
						0				0

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Boring Location:

SP-11

Boring ___ Date ___ Sheet ___ of ___
Job ___ Job No. ___
Logged by ___ Weather ___
Drilled by/Method ___
Sampling Method ___

Water Content	Color	Size % G. S F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
dry	lt brown	70 20 10		0			dry, silty, fine sandy, GRAVEL	0 fill
damp		35 65	X	1			Damp light brown, fine sandy, SILT	1 SILT
moist to wet		30 70		7				
		80 20	X	8			moist to wet, light brown, silty, fine SAND	fine SAND
							BO H	

SP-11-18-S @ 14:25 and 24"
SP-11-40-S @ 14:30 80"

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Boring Location:

Boring ___ Date 2014 Sheet ___ of ___
Job ___ Job No. ___
Logged by TK Weather ___
Drilled by/method ___
Sampling method ___

SP-12

Groundwater

Water Content	Color	Size % G	S	F	Sample Number	Depth	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
damp	lt brown	45	25	30		0	Damp, lt brown, fine sandy, silty, GRAVEL	0 - fill
damp	lt brown		45	55		1	Damp, lt brown, fine sandy, SILT - cobble broken (light discoloration, mottling?)	SILT
					X			
						2		
						3		
						4		
						5		
					X	6	damp, lt brown, silty, fine SAND faint mottling (Fe oxide)	6 SAND
			75	25				
			40	60		7	damp, lt brown, fine sandy, SILT	7 SILT
						8		
						9		
						10		
					X	11	water on drill rods at 11' bgs	
			35	65			wet, light brown, fine sandy, SILT (petroleum odor and sheen at 10', smell down to ≈ 14' bgs)	Screen 10-20' Sch 80 1" 10-slot natural pack
						12		
					X	13		
						14		
			25	75			moist, lt brown, fine sandy, SILT	
						15		
						16	wet, lt brown, fine sandy, SILT	
			40	60				
			30	70		17	damp, lt brown, fine sandy, SILT	
						18		
					X	19		
						20	BOH 20'	

SP-12-230-S @ 12:00 and 230-240 SP-12-122-S @ 12:40 / SP-12-144-S @ 11:45
SP-12-18-S @ ... SP-12-... -S@ ...

PGG

Boring Location:

SP-13

Date 2/4/ | Job Sunnyside | Job No. | Logged by | Weather Cold | Drilled by/Method | Sampling Method

REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.

SUMMARY LOG

Water Content	Color	Size % G	S	F	Sample Number	Depth	Remarks	Summary Log
dry	lt brown					0	Dry to damp, lt brown, silty GRAVEL	FILL
damp			40	60	X	1	Damp, lt brown, fine sandy SILT	SILT
						5	drilling harder after @ 5.5'	
							damp to moist, lt brown, slightly fine sandy SILT	
moist			30	70	X	6		SAND
			80	20		7	damp to moist, lt brown, slightly silty, fine SAND	SILT
			30	70			damp to moist, lt brown, fine sandy SILT	
						8	clayey, SILT	
							EOB	

SP-13-18-S @ 14:55 and 18"

SP-13-40-S @ 15:00

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Boring Location: **SP-14**

Boring ___ Date 2/5/14 Sheet ___ of ___
Job Sunnyside ___ Job No. JY1201
Logged by JTK Weather Cold
Drilled by/Method ___
Sampling Method ___

Water Content	Color	Size % G	S	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
Damp						0			Surface organics	0 SILT
			30	70					Damp, lt brown, fine sandy, SILT	
					X	1–5				1–5
			75	25	X	6			Damp lt brown, silty fine SAND	6 SAND
			25	75		7			Moist, lt brown slight clayey, fine sandy, SILT	7 SILT
wet			45	55		8			Wet, light brown, fine-med sandy, SILT	8
						9			BoH	9

SP-14-18-S @ 15:25 and 18"
SP-14-40S @ 15:30 and 72"

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Boring Location:

SP-15

Boring ___ Date 9/5/14 Sheet ___ of ___
Job ___ Job No. JG12__
Logged by ___ Weather Cool
Drilled by/Method ___
Sampling Method ___

Water Content	Color	Size % G S F (Max Range)	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
dry		30 70		0			dry light brown, fine sandy, SILT	0 SILT
damp				1			damp light brown fine sandy SILT	1
			X	2				2
				3				3
				4				4
				5				5
		10 90 +		6			wet lt brown slightly fine SAndy SILT	6
wet				7				7
				8				8
				9			BoH	9
				0				0
				1				1
				2			SP-15-S-18 @ 15:45 and 18" SP-15-S-40" @ 15:50 and 72"	2
				3				3
				4				4
				5				5
				6				6
				7				7
				8				8
				9				9
				0				0

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Boring Location: 2/5

SP-16

Groundwater

Boring | Date 2/5/17 | Sheet | of

Job Swinomish | Job No. JG1601

Logged by [redacted] GW | Weather Cold

Drilled by/Method ESN

Sampling Method

Water Content | Color | Size % (G S F, Max. Range) | Sample Number | Depth | Sample Recovery | Penetration Resistance

REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.

SUMMARY LOG

0 — Dark brown, v.f. sandy SILT — SILT

D. Br. 10 90 (1–2)

5–6 — Dark brown, v.f. sandy SILT (D. Br. 10 90)

11 — brown v.f. sandy SILT (S)

13–14 — SILT

17–18 — SP-16-12-S 1608

Screen 10.5-20.5

SP-16-18-S 1600

SP-16-20-S 1605

20

Refusal @ 20.5 ft bgs. -> feels like Rock.

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SP-3

Sample #:

Project Number:
Project Name:
Project Address:
Client Name:
Date: 2/5/14
Location:
Sampled By: TWH
Purged By: TWH

Casing Diameter: 1" ✓ 2" 4" 6" **Other**

Depth to Water (feet): ?
Depth of Well (feet): 16'
Reference Point (surveyors notch, etc.): TP
Day/Time Sampled:
Purge Volume Measurement Method: bucket
Date Purged: 2/5/14
Purge Time (from/to):
Water Level Probe Used: none

Purge Volume Calculation: ($\pi r^2 h$)(7.48 gal/ft³)(3 casing volumes)
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.95)(h); 6" = (4.41)(h)
Calculated Purge Volume (gallons):
Actual Purge Volume (gallons):

Q = 25 mL/min

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	ODOR	OTHER ORP/Temp
12:17	20.25	7.18	—	lt brown	very high	none	80/5.5
12:21	20.25	7.24	682	"	"	"	64/5.6
12:30	20.25	7.24	676	"	"	"	63/6.1

Purging Equipment: peristaltic
Sampling Equipment: peristaltic

Laboratory: Onsite
Chain-of-Custody (yes/no): yes
Shipment Method:
Date Sent to Lab:
Field QC Sample Number:
Split with (names/organizations):

Well Integrity:

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
4-6	1 L Alt	none	none	
1-2	500mL Alt	HCl	none	
3	40 mL VOA	HCl	none	

Signature:

Page ___ of ___

PgG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SP-8

Sample #:

Project Number: 2G 1251
Date: 2/6/15
Project Name: Sunnyside Pesticide
Location: Sunnyside Airport
Project Address:
Sampled By: GSI WS Tuk
Client Name:
Purged By: GSI WS Tuk

Casing Diameter: ✓ 2" ___ 4" ___ 6" ___ **Other** ___

Depth to Water (feet):
Purge Volume Measurement Method:
Depth of Well (feet):
Date Purged:
Reference Point (surveyors notch, etc.):
Purge Time (from/to):
Day/Time Sampled:
Water Level Probe Used:

Purge Volume Calculation: ($\pi r^2 h$)(7.48 gal/ft³)(3 casing volumes)
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.96) (h); 6" = (4.41) (h)
Calculated Purge Volume (gallons):
Actual Purge Volume (gallons):

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	ODOR/ORP	~~OTHER~~ Temp
	0.25	7.69	831	lt brown	heavy	none/-123	11.5
	1.25	7.90	780		256	none/-47	14.2

Purging Equipment: peristaltic
Sampling Equipment: peristaltic

Laboratory: Onsite
Date Sent to Lab:
Chain-of-Custody (yes/no):
Field QC Sample Number:
Shipment Method:
Split with (names/organizations):

Well Integrity:

Quantity:	Container:	Preservatives:	Filtered **(type):**	Remarks:
6	1L AG	none	no	
8	500 AG	HCL	no	
3	VOA	HCL	no	

Signature: [signature]

Page 1 of 1

PGG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SP-12

Sample #: ______

Project Number: JGr 1201
Project Name: Sunnyside pesticide
Project Address: ______
Client Name: ______
Date: 2/6/14
Location: ______
Sampled By: GSW & TWH
Purged By: " "

Casing Diameter: 1" ✓ 2" ______ 4" ______ 6" ______ **Other** ______

Depth to Water (feet): ______
Depth of Well (feet): ______
Reference Point (surveyors notch, etc.): ______
Day/Time Sampled: ______
Purge Volume Measurement Method: ______
Date Purged: ______
Purge Time (from/to): ______
Water Level Probe Used: ______

Purge Volume Calculation: ($\pi r^2 h$)(7.48 gal/ft^3)(3 casing volumes)
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.96) (h); 6" = (4.41) (h)
Calculated Purge Volume (gallons): ______ Actual Purge Volume (gallons): ______

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	ODOR	OTHER Temp
		7.58	1556	lt brown	really heavy	diesel/?	11.4

Purging Equipment: Peristaltic
Sampling Equipment: peristaltic

Laboratory: Onsite
Chain-of-Custody (yes/no): yes
Shipment Method: ______
Date Sent to Lab: ______
Field QC Sample Number: ______
Split with (names/organizations): ______

Well Integrity: ______

Quantity:	Container:	Preservatives:	Filtered **(type):**	Remarks:
6	1L AGr	none	no	High turbidity slight petroleum
2	500mL AGr	HCl	no	odor (more diesel than gasoline)
3	VOA	HCl	no	

Signature: ______ Page ______ of ______

PGG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SP-16

Sample #:

Project Number: 261201 — Date: 2-5-14
Project Name: Sunnyside Post Rich — Location: Sunnyside Airport
Project Address: Airport — Sampled By: MBS w/ TK
Client Name: City Sunnyside — Purged By:
Casing Diameter: 2" ___ 4" ___ 6" ___ Other: SCH80 10' Slot Tendwell w/ 2" BH Screen 11–21 ft bgs.

Depth to Water (feet): @ 11.5 — Purge Volume Measurement Method:
Depth of Well (feet): 21 — Date Purged:
Reference Point (surveyors notch, etc.): — Purge Time (from/to):
Day/Time Sampled: — Water Level Probe Used:

Purge Volume Calculation: (cfh)(7.48 gal/ft³)(3 casing volumes)
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.96)(h); 6" = (4.41)(h)
Calculated Purge Volume (gallons): — Actual Purge Volume (gallons):

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	~~ODOR~~ ORP	~~OTHER~~ T
1757	.01	7.17	1432	Brown	High	-10	11.0
1810		7.21	1251	Tan	"	47	12.4

Purging Equipment: Peristaltic Teflon Tubing — Sampling Equipment: Teflon Tubing

Laboratory: On Site — Date Sent to Lab: 2/6
Chain-of-Custody (yes/no): yes — Field QC Sample Number:
Shipment Method: Drop — Split with (names/organizations):

Well Integrity: — @ 1800 2/5/14

Quantity	Container	Preservatives	Filtered (type)	Remarks
6	AG	—	—	1L
2	AG	HCl	—	500mL
3	VOA	HCl	—	40mL
11		Centerline		

Signature: [signature]

Page 1 of 1

PGG

PgG Pacific groundwater group
2377 Eastlake Ave E, Suite 200
Seattle, Washington 98102
206.329.0141 FAX 206.329.6968

Boring Location: SP-32

Boring SP-32 Date [illegible] Sheet 1 of 2
Job [illegible] Job No. [illegible]
Logged by [illegible] Weather [illegible]
Drilled by/Method [illegible]
Sampling Method [illegible]

Water Content	Color	Size % G	S	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
									SPT probe runs	
						0			[illegible] GRAVEL (fill)	0
						1			Brown Moist [illegible] sandy SILT	1
						2				2
						5			Brown Moist [illegible] sandy SILT	5
						7			Brown Moist-Wet, fine silty SAND	7
						8			[illegible]	8
						9			Brown Wet [illegible] sandy SILT	9
						10			Brown [illegible] sandy SILT	10
						12			Brown [illegible] sandy SILT	12
						13			[illegible]	13
						16			SAND [illegible]	16
						17			[illegible]	17
						19			[illegible]	19
						20			SILT / SAND [illegible]	20

PgG PACIFIC GROUNDWATER GROUP
2377 Eastlake Ave. E, Suite 200
Seattle, Washington 98102
206.329.0141 FAX 206.329.6968

Boring Location: SP-33
5765 S
227 W

Boring ______ Date ______ Sheet ___ of ___
Job ______ Job No. ______
Logged by ______ Weather ______
Drilled by/Method ______
Sampling Method ______

Water Content	Color	Size % G	S	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
		Max. Range								
						10				0
						1				1
						2				2
						3				3
						4				4
						5				5
						6				6
						7				7
						8				8
						9				9
						10				10
						1				1
						2				2
						3				3
						4				4
						15				15
						6				6
						7				7
						8				8
						9				9
						20				20

DTW = 14.16 ft below → drill case
Depth Measurements @ 1225 & 1230.
SWL

TOC = ~4.05 ft above ground surface. 4.05

5.2ft SW of MW-3
SWL @ MW-3 = 9.22 below TOC

MW-3:
TOC = 0.50 below

4.5' = Top Drilled to top PVC well

14.16
4.5
9.66

GW Scan @ SP-31 @ 36-40ft
@ SP-32-40 @ 36-40 1445
@ SP-32-20 @ 16-20 (PVC) 1550

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-1

Sample #: ___

MW-1

Project Number: SG1201 | Date: 3/31/14
Project Name: [illegible] | Location: [illegible]
Project Address: [illegible] | Sampled By: JSL
Client Name: [illegible] | Purged By: JSL

Casing Diameter: 2" X 4" ___ 6" ___ Other ___

Depth to Water (feet): 10.56 | Purge Volume Measurement Method: [illegible]
Depth of Well (feet): 20 | Date Purged: 3/31
Reference Point (surveyor's notch, etc.): [illegible] | Purge Time (from/to): [illegible]
Day/Time Sampled: 3/31/14 1300 | Water Level Probe Used: [illegible]

Purge Volume Calculation: ($\pi r^2 h$)(7.48 gal/ft³)(3 casing volumes) = 4.44
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.96)(h); 6" = (4.41)(h)
Calculated Purge Volume (gallons): 4.7 | Actual Purge Volume (gallons): ___

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	~~ODOR~~ T	~~OTHER~~ ORP
1227	[illegible]	7.45	966		[illegible]	14.6	
[illegible]	1.0	7.60	946			14.2	159
[illegible]	1.5	7.75	—			[illegible]	170
223	2.0	[illegible]	946		[illegible]	[illegible]	163
230	2.5	7.75	932			14.2	—
1236	3.0	7.74	925			14.5	156
234	3.25	7.74	926			14.3	154

[illegible]

Purging Equipment: [illegible] | Sampling Equipment: ___

Laboratory: [illegible] | Date Sent to Lab: 4/1/14
Chain-of-Custody (yes/no): yes | Field QC Sample Number: ___
Shipment Method: Courier | Split with (names/organizations): ___

Well Integrity: New, Good.

@ 1300

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
6	L	—	X	[illegible]
3	VOA	HCl		TPH
2	[illegible]	HCl		
[illegible]				

Signature: JSL

Page ___ of ___

PGG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-2
MW-2
Sample #:

Project Number: [illegible] Date: 3/31/14
Project Name: [illegible] Location: [illegible]
Project Address: [illegible] Sampled By: GSW
Client Name: [illegible] Purged By: GSW

Casing Diameter 2" X 4" 6" Other

Depth to Water (feet): 10.95 Purge Volume Measurement Method:
Depth of Well (feet): 20 Date Purged: 3/31/14
Reference Point (surveyors notch, etc.): Purge Time (from/to): 1320 →
Day/Time Sampled: 1430 Water Level Probe Used:

Purge Volume Calculation: [illegible] (πr²h)(7.48 gal/ft³)(3 casing volumes)
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.96)(h); 6" = (4.41)(h)
Calculated Purge Volume (gallons): 4.5 Actual Purge Volume (gallons):

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	~~ODOR~~ ORP	~~OTHER~~ T
1330	0.25	7.73	[illegible]			14	[illegible]
1337	1.0	7.67	1004		light	138	14.6
1344	1.75	7.66	1004			116	14.8
1348	2.25	7.68	1005		"	150	14.4
1353	2.75	7.69	1005				14.5

Purging Equipment: [illegible] Sampling Equipment: Same

Laboratory: OnSite [illegible] Date Sent to Lab: 4/1/14
Chain-of-Custody (yes/no): Field QC Sample Number:
Shipment Method: [illegible] Split with (names/organizations):

Well integrity: [illegible] @1430 [illegible]

Quantity	Container	Preservatives	Filtered (type)	Remarks:
6	[illegible]	—	—	
2	[illegible]	HCl	—	
3	Vol		—	
[illegible]				

Signature: GSW Page 1 of 1

PGG

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: MW-3

Sample #:

MW-3

Project Number:	[illegible]	Date:	3/31/14
Project Name:	[illegible]	Location:	[illegible]
Project Address:	[illegible]	Sampled By:	GS
Client Name:	[illegible]	Purged By:	

Casing Diameter: 2" X 4" ____ 6" ____ Other ____

Depth to Water (feet):	15.26	Purge Volume Measurement Method:	[illegible]
Depth of Well (feet):	20	Date Purged:	3/31/14
Reference Point (surveyors notch, etc.):		Purge Time (from/to):	1430 [illegible]
Day/Time Sampled:	3/31/14 1500	Water Level Probe Used:	

Purge Volume Calculation: 4.74 (ft of h) / 48 gal/ft³ (3 casing volumes)
Purge Volume (gallons) for 2" = (0.49)(h); 4" = (1.96)(h); 6" = (4.41)(h)
Calculated Purge Volume (gallons): 4.7
Actual Purge Volume (gallons):

TIME (2400 hr)	CUMULATIVE VOLUME (gal)	pH (units)	EC (umhos/cm 25 c)	COLOR (visual)	TURBIDITY (visual)	ORP	OTHER
1437	0.4	7.61	2020	[illegible]	[illegible]	200	4.5
1441	1.0	7.54	2510			191	4.4
1447	1.6	7.45	2480		[illegible]	160	4.0
1454	2.25	7.52	2600		[illegible]	183	4.7
1457	2.5	7.50	2460			165	4.6

Purging Equipment: [illegible] | Sampling Equipment:

Laboratory:	[illegible]	Date Sent to Lab:	4/1/14
Chain-of-Custody (desired):		Field QC Sample Number:	
Shipment Method:	Courier	Split with (names/organizations):	

Well Integrity: OK [illegible]

Quantity	Container	Preservatives	Filtered (type)	Remarks
6	[illegible]	—	—	[illegible] + TPH
2	[illegible]		—	
3	VOA	HCl	—	
[illegible]				

Signature: [illegible]

Page 1 of 1

PGG

Slugtest Manual Depth
3/31/2014

SMW-1	SMW-2
DTW = 10.55 @ 15:59:00	[illegible]
Slug in 16:03:30	10.46 @ 15:[illegible]:00
10.46 @ 16:00:30	In @ 16:25:00
16:00:30 10.52	10.55 @ 16:26:15
16:[illegible]:00 10.[illegible]	[illegible] @ 16:27:30
Pull Slug @ 16:20:00	11.08 @ 16:32:00
10.73 @ 16:20:45	11.[illegible] @ 16:36:00
10.65 @ 16:20:20	10.[illegible] @ 16:50:00
10.60 @ 16:24:30	[illegible]
10.63 16:30:00	
10.61 @ 16:35:20	
[illegible]	

Sunnyside UL Snapshot 5/9/2014

	DTW	Time	
Culvert	4.4-4.6	1107	— Approx +/- [illegible]
Weir	2.70	1110	— [illegible] Metal Bracket | [illegible]
SMW-1	9.85	1055	
SMW-2	10.24	1057	
SMW-3	9.66	1101	

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-1

Sampling Event: 201508 Well 1

Sample #: ____

Project Number: 3G-1201	Date: 8-26-15
Project Name: Sunnyside Pesticide	Location: Airport
Project Address: Sunnyside Airport	Sampled By: GSW
Client Name: City of Sunnyside	Purged By:
Laboratory: Anatek	Date Sent to Lab: 8/27/15
Chain-of-Custody (yes/no): yes	Field QC Sample Number: —
Shipment Method: Courier	Sample Split: —

Depth to Water (feet): 10.32

Depth of Well (feet): —

Reference Point (surveyors notch, etc.): TOC

Sampling Equipment: Teflon tubing, Grundfos

Purge Volume Measurement Method:

Purge Date/Time: 1413 →

Purging Equipment: Dedicated

Water Level Probe Used: P6150

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf ; 4-inch = 1.97 gpf ; 6-inch = 4.41 gpf PVol = πr²h (7.48 gal/ft³)

Purge Volume = ft of water ____ x CVC ____ = ____ gallons Casing diameter (inch): 2

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp (C)	TURBIDITY (Visual / NTU)	ORP	DTW
1415	0.25	7.52	905	21.14	13.1	145	10.88
1420	0.8	7.49	905	21.08	7.1	145	10.92
1425	1.25	7.48	904	20.51	9.2	146	11.03
1430	1.6	7.47	905	20.23	0.3	145	11.02
1433	—	7.46	906	20.14	0.0	145	11.02
1436	1.4	7.46	904	20.07	0.0	145	—

Water Clear, no color

Well Integrity: Good

Bottle Inventory

Day/Time Sampled: 1436 8-26-15

Quantity:	Container:	Preservatives:	Filtered (type):	Remarks:
1	1L AG	No	No	Lab Container

Signature: GSW

PGG Page 1 of 1

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SW-2

Sampling Event: [illegible] Sample #:

Project Number: [illegible] Date: 8-26-15
Project Name: Sunnyside Pesticide Location: Sunnyside Airport
Project Address: Sunnyside Airport Sampled By: [illegible]
Client Name: [illegible] Purged By:
Laboratory: [illegible] Date Sent to Lab: [illegible]
Chain-of-Custody (yes/no): [illegible] Field QC Sample Number:
Shipment Method: [illegible] Sample Split:

Depth to Water (feet): [illegible] Purge Volume Measurement Method:
Depth of Well (feet): Purge Date/Time: 1305
Reference Point (surveyors notch, etc.): TOC Purging Equipment: Geopump
Sampling Equipment: Teflon Geopump Water Level Probe Used: [illegible]

Three-Casing Volume Constant (CVC): 2-inch = **0.48** gpf ; 4-inch = **1.97** gpf ; 6-inch = **4.41** gpf PV=(π r² h) (7.45 gal/ft³)
Purge Volume = ft of water ______ x CVC ______ = ______ gallons Casing diameter (ft/in):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	ORP	DO
1307	0.1	[illegible]	[illegible]	0.48	[illegible]	117	[illegible]
1313	0.8	7.41	940	18.21	0.0	152	9.90
1318	1.4	7.39	1020	18.16	0.0	155	10.94
1323	2.0	7.38	1010	18.24	0.0	157	10.97
1328	2.5	7.37	1010	18.16	0.0	158	10.91
1331	2.75	7.37	1010	18.16	0.0	158	10.91
1334	3.0	7.37	1010	18.23	0.0	159	—

DO > 0% [illegible] water clear, no color
[illegible] Dedicated [illegible]

Well Integrity: [illegible]

Bottle Inventory Day/Time Sampled: 8-26-15 1335

Quantity	Container	Preservatives	Filtered (type)	Remarks
1	[illegible]	[illegible]	[illegible]	[illegible]

Signature: GSW

PGG Page 1 of 1

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-8
Sampling Event: 2015 08
Sample #:

Project Number: [illegible]
Project Name: [illegible]
Project Address: [illegible]
Client Name: [illegible]
Laboratory: [illegible]
Chain-of-Custody (yes/no): yes
Shipment Method: [illegible]
Date: 8-26-2015
Location: [illegible]
Sampled By: GSL
Purged By:
Date Sent to Lab: 8/27/15
Field QC Sample Number: —
Sample Split: —

Depth to Water (feet): [illegible]
Depth of Well (feet):
Reference Point (surveyors notch, etc.): [illegible]
Sampling Equipment: [illegible]
Purge Volume Measurement Method:
Purge Date/Time: [illegible]
Purging Equipment: [illegible]
Water Level Probe Used: ✓

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf   PV=πr²h (7.48 gal/ft³)
Purge Volume = ft of water ___ x CVC ___ = ___ gallons   Casing diameter (ft/"): 2"

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp (C)	TURBIDITY (visual / NTU)	ORP	DTW
1158	0.1	7.42	2720	18.47	2.4	85	—
1204	0.6	7.35	2710	18.46	6.5	109	15.64
1208	—	7.33	2690	18.25	14.7	118	15.73
[illegible]	[illegible]	7.34	2670	18.42	22.8	24	15.73
[illegible]	1.75	7.33	2660	[illegible]	17.6	129	[illegible]
1220	[illegible]	7.33	2650	18.41	5.6	132	—
[illegible]	2.25	7.33	2650	18.43	[illegible]	135	—

[illegible]

Well Integrity: Good

Bottle Inventory   Day/Time Sampled: 8-26-15 1230

Quantity	Container	Preservatives, Filtered (type)	Remarks
7	AG 1L	—	Lab Centrifuge

Signature:

PgG Page 1 of 1

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-4

Sampling Event: 7 December 2015 Supplemental No 3.

Sample #:

Project Number:
Project Name: Sunnyside Airport
Project Address:
Client Name:
Laboratory: Onsite Env.
Chain-of-Custody (yes/no): yes
Shipment Method:

Date: 12/23/15
Location:
Sampled By: TWH
Purged By: TWH
Date Sent to Lab: 12/24/15
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.42
Depth of Well (feet): 43.30 + 0.29
Reference Point (surveyors notch, etc.): TOC North
Sampling Equipment: peristaltic

Purge Volume Measurement Method: bucket
Purge Date/Time: 12/23/15 12:40 -
Purging Equipment: Peristaltic
Water Level Probe Used: water mk ET

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf PV=(π r² h) (7.48 gal/ft³)

Purge Volume = ft of water ______ x CVC ______ = 2.15 gallons Casing diameter (inch):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp (C)	TURBIDITY (visual / NTU)	ORP	DTW
12:42	≥ 0.25	7.33	667.1	14.3	mod	-69	9.44
12:45	0.5	7.49	663.2	14.3	61.59	-59	9.44
12:53	1.00	7.52	660.7	14.1	28.23	-39	9.44
12:59	1.50	7.57	662.8	13.6	12.17	-17.5	9.45
13:05	2.00	7.60	662.3	13.5	10.63	-17	9.44
13:11	2.50	7.56	662.6	13.9	7.49	-27	9.45
13:15	2.75	7.55	662.0	13.9	7.36	-26	9.45
13:18	3.00	7.59	662.6	13.7	5.60	-20	9.45

TD felt soft on bottom (sediment) calibrated oakton 450 at 12:16
q = 300 ml/min
Tubing Pt off Bottom

Well Integrity: Total nitrate z Nitrite 0.3

Bottle Inventory

Day/Time Sampled: 12/23/15 13:25

Quantity	Container	Preservatives	Filtered (type)	Remarks
7	AG	None	no	Pesticides
2	250 HDPE	none	no	Nitrate Nitrite

Signature: [signature]

PGG Page 1 of 2

12-16-2015 NO_3 Recon

Sample/ Location	Bottle?	time	Depth	Test Strip
SP-34-36	Y	1000	35	~20 - Photo
-"-	Y	1020	11-15	5-10 mg/L
SP-35-11	Y	1100	11-15	~5 mg/L → [illegible]
SP-36-11	Y	1130	11-15	5-10 mg/L
SP-37-11	Y	1200	11-15	~50 mg/L → Stepping [illegible] on the west
SP 38-11	Y	1250	11-~~15~~20	10-15 mg/L [illegible] Screen [illegible]
39-11	Y	1330	11-20	Screen to 20. ~50 mg/L [illegible]
SP-40-11	Y	1415	11-21	Screen 11-21 [illegible] Refusal, [illegible] Rods stuck again. 10-15 mg/L

12/15/2015 Sunnyvale Airport

GCN Onsite @ 1040 Gregg Drilling + Support

Onsite was 10' U of well location, had Drg to 4Ft ...

Rig onhole @ 1100

Driller - Brian
Helper - Trevor K.
SFH Ag... Services
Jim King

1144 Rig ... by drill ...
@ just ... 40Ft

1150 Driller ... wood ... at bottom.
305 Cont... do ... Auger ... over

1400 ... @ 44Ft
... available w/
tooling
Tagged First gravel
@ 36Ft.

36 Sand
37
7' screen
44

... well with
Pre-Pack ...
...
... of Blank ...
... PVC @ ...
to finish last 3Ft of well

Sat ... 12/16/15
... pre ...
... Vol = 38-...

... 6.95
... 5.05

DTW=9.55 8/12/16/15 9:15

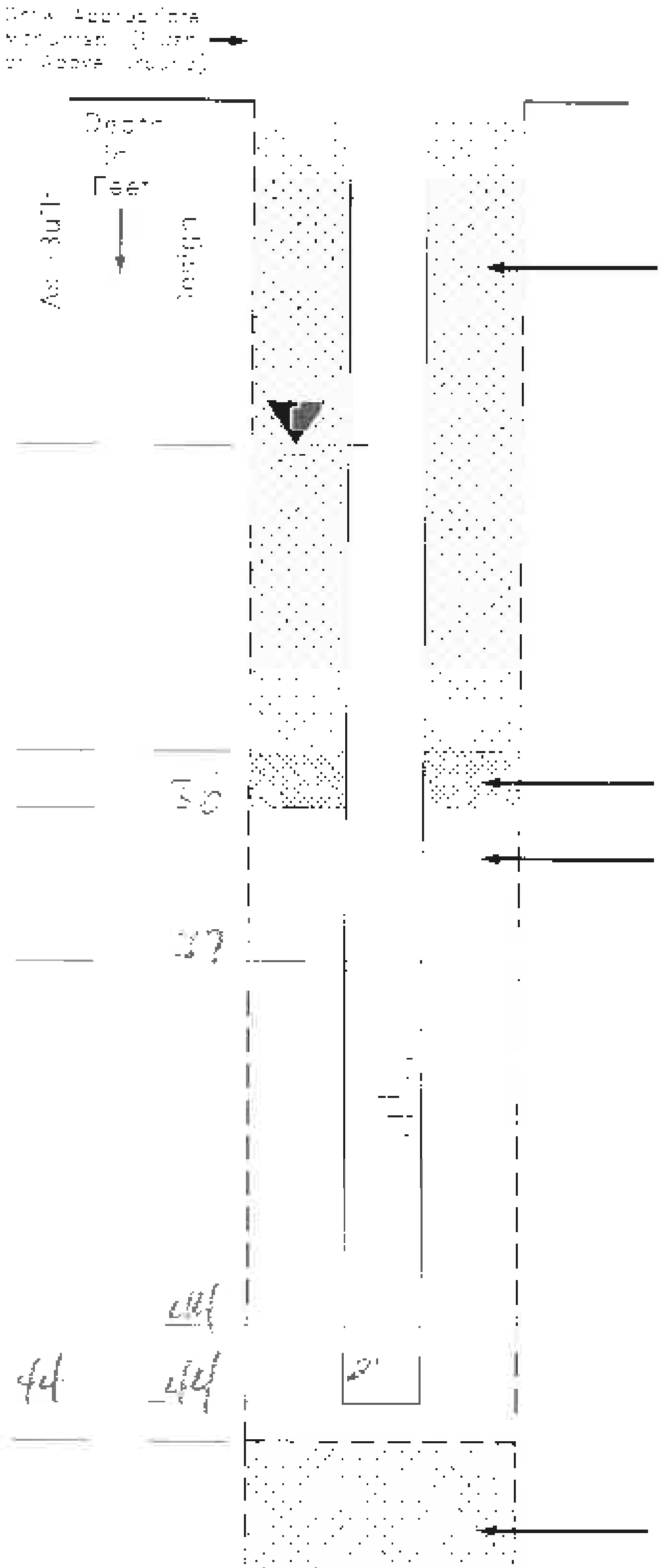
WELL INSTALLATION REPORT

BJW-7:3

Well No. [illegible] Date [illegible]

Job [illegible] Job No. [illegible]

Observer [illegible] Drilling Method [illegible]



Approx. Elevation ___

Type of Monument [illegible]

Stickup Monument ___ No

Seal Material [illegible]

Borehole Diameter 8"

Water Level Date ___

Riser Pipe Diameter 2"

Riser Pipe Material PVC

Type of Joints Thread

O-Ring Seal? Yes ✓ No

Seal Material ___

Filter Pack Material ___

Filter Pack Size ___

Screen Diameter 2"

Screen Material PVC Slotted Prepack

Screen Slot Size PVC [illegible]

Screen Construction: Milled / Wire Wound

Tail Pipe Diameter 2"

Tail Pipe Length 2'

Tail Pipe Material PVC

Bottom Seal Type ___

Pacific Groundwater Group
[illegible]

[illegible] 857 5706 [illegible]

PgG PACIFIC groundwater GROUP
2377 Eastlake Ave E Suite 200
Seattle, Washington 98102
206.329.0140 FAX 206.329.6968

Boring Location:

5/25/2016

Boring ______ Date ______ Sheet ___ of ___

Job ______ Job No. ______

Logged by ______ Weather ______

Drilled by/Method ______

Sampling Method ______

Water Content	Color	Size % G	S	F	Sample Number	Depth	Sample Recovery	Penetration Resistance	REMARKS: Drill action, sample procedures, water conditions, heave, soil variations.	SUMMARY LOG
		Max. Range								

TP4 - 1215 - 1250

[illegible] debris, Burned plastic [illegible] [illegible] [illegible] Can, Bud Light Cans

E of 4 Pits

TP3 1255 - 1315

[illegible], Paint buckets [illegible] Drum, [illegible]

TP2 Abandoned Common Phone line w/ Cable support [illegible] [illegible] PVC [illegible] water line ([illegible]) [illegible]

TP1 Between Water lines [illegible] [illegible] [illegible] [illegible] Small rubble, old irrigation line

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-1

Sampling Event: 2017-04

Sample #:

Project Number:
Project Name:
Project Address:
Client Name:
Laboratory: OSEO
Chain-of-Custody (yes/no):
Shipment Method:

Date: 4-12-17
Location:
Sampled By: GSW
Purged By:
Date Sent to Lab:
Field QC Sample Number:
Sample Sort:

Depth to Water (feet): 9.37 / 9.32 / 9.28
Depth of Well (feet): 9.76
Reference Point (surveyors notch, etc.):
Sampling Equipment:

Purge Volume Measurement Method:
Purge Date/Time: 1756 →
Purging Equipment:
Water Level Probe Used:

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gal; 4-inch = 1.97 gal; 6-inch = 4.41 gal   PV=(π r² h)(7.48 gal/ft³)

Purge Volume = ft of water x CVC = gallons   Casing diameter (in)

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)		
1750	0.1	7.2		12.5			
1810	1.6	7.2		12.4	cl	DTW 9.86	
1820		7.2		12.4			

Gas pressure on spring.

Labels crashed matched with 1810

Well Integrity:

Bottle Inventory

Day/Time Sampled: 4-12-17 1810

Quantity	Container	Preservatives: Filtered (type)	Remarks
1	Poly	—	
3	AGs	—	

Signature:

PGG Page 1 of 1

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-2

Sampling Event: 2017-04

Sample #:

Project Number: 3(5)1231 | Date: 4/12/17
Project Name: Smoqysid | Location:
Project Address: | Sampled By: GSW
Client Name: | Purged By:
Laboratory: | Date Sent to Lab:
Chain-of-Custody (yes/no): | Field QC Sample Number:
Shipment Method: | Sample Split:

Depth to Water (feet): 9.62 / 9.65 | Purge Volume Measurement Method
Depth of Well (feet): – | Purge Date/Time: 10-4-?
Reference Point (surveyor's notch, etc.): | Purging Equipment: Geopump
Sampling Equipment: | Water Level Probe Used

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf | PV=(π r² h)(7.48 gal/ft³)

Purge Volume = ft of water ___ x CVC ___ = ___ gallons | Casing diameter (ft/in):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (µmhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)		
1700	0.1	6.7	–	12.7			
1705	1.1		–	13.4		slightly yellowish	
1715	1.75			13.5		DTW = 10.02	
1721	[illegible]	6.8		13.5		10.02	

Air Freezer open

Well Integrity:

Bottle Inventory | Day/Time Sampled: 1730 4/12

Quantity: | Container: | Preservatives: | Filtered (type): | Remarks:

Quantity	Container	Preservatives	Filtered (type)	Remarks
	5 L			
1	Poly			

Signature: ___ PGG Page 1 of 1

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SW-3

Sampling Event: 2017-04

Sample #:

Project Number: 3092
Project Name: [illegible]
Project Address: [illegible]
Client Name: [illegible]
Laboratory: [illegible]
Chain-of-Custody (yes/no):
Shipment Method:

Date: 4/13/17
Location:
Sampled By: GSU
Purged By: GSU
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 1.41
Depth of Well (feet):
Reference Point (surveyors notch, etc.):
Sampling Equipment:

Purge Volume Measurement Method:
Purge Date/Time: 1554
Purging Equipment: Cooper
Water Level Probe Used:

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf ; 4-inch = 1.97 gpf ; 6-inch = 4.41 gpf PV=(πr² h) (7.48 gal/ft³)

Purge Volume = ft of water ______ x CVC ______ = ______ gallons Casing diameter (inch):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)
1600	0.1	6.5	—	13.9	clear
1609	1	—	—	13.7	"
1620	2.1	6.8		13.7	
1624	2.7	6.8	—	13.7	v. slightly cldy in Bucket
	DTW 9.52				

Well Integrity:

Bottle Inventory

Day/Time Sampled: 4/13/17 1625

Quantity	Container	Preservatives	Filtered (type)	Remarks
2	Ag / Poly	—		Para/Herb 3D5

Signature: [illegible]

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: Shallow-4

Sample #:

Sampling Event: 2017-04

Project Number: 38120
Project Name: [illegible]
Project Address:
Client Name:
Laboratory: OSL
Chain-of-Custody (yes/no):
Shipment Method:

Date: 4/18/17
Location:
Sampled By: GSW
Purged By:
Date Sent to Lab: 4/18/17
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.50
Depth of Well (feet): [illegible]
Reference Point (surveyors notch, etc.):
Sampling Equipment:
Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf ; 4-inch = 1.97 gpf ; 6-inch = 4.41 gpf
Purge Volume = ft of water ____ x CVC ____ = ____ gallons

Purge Volume Measurement Method:
Purge Date/Time: 1506 →
Purging Equipment: 6 gpm
Water Level Probe Used:
PV=(π r² h) (7.48 gal/ft³)
Casing diameter (ft):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (Visual / NTU)
1507		7.1	—	14.5	Clear
1514		—		14.5	↓
1523	2	6.9		14.4	↓
1530	2.7	6.9		14.5	↓

Well Integrity:

Bottle Inventory

Day/Time Sampled: 1530

Quantity	Container	Preservatives Filtered (type)	Remarks
5	AG		Pest/Herb
1	Poly		NO3

Signature: [illegible]

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Chain of Custody

OnSite Environmental Inc.

Page ___ of ___

Laboratory Number:

Turnaround Request (in working days)
☐ Same Day ☐ 1 Day
2 Days 3 Days
X Standard (7 Days)

Company: [illegible]

Project Name: [illegible]

Project Manager: [illegible]

Sampled by: [illegible]

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers
	[illegible]-1	8/1/17	10:45	Grnd	7
	[illegible]-2	8/1/17	13:15	Grnd	7
	[illegible]-3	8/1/17	14:00	Grnd	7
	[illegible]-4	8/1/17	15:20	Grnd	7

	Signature	Company	Date	Time
Relinquished	[illegible]	[illegible]	8/1/17	1035
Received	[illegible]	[illegible]	8/1/17	
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

① See email regarding centrifuge or settling.

② See email regarding reporting limits

Data Package: Standard ☐ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-1

Sampling Event: 2017 - July

Sample #:

Project Number:
Project Name: Sunnyside Airport
Project Address:
Client Name:
Laboratory: Synlab
Chain-of-Custody (yes/no):
Shipment Method:

Date: 7/31/17
Location: adjacent to Company
Sampled By: TW
Purged By: TW
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.48
Depth of Well (feet):
Reference Point (surveyor's notch, etc.): TOC N
Sampling Equipment: Peristaltic

Purge Volume Measurement Method: cuvet
Purge Date/Time: 7/31/17 10:14
Purging Equipment: Peristaltic
Water Level Probe Used: Waterline ET

Three-Casing Volume Constant (CVC): (2 inch) = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf   PV = π(d²h)(7.48 gal/ft³)

Purge Volume = ft of water ___ x CVC ___ = ___ gallons   Casing diameter (in): ___

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp (C)	TURBIDITY (visual / NTU)	DTW / color	q / odor
10:18	0.25	6.85	1247	19.1	clr	9.80/clr	200/none
10:25	0.50	6.97	1142	18.7	"	9.85/clr	200/none
10:35	1.00	7.20	1139	19.8	"	9.86/clr	200/none
10:44	1.75	7.24	1,216	19.9	"	9.87/clr	200/none
10:50	2.00	7.15	1112	19.0	"	9.87/clr	200/none
10:54	2.25	7.17	11[illegible]	18.9	"	9.88/clr	200/none

well cap under pressure, water rising in well
q_1 = 300 ml/min q_2 = 200 ml/min

Well Integrity: good

Bottle Inventory   Day/Time Sampled: 7/31/17 10:45

Quantity	Container	Preservatives	Filtered (type)	Remarks
2	AG			Organochlorine
2	AG			organo phosphorus
2	AG			herbicides
1	HDPE			Nitrate

7 bottles

Signature: TW

PGG   Page ___ of ___

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: Smw-2

Sampling Event: 2017 July

Sample #:

Project Number:
Project Name: Sunnyside Airport
Project Address:
Client Name:
Laboratory: Onsite
Chain-of-Custody (yes/no):
Shipment Method:

Date: 7/31/17
Location: center access road to runway
Sampled By: TWK
Purged By: TWK
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.66
Depth of Well (feet):
Reference Point (surveyor's notch, etc.): TOC(N)
Sampling Equipment: Peristaltic

Purge Volume Measurement Method: bucket
Purge Date/Time: 7/31/17 11:53
Purging Equipment: Peristaltic
Water Level Probe Used: WL ET

Three-Casing Volume Constant (CVC): (2-inch) = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf   PV=(π r² h)(7.48 gal/ft³)

Purge Volume = ft of water ___ x CVC ___ = ___ gallons   Casing diameter (inch):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (Visual / NTU)	odor/color	DTW/Q
	0.25	7.43	797	19.0	clr	none/clr	9.83/200
12:05	0.50	7.23	817	18.1	"	"/"	9.84/200
12:10	0.75	7.23	825	18.4	light	"/"	9.84/200
12:18	1.03	7.22	837	18.0	"	"/"	9.84/200
12:22	1.25	7.23	837	18.0	"	"/"	9.84/200

good end turbidity is light, but wouldn't clear up. Flow rate is between 150 ml/min and 200 ml/min, pump needed ≥200 to keep pumping

Well Integrity:

Bottle Inventory   Day/Time Sampled: 7/31/17 12:35

Quantity: Container: Preservatives: Filtered (type): Remarks

std Sunnyside set — 7 bottles

Signature: [signature]

PGG

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-3

Sampling Event: 2017 July

Sample #:

Project Number:
Project Name: Sunnyside Airport
Project Address:
Client Name
Laboratory: onsite
Chain-of-Custody (yes/no):
Shipment Method:

Date 7/31/17
Location
Sampled By: TWh
Purged By: TWL
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.29
Depth of Well (feet):
Reference Point (surveyors notch, etc.): TOC N
Sampling Equipment: Peristaltic

Purge Volume Measurement Method: bucket
Purge Date/Time 7/31/17 13:16
Purging Equipment: Peristaltic
Water Level Probe Used: WL ET

Three Casing Volume Constant (CVC): 2-inch = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf   PV=(π r² h)(7.48 gal/ft³)

Purge Volume = ft of water ____ x CVC ____ = ____ gallons   Casing diameter (ft/in):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	color/odor	DTW/Q
13:20	0.25	7.22	1515	19.6	clr	clr/none	9.55 / 200 ml/min
13:29	0.75	7.14	1528	18.4	clr	clr/none	9.65 / 150 ml/min
13:36	1.00	7.19	1529	19.1	"	" / none	9.63 / 150 "
13:39	1.25	7.18	1529	19.0	"	" / "	9.64 / 150 "

Can't maintain flow rate that doesn't draw down, fussing with 150 ml/min → 200 ml/min to keep running.

Well Integrity: good

Bottle Inventory   Day/Time Sampled: 7/31/17 14:00

Quantity   Container   Preservatives; Filtered (type)   Remarks

collected std Sunnyside set 7 bottles

Signature: [signature]

PGG   Page ____ of ____

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-4

Sampling Event: 2017 July

Sample #:

Project Number:

Date: 7/31/17

Project Name: Sunnyside Airport

Location:

Project Address:

Sampled By: TWh

Client Name:

Purged By: TWh

Laboratory: Onsite

Date Sent to Lab:

Chain-of-Custody (yes/no):

Field QC Sample Number:

Shipment Method:

Sample Split:

Depth to Water (feet): 9.51

Purge Volume Measurement Method: bucket

Depth of Well (feet):

Purge Date/Time: 7/31/17 14:30

Reference Point (surveyors notch, etc.): TBCN

Purging Equipment: Peristaltic

Sampling Equipment: Peristaltic

Water Level Probe Used: WL ET

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf 4-inch = 1.97 gpf 6-inch = 4.41 gpf PV=(πr²h)(7.48 gal/ft³)

Purge Volume = ft of water ____ x CVC ____ = ____ gallons

Casing diameter (ft/in):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual - NTU)	DTW/Q	color/odor
14:33	0.25	7.63	815	19.8	clr	9.53/200	clr/none
14:41	0.50	~~7.70~~ 7.46	770	18.6	"	9.53/200	"/"
14:48	1.00	7.44	777	18.5	"	9.53/200	"/"
14:52	1.25	7.43	752	18.2	"	9.53/200	"/"
14:56	1.50	7.44	777	18.5	"	9.54/200	"/"

Potentially strong pesticide odor upon opening well, in well? potentially ambient. a car drove by during sampling kick up a lot of dust

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 7/31/17 15:20

Quantity Container Preservatives/Filtered (type): Remarks

collected std sunnyside set - 7 bottles

Signature: [signature]

PGG Page of

Sunnyside 7/31/2017

1 poly drum @ 15 gallons

4 steel 55 gallons
all fuel
2 steel 10 gallons

Large area has ponded water from

near runway - see photos

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-1

Sampling Event: 2017 October

Sample #:

Project Number: 455

Date: 10/30/17

Project Name

Location:

Project Address

Sampled By: TWK

Client Name: Sunnyside

Purged By:

Laboratory: onsite

Date Sent to Lab:

Chain-of-Custody (yes/no): yes

Field QC Sample Number:

Shipment Method: Courier

Sample Split:

Depth to Water (feet): 9.57

Purge Volume Measurement Method: bucket

Depth of Well (feet):

Purge Date/Time: 10/30/17 10:40

Reference Point (surveyors notch, etc.): TOC

Purging Equipment: peristaltic

Sampling Equipment: peristaltic

Water Level Probe Used: WL ET

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf; 4-inch = 1.97 gpf; 6-inch = 4.41 gpf   PV=(πr²h)(7.48 gal/ft³)

Purge Volume = ft of water ______ x CVC ______ = ______ gallons   Casing diameter (ft/in):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	DTW	color/odor
10:45	0.25	7.07	1251	18.7	—	9.92	ltbrown/none
10:47	0.50	7.00	1210	18.9	11.48	9.96	" / "
10:55	0.75	7.04	1183	18.6	7.81	9.96	" / "
11:05	1.50	7.07	1170	18.9	3.36	10.01	clr/none
11:17	2.00	7.09	1141	18.7	4.36	9.92	" / "

9, 450ml/95 secs 92 450ml/120 secs

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 10/30/17 11:15

Quantity: Container: Preservatives/ Filtered (type): Remarks

Signature: [signature]

PGG Page ___ of ___

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-2

Sampling Event: 2017 October

Sample #:

Project Number:
Project Name:
Project Address:
Client Name: Sunnyside
Laboratory: Onsite
Chain-of-Custody (yes/no): Yes
Shipment Method: Courier

Date: 10/30/17
Location:
Sampled By: TWh
Purged By: TWh
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.9
Depth of Well (feet):
Reference Point (surveyors notch, etc.): TOC
Sampling Equipment: Peristaltic

Purge Volume Measurement Method: bucket
Purge Date/Time: 10/30/17 12:10
Purging Equipment: Peristaltic
Water Level Probe Used: WL ET

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf, 4-inch = 1.97 gpf, 6-inch = 4.41 gpf   PV=(π r² h) 7.48 gal/ft

Purge Volume = ft of water ______ x CVC ______ gallons   Casing diameter (ft/in)

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	DTW	color/odor
12:13	0.25	7.27	918	17.4	53.08	10.06	lt brown / lt petroleum
12:23	0.75	7.17	931	17.4	11.23	10.08	" / "
12:34	1.56	7.16	941	17.5	5.39	10.09	" / "
12:40	2.25	7.15	943	17.6	2.34	10.10	" / "

Q - 450ml / 2m 13sec ≈ 200 ml/min

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 10/30/17 13:00

Quantity:	Container:	Preservatives:	Filtered (y/no):	Remarks:
2	1L AG	none	NO	organochlorine
2	1L AG	↓	↓	organophosphorus
2	1L AG			
1	500 HDPE			Nitrate

Signature: [signature]

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-3

Sampling Event: 2017 October

Sample #: ______

Project Number: ______
Date: 10/30/17
Project Name: ______
Location: ______
Project Address: ______
Sampled By: TWh
Client Name: Sunnyside
Purged By: TWh
Laboratory: Onsite
Date Sent to Lab: ______
Chain-of-Custody (yes/no): Yes
Field QC Sample Number: ______
Shipment Method: Courier
Sample Split: ______

Depth to Water (feet): 9.29
Purge Volume Measurement Method: bucket
Depth of Well (feet): ______
Purge Date/Time: 10/30/17 13:30
Reference Point (surveyors notch, etc.): TOC
Purging Equipment: peristaltic
Sampling Equipment: peristaltic
Water Level Probe Used: WL ET

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf 4-inch = 1.97 gpf 6-inch = 4.41 gpf PV=(π r² h)(7.48 gal/ft³)

Purge Volume = ft of water ______ x CVC ______ = ______ gallons Casing diameter (inch)

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	DTW	color/odor
13:35	0.25	7.10	1578	17.2	9.96	9.58	clr / ?
13:42	0.75	7.07	1613	17.3	~~3.96~~	~~9.60~~ 9.66	" / none
13:48	1.00	7.07	1536	17.3	2.80	9.70	" / "
13:55	1.50	7.07	1570	17.3	2.36	9.71	" / "

450ml / 2 mins 3sec = 9

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 10/30/2017 14:10

Quantity	Container	Preservatives	Filtered (type)	Remarks
2				chlorine herbacides
2				organo phosphorous
2				organo chlorine
1				Nitrates

Signature: [signature]

PGG

Page ______ of ______

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-4

Sampling Event: 2017 October

Sample #:

Project Number:
Project Name:
Project Address: Sunnyside
Client Name:
Laboratory: Onsite
Chain-of-Custody (yes/no): Yes
Shipment Method: Courier

Date: 10/30/17
Location:
Sampled By: TWH
Purged By: TWH
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.53
Depth of Well (feet):
Reference Point (surveyors notch, etc.): TOC N
Sampling Equipment: Peristaltic

Purge Volume Measurement Method: bucket
Purge Date/Time: 10/30/17 14:47
Purging Equipment: peristaltic
Water Level Probe Used: WL Et

Three Casing Volume Constant (CVC): 2-inch = **0.48** gpf ; 4-inch = **1.97** gpf ; 6-inch = **4.41** gpf   PV=(π r² h) (7.48 gal/ft³)

Purge Volume = ft of water ____ x CVC ____ = ____ gallons   Casing diameter (feet):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp (C)	TURBIDITY (visual / NTU)	DTW	color/odor
	0.25	7.53	784	16.1	8.83	9.56	l brwn/none
14:57	0.75	7.47	775	17.9	1.27	9.56	clr/none
15:04	1.25	7.46	799	15.6	1.63	9.55	"/"
15:15	1.75	7.45	802	15.7	1.57	9.55	clr/none

450ml/min 54sec =9.1

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 10/30/17 15 30

Quantity	Container	Preservatives: Filtered (type):	Remarks:
2			
2			
2			
1			

Signature: [signature]

PGG

Page ____ of ____

GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-1

Sampling Event: January 2018

Sample #:

Project Number: JG
Date: 1/31/2018
Project Name:
Location:
Project Address: Sunnyside, WA
Sampled By: TWH
Client Name:
Purged By: TWH
Laboratory: Onsite
Data Sent to Lab:
Chain-of-Custody (yes/no): yes
Field QC Sample Number:
Shipment Method: courier
Sample Split:

Depth to Water (feet): ~~9.80~~ 9.81
Purge Volume Measurement Method: bucket
Depth of Well (feet):
Purge Date/Time: 1/31/2018 10:18
Reference Point (surveyors notch, etc.): TOC North
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Water Level Probe Used: WL ET

Three-Casing Volume Constant (CVC): (2-inch = 0.48 gpf) 4-inch = 1.97 gpf 6-inch = 4.41 gpf PVF(...) (7.48 gal/ft³)

Purge Volume = ft of water ______ x CVC ______ = ______ gallons Casing diameter (ft/in): ______

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual) / NTU	color/odor	ORP / DTW
q_2 — 10:32	0.75	6.36	1409	14.1	light	lt brown/none	-136.3/10.1
10:46	1.00	7.41	1430	14.1	light	" / "	-104.7/10.14
10:51	1.4	7.57	1402	14.6	"	" / "	-87.5/10.18
11:01	2.00	7.95	1406	15.0	"	" / "	-98.7/10.19
11:09	2.25	7.93	1407	15.7	clr	clr/none	-107.1/10.19
11:14	2.50	7.64	1389	15.3	clr	clr/non	-91.2/10.20
11:19	2.75	7.59	1392	15.1	"	" / "	-88.5/10.20
11:23	3.00	7.54	1389	15.0	"	" / "	-86.1/10.20

q_1 = 300 ml/min q_2 ≈ 200 ml/min almost minimum rate for pump.
oakton probe is acting weird for pH and ORP, taking a long time to read.

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 1/31/2018 11:00

Quantity:	Container:	Preservatives:	Filtered (type)	Remarks
36	1L AG	no	no	pest/herb
1	5in Hdpe	no	no	nitrates

Signature: [signature]

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-2

Sampling Event: January 2018

Sample #: SMW-2

Project Number:

Date: 1/31/2018

Project Name: Sunnyside Airport

Location:

Project Address:

Sampled By: Thh

Client Name:

Purged By: Thh

Laboratory: Onsite

Date Sent to Lab:

Chain-of-Custody (yes/no): yes

Field QC Sample Number:

Shipment Method: Courier

Sample Split:

Depth to Water (feet): 10.18 @ 10:45 10.16 12:19

Purge Volume Measurement Method:

Depth of Well (feet):

Purge Date/Time: 1/31/18 12:19 –

Reference Point (surveyors notch, etc.): TOC N

Purging Equipment: Peristaltic

Sampling Equipment: Peristaltic

Water Level Probe Used: WLET

Three-Casing Volume Constant (CVC): (2-inch = 0.48 gpf) 4-inch = 1.97 gpf 6-inch = 4.41 gpf PV = π r² h × 7.48 gal/ft³

Purge Volume = ft of water ___ x CVC ___ = ___ gallons Casing diameter (ft/in) ___

DTW	TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	color/odor	ORP
q1) 10.34	12:21	0.25	7.18	973.5	14.5	clear	clr / none	-25.9
10.40	12:31	0.50	7.16	1010	15.1	clear	" / "	-25.2
q2) ~~10.43~~ 10.37	12:38	1.00	7.20	1018	15.1	light	" / "	-26.3
	12:43	1.25	7.16	1026	15.1	light	" / "	-24.8
10.38	12:46	1.50	7.16	1032	15.0	light	" / "	-24.8
10.38	12:50	1.75	7.17	1048	14.9	light	" / "	-24.9
10.39	12:55	2.00	7.16	1054	15.1	light	" / "	-24.1
10.40	13:04	2.50	7.14	1067	15.1	"	" / "	-23.7
10.40	13:09	3.00	7.14	1075	15.1	"	" / "	-23.3

q1 = 250 ml/min used a new probe with same oakton
q2 = 200 ml/min

Well integrity: good

Bottle Inventory

Day/Time Sampled: 1/31/18 13:00

Quantity	Container	Preservatives	Filtered (type):	Remarks:
2	1L AG	none	none	organochlorine pest
2	1L AG	↓	↓	organophosphorus pest.
2	1L AG	↓	↓	herbicides
1	5m HDPE	none		nitrate

Signature: Thh

PGG

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-2

Sampling Event: Jan 2018 Cont

Sample #:

Project Number:
Project Name:
Project Address:
Client Name:
Laboratory:
Chain-of-Custody (yes/no):
Shipment Method:

Date: 1/31/18
Location:
Sampled By: TWK
Purged By: TWK
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet):
Depth of Well (feet):
Reference Point (surveyors notch, etc.):
Sampling Equipment:

Purge Volume Measurement Method:
Purge Date/Time:
Purging Equipment:
Water Level Probe Used:

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf; 4 inch = 1.97 gpf; 6-inch = 4.41 gpf; PV=(r in ft)² π (7.48 gal/ft³)

Purge Volume = ft of water ____ x CVC ____ = ____ gallons; Casing diameter (ft/in):

TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	ORP	
13:18	3.5	7.10	1085	15.3	clr	-22.3	
13:27	4.0	7.12	1090	15.3	"	-22.6	
13:36	5.25	7.09	1093	15.2	clr	-21.5	
13:40	5.50	7.11	1092	15.2	"	-22.2	

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 1/31/18 13:00

Quantity: Container: Preservatives: Filtered (type): Remarks:

Signature: [signature]

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-3

Sampling Event: January 2018

Sample #: ______

Project Number: ______
Date: 1/31/18
Project Name: Sunnyside Airport
Location: ______
Project Address: ______
Sampled By: TWH
Client Name: ______
Purged By: TWH
Laboratory: Onsite
Date Sent to Lab: ______
Chain-of-Custody (yes/no): ______
Field QC Sample Number: ______
Shipment Method: ______
Sample Split: ______

Depth to Water (feet): 9.5 , 10:46 9.48 @ 14:17
Purge Volume Measurement Method: bucket
Depth of Well (feet): ______
Purge Date/Time: 1/31/18 14:22
Reference Point (surveyors notch, etc.): TOC N
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Water Level Probe Used: WLET

Three-Casing Volume Constant (CVC): 2-inch = 0.48 gpf ; 4-inch = 1.97 gpf ; 6-inch = 4.41 gpf PV=(πr²h)(7.48 gal/ft³)

Purge Volume = ft of water ______ x CVC ______ = ______ gallons Casing diameter (ft): ______

DTW	TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp. (C)	TURBIDITY (visual / NTU)	color/odor	ORP
9.69	14:24	<0.25	7.06	1987	13.9	clear	clear/none	-19.6
9.78	14:31	≈0.50	7.09	2.00 mS	14.6	clear	clear/none	-20.4
9.83	14:39	≈0.75	7.05	2.01 mS	14.7	"	"/"	-18.6
9.85	14:45	1.00	7.05	2.01 mS	14.8	"	"/"	-18.3
9.87	14:52	1.25	7.02	2.03 mS	14.8	"	"/"	-18.1
9.88	14:57	1.50	7.05	2.05 mS	14.7	"	"/"	-19.3

q₁ = 200 ml/min q₂ = 175 ml/min

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 1/31/18 15:30

Quantity	Container	Preservatives	Filtered (type)	Remarks
6	1L AG	no	no	Pest/herb
1	500 HDPE	no	no	Nitrates

Signature: [signature]

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GROUNDWATER SAMPLING FIELD DATA SHEET

Well #: SMW-4

Sampling Event: January 2018

Sample #:

Project Number:
Project Name: Sunnyside Airport
Project Address:
Client Name:
Laboratory: Onsite
Chain-of-Custody (yes/no): yes
Shipment Method: Courier

Date: 1/31/18
Location:
Sampled By: TWH
Purged By: TWH
Date Sent to Lab:
Field QC Sample Number:
Sample Split:

Depth to Water (feet): 9.74 @ 16:48 9.74 @ 15:40
Depth of Well (feet):
Reference Point (surveyors notch, etc.): toc N
Sampling Equipment: Peristaltic
Three-Casing Volume Constant (CVC): (2 inch = 0.48 gpf) 4-inch = 1.97 gpf; 6-inch = 4.41 gpf   PV= π r²h) (7.48 gal/ft³)
Purge Volume = ft of water ____ x CVC ____ = ____ gallons   Casing diameter (ft/in): ____

Purge Volume Measurement Method: bucket
Purge Date/Time: 1/31/2018 15:41
Purging Equipment: Peristaltic
Water Level Probe Used: WL ET

DTW	TIME (2400 hr)	CUMULATIVE VOLUME (gal / L)	pH (units)	EC (umhos/cm 25 c)	Temp (C)	TURBIDITY (visual / NTU)	color/odor	ORP
9.75	15:46	<0.25	7.43	885.1	13.8	clear	clear/none	-39.0
9.78	15:51	0.50	7.41	880.7	14.2	"	"/"	-37.6
9.78	15:55	0.75	7.39	880.1	14.3	"	"/"	-37.3
9.78	15:58	1.00	7.39	890.1	14.3	"	"/"	~~-37.~~ -36.9
9.78	16:02	1.25	7.34	894.8	14.3	"	"/"	-35.7
9.78	16:05	1.50	7.39	896.4	14.2	"	"/"	-37.3
9.78	16:12	2.00	7.33	895.4	14.2	"	"/"	-35.4
9.78	16:16	2.25	7.38	899.9	14.2	"	"/"	-37.3
9.78	16:22	3.00	7.38	900.9	14.2	"	"/"	-36.0
9.78	16:33	3.50	7.36	899.9	14.2	"	"/"	-35.7

@ ~250 ml/min

Well Integrity: good

Bottle Inventory

Day/Time Sampled: 1/31/2018 16:30

Quantity	Container	Preservatives	Filtered (type)	Remarks
6	1L Amb	no	no	Pest/Herb
1	5oz HDPE	no	no	nitrates

Signature: [signature]

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