Groundwater Monitoring Well Construction and Monitoring Plan

Simplot Grower Solutions
J.R. Simplot Company

Warden, Washington
March 2023

Prepared by:
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Prepared for:
J.R. Simplot Company

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1800 W. 1st Street
Warden, WA 98857

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Acronyms

Acronym	Definition
µg/L	micrograms per liter
AO	Agreed Order
bgs	below ground surface
CAP	cleanup action plan
CUL	cleanup level
DO	dissolved oxygen
DOT	U.S. Department of Transportation
Ecology	Washington State Department of Ecology
EDB	ethylene dibromide
HASP	health and safety plan
HDR	HDR Engineering, Inc.
IDW	investigation-derived waste
L/min	liters per minute
MS	matrix spike
MSD	matrix spike duplicate
ORP	oxygen reduction potential
QA/QC	quality assurance/quality control
RI/FS	remedial investigation/feasibility study
SGS	Simplot Grower Solutions
Simplot	J.R. Simplot Company
SOP	standard operating procedure
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

1 Introduction

This *Groundwater Monitoring Well Construction and Monitoring Plan* describes the procedures that the J.R. Simplot Company (Simplot) will perform to construct four groundwater monitoring wells and subsequently monitor to comply with the cleanup action at the Simplot Grower Solutions (SGS) facility in Warden, Washington (**Figure 1**, Appendix A). The cleanup action and subsequent compliance monitoring is being conducted pursuant to Agreed Order (AO) DE 16890 and the Model Toxics Control Act (MTCA) regulations (Chapter 173-340 Washington Administrative Code [WAC]) to implement the remedies specified in the *Cleanup Action Plan* (CAP; Ecology 2019) to remove ethylene dibromide-(EDB) contaminated soil and groundwater.

Simplot entered into AO DE 16890 with Washington State Department of Ecology (Ecology) on May 7, 2020, to implement the CAP in accordance with the scope of work and schedule attached to the AO DE 16890.

1.1 Site Description

Site Name	Simplot Growers Solutions, Warden, Washington Site (Agreed Order refers to site as Warden City Wells site)
Ecology Facility/sites ID	2802409
Agreed Order	No. DE 16890
Cleanup Site ID (CSID)	No. 1618 (Warden City Water Supply Wells 4&5)
Address	1800 West 1st Street Warden, WA 98857
Location:	GPS: 46.97025 46° 58' 13" North and -119.060309 -119° 3' 37" West UTM: Zone 11 N; 343279.18, 5203918.33 Legal: SW T17N R30E S9 Parcel: 060697000 County: Grant, WA
Ecology Site Manager	Christer Loftenius, LG, LHG State of Washington Department of Ecology Toxics Cleanup Program, Eastern Region 4601 N Monroe Street Spokane, Washington 99205-1295 clof461@ecywa.gov 509.329.3400
Potentially Liable Person (PLP)	J.R. Simplot Company P.O. Box 27 Boise, Idaho 83707
PLP Contact	Molly Dimick, MBA Environmental Engineer J.R. Simplot Company PO Box 912 1130 W. Hwy 30 Pocatello, ID 83204 208.235.5682 Molly.Dimick@simplot.com
Site Owner	Same as PLP

Work Plan Preparer	HDR Engineering, Inc. Tyler Allen 412 East Parkcenter Boulevard, Suite 100 Boise, Idaho 83706 Tyler.Allen@hdrinc.com 208.387.7018

1.2 Purpose of Plan

Currently, the SGS site monitoring network is composed of nine groundwater monitoring wells (MWs): MW-1, MW-2, MW-3, MW-6S, MW-7S, MW-7D, MW-8S, MW-9S, and MW-10S. Monitoring wells MW-5S and MW-5D were decommissioned in June 2020 (HDR 2020) because they were in the area of corrective action involving soil excavation, completed in Spring 2021. The CAP calls for replacing these two wells after excavation and backfilling activities are complete (HDR 2021a). In addition, the CAP requires two additional downgradient wells to aid in compliance monitoring.

For further details on remediation activities and compliance monitoring, refer to the following documents:

- *Final Engineering Design Report* (HDR 2021a)
- *Cleanup Action Implementation Compliance Monitoring Plan* (HDR 2021b)

The purpose of this plan is to detail the following activities.

- Construct four monitoring wells (**Figure 2**, Appendix A):
    - MW-5SR and MW-5DR – replacement wells in the approximate location as the original wells, within the excavation area footprint.
    - MW-11S and MW-12S – new downgradient wells from the excavation area.
- Describe approach and procedures for groundwater compliance monitoring.

1.3 Plan Organization

This plan is organized into the following sections:

- Section 1 provides an introduction;
- Section 2 presents a site description and background;
- Section 3 describes monitoring well installation along with soil and groundwater sampling procedures during installation;
- Section 4 describes semiannual groundwater compliance monitoring procedures;
- Section 5 identifies the quality assurance and quality control (QA/QC) procedures;
- Section 6 describes the health and safety plan (HASP).
- Section 7 describes the reporting submittals.

2 Site Description and Background

2.1 Geology and Hydrogeology

A description of site geology and hydrogeology is primarily taken from the *Preliminary Investigation of Ethylene Dibromide Contamination* (PGG 2007), *Phase II Preliminary Investigation Report* (Ecology 2009), and remedial investigation/feasibility study (RI/FS) activities conducted by HDR Engineering, Inc. (HDR 2018).

The City of Warden is located within the Columbia Plateau, which is dominated by the Columbia River Basalt Group (thick sequence of basalt flows). Unconsolidated sediment overlies basalt in the Warden area and is comprised of sand and silt deposited by outburst floods from Glacial Lake Missoula and Palouse Formation loess (windblown silt and fine sand). Lithology at the monitoring wells associated with the site is described as unconsolidated soil of very silty to slightly silty to silty fine sand 17 to 64 feet thick. An on-site geologist also observed layers of caliche (hardened soil cause by crystalized salts) while overseeing drilling in the upper 25 feet of boreholes. For the SGS site, caliche is interbedded with sand from 4 to 25 feet below ground surface (bgs). Beneath the unconsolidated soil and caliche is 4.5 to 14 feet of weathered basalt. Beneath the weathered basalt is competent basalt. The contact between the overburden and basalt, in the vicinity of the monitoring wells, slopes to the west-northwest. A summary of lithology for monitoring well MW-5, constructed at the SGS site, is as follows (PGG 2007):

Depth below ground surface	Description
0 to 4 feet	Fill material
4 to 18.5 feet	Fine sand with caliche interbeds
18.5 to 43 feet	Fine sand and silty sand
43 to 49 feet	Weathered basalt
49 to >55 feet	Hard basalt
55 feet	Boring bottom

The site and surrounding area lie in the Odessa groundwater management subarea, a segment of the Columbia Basin groundwater system, which is characterized by declining basalt aquifer water levels and high amounts of recharge to the shallow aquifer due to irrigated agricultural activities in the region. The surficial geologic deposits are outwash deposits and wind-blown aeolian deposits (loess). Below these surficial deposits, three aquifers are identified in the City of Warden area:

- Shallow aquifer - comprised of unconsolidated deposits (includes weathered basalt, gravels, sand, silt, and clay); regionally, this aquifer flows toward the west (George 2006). Monitoring wells associated with the RI/FS are constructed in the shallow aquifer.
- Deep Basalt aquifers: comprised of the Wanapum and Grande Ronde deep aquifers. No monitoring wells associated with the RI/FS are constructed in the deep aquifer.
    - Wanapum aquifer – part of the Wanapum Basalt formation of the Columbia River Basalt Group; this formation extends to a depth of approximately 600 feet bgs; regionally, groundwater flows southwest (Hansen et al. 1994).

- Grande Ronde aquifer – a deeper basalt aquifer found beneath the Wanapum formation; regionally, flows toward the south and southwest (Hansen et al. 1994).

The topography of the area is generally flat with a few gently sloping hills. Elevation of the site is approximately 1,252 feet above sea level. The geomorphologic setting of the area is characterized by outwash deposits and wind-blown aeolian deposits (loess). The nearest major natural surface water body is Warden Lake to the west approximately 4.5 miles. The nearest man-made surface water body is the East Low Canal just north of the site. The nearest undeveloped natural land is approximately 3 miles west/southwest of the site, part of which is the Columbia National Wildlife Refuge. Other areas around Warden are residential or agriculturally developed land.

2.2 Groundwater Conditions

Figure 2 (Appendix A) illustrates the current and proposed groundwater monitoring well network for the site. The current wells were constructed to provide information on groundwater flow direction, seasonal variations in flow and gradient, and groundwater quality upgradient and downgradient of the SGS site. **Table 1** (Appendix B) summarizes monitoring well construction and survey information. Shallow wells (MW-5S, MW-6S, MW-7S, MW- 8S, MW-9S, and MW-10S) were screened in the upper portion of the shallow aquifer to monitor water at the groundwater/vadose zone interface. Well MW-7D and Ecology wells MW-1, MW-2, MW-3, MW-4, and MW-5D were screened in the lower portion of the shallow aquifer in unconsolidated to weathered basalt interface (ranging from 55 to 75 feet bgs). The upper and lower wells provide information as to potential groundwater gradient differences between the lower and upper zones within the shallow aquifer, as well as differences in EDB levels. Both upper and lower wells are within the shallow unconfined aquifer. Well MW-6D was planned but not drilled, because basalt was encountered at a depth of approximately 26 feet, so only MW-6S was installed. MW-9S, drilled off site to the south of the facility, encountered basalt at 16 feet bgs. Furthermore, the borehole was dry at the time of drilling in July 2013 and the well was dry in October 2013 and December 2017. MW-9S is screened from 7 to 17 feet bgs. Well MW-4 was decommissioned in April 2015 at the request of the landowner. Wells MW-5S and MW-5D were decommissioned in June 2020 to support remedial excavation in the area.

Following is a summary of groundwater monitoring well sampling results. Refer to the RI/FS for more details on groundwater conditions (HDR 2018).

- Groundwater gradient, based on the upper wells, shows a southerly/southwesterly flow direction. Groundwater flow for the deeper wells is split where groundwater north of the canal flows northerly, and groundwater south of the canal flows in a southerly direction. No upper wells in the shallow aquifer have been installed north of the canal to confirm the observations found south of the canal. However, the observations from the shallow wells south of the canal are likely a result of groundwater mounding caused by the canal acting as a losing stream.
- EDB has been found in groundwater beneath the site associated with shallow well MW-5S (decommissioned June 2020), which was screened through the vadose zone/groundwater interface. Shallow well MW-6S was non-detect in October 2013 and measured 0.35 micrograms per liter (µg/L) in December 2017. Monitoring well MW-5D (paired well to MW-5S and also recently decommissioned), which was screened at the unconsolidated groundwater/basalt interface, was non-detect (or at trace amounts of EDB) during the RI

monitoring period. EDB has not been detected in off-site monitoring wells, including wells that are downgradient (at least part of the year) from the SGS site. Groundwater samples collected and analyzed in December 2017 (3 years from the previous monitoring) were consistent with previous findings. Monitoring well MW-5S was screened in the caliche zone, and based on soil sampling from this well, it is postulated that the detection of EDB in this well is from the slow dissolution of EDB held in this confining layer. That EDB has not been detected in downgradient monitoring wells (e.g., MW-8S, MW-10S, MW-4, MW-3) suggests the presence is localized and there is no established plume. While EDB has not been detected in off-site monitoring wells, it had been detected in City of Warden water supply wells No. 4 (later decommissioned) and 5, including at levels in excess of the Washington groundwater quality standard (see RI/FS [HDR 2018] for more details).

3 Monitoring Well Installation

Depth to water (shallow aquifer) in the project area is approximately 11 to 30 feet bgs and varies seasonally, where groundwater elevation rises during the irrigation season and declines during the non-irrigation season. Shallow groundwater is influenced by the East Low Canal, where the canal acts as a losing stream (creates a hydraulic mound) during the irrigation season. The shallow aquifer system consists of the outwash deposits, loess, and other unconsolidated materials above the basalt of the Wanapum Basalt formation of the Columbia River Basalt Group. The city wells are finished in the Wanapum aquifer (deep aquifer), which lies below the unconsolidated material and caliche in the Wanapum Basalt formation of the Columbia River Basalt Group. All site monitoring wells are developed in the shallow aquifer. Monitoring wells designated with a “D” refer to wells screened at the bottom of the shallow aquifer (above the competent basalt) whereas monitoring wells with no designation or with an “S” designation are screened in the upper portion of the shallow aquifer.

Four groundwater monitoring wells will be constructed (MW-5SR, MW-5DR, MW-11S, and MW-12S). Proposed groundwater monitoring well locations are shown on **Figure 2** (Appendix A). Monitoring wells MW-5SR and MW-5DR are intended to directly replace MW-5S and MW-5D (both decommissioned in June 2020) and will be installed in the excavation backfill area. Monitoring wells MW-11S and MW-12S will be installed downgradient of excavation in the southerly and westerly direction, respectively, and will be used for compliance monitoring.

Monitoring well construction will follow Chapter 173-160 WAC - *Minimum Standards for Construction and Maintenance of Wells*. Wells will be commissioned in accordance with Ecology procedures.

3.1 Utilities

Monitoring wells will be located and staked prior to drilling. Washington Utilities Coordinating Council (Call Before you Dig, 1-800-424-5555) will be contacted to locate underground utilities prior to field work. HDR will also consult with the facility manager regarding knowledge of utilities. In addition, information obtained from previous geophysical surveying will be used to avoid drilling near underground anomalies. A private utility locator will also be subcontracted by HDR to locate any private utilities at or around the proposed monitoring well installation locations.

3.2 Groundwater Monitoring Well Installation with Rotosonic Drilling

Three proposed “shallow” groundwater monitoring wells (MW-5SR, MW-11S, and MW-12S) will be installed with screens that intersect the water table and terminate in the unconsolidated sediments above the basalt. The proposed designs of MW-5SR, MW-11S, and MW-12S are shown on **Figure 3, Figure 5,** and **Figure 6** (Appendix A), respectively. A summary of proposed monitoring well construction details is presented in **Table 2** (Appendix B).

One proposed “intermediate” groundwater monitoring well (MW-5DR) will be installed with screen that intersects the weathered or competent basalt. The proposed design of MW-5DR is shown on **Figure 4** (Appendix A). A summary of proposed monitoring well construction details is presented in **Table 2** (Appendix B).

All four well boreholes will be drilled using rotosonic equipment, since both unconsolidated formation and basalt will be encountered. An outer casing is advanced to keep the borehole open while the core barrel can be retrieved. Pursuant to the AO, the work will be performed under the supervision and direction of a geologist/hydrogeologist/engineer licensed by the State of Washington. A Washington-licensed well driller will be hired to install the monitoring wells. Continuous core sampling will be used to collect samples. Soil samples will be collected from MW-5SR, MW-11S, and MW-12S for lithology description and analysis at the following depth intervals: 1 to 3, 10 to 12, 20 to 22, 30 to 32, and 34.5 to 36.5 (bottom of boring) feet bgs. Soil samples will be collected from MW-5DR for lithology description and analysis at the following depth intervals: 1 to 3, 10 to 12, 20 to 22, 30 to 32, 40 to 42, and 52 to 54 (bottom of boring) feet bgs. In addition, a soil sample for laboratory analysis will be collected at the first encountered caliche zone (expected to be in the 4- to 10-foot depth range) from each boring for the MW-11S and MW-12S installations.

The drilling equipment will be steam-cleaned prior to being brought on site and between the drilling of each monitoring well. The monitoring well drilling and construction will be completed in conformance with local and state regulations.

The rotosonic drill rig will advance each boring down to the proposed total depth. The anticipated depth to water at the site varies seasonally from 19 to 33 feet bgs. The shallow well borings will be drilled to a depth of approximately 36.5 feet bgs. For planning purposes, a 20-foot well screen from 16 to 36 feet bgs is assumed for shallow wells. The intermediate well will be drilled to a depth of approximately 54.5 feet, consistent with MW-5D. A 10-foot screen will be placed from 44 to 54 feet bgs for the intermediate well. Actual screen depths will be determined in the field.

The monitoring wells will be completed using 2-inch-diameter, flush-threaded, Schedule 40 PVC casing and well screen. Twenty feet of factory-slotted well screen (0.010-inch slot size) will be set in each of the shallow wells. Ten feet of factory slotted well screen (0.020-inch slot size) will be set in the intermediate well. End caps will be threaded to the base of the well screens. P.W. Gillibrand Raptor Filter Sand (gradation #20-40) or equivalent will be used as a filter pack surrounding the shallow well screens and extend to approximately 2 feet above the top of the well screens. For the intermediate well, CSSI silica sand (gradation #10-20) or equivalent will be used.

The annular seal above the filter pack in each well will consist of 3/8-inch bentonite chips or pellets, which will be dry-poured from the surface down the annular space between the PVC casing and drill

string casing to within a few feet of the ground surface. Potable water will be poured down the annulus to hydrate the chips/pellets during placement. The fill level of the filter pack and bentonite seal will be monitored with a weighted sounding tape as the drill string is withdrawn to verify proper placement by keeping the fill level slightly above the base of the drill bit.

The wellheads of each well will be secured using a lockable, 5-foot-long, 6-inch by 6-inch, protective steel monument, which will be placed over the well and centered in a concrete pad. The top of the annular space surrounding the well from ground surface to 3 feet below ground surface, will also be filled with neat cement grout per WAC 173-160-450 to protect the well casing from frost heave. Steel guard posts will be sunk into the ground around the well monument and filled with concrete to serve as a protective barrier against collision damage.

3.3 Soil Sampling Procedures

Soil samples from the four monitoring wells (MW-5SR, MW-5DR, MW-11S, and MW-12S) will be collected continuously with the rotosonic rig. To collect intact subsurface soil samples, an inner sampling core is advanced through the soil and can be retrieved, while an outer core remains in place to keep the borehole open. A minimum 100-gram sample will be taken from the sample core soil and placed directly into laboratory-supplied glass jars for EDB analysis by U.S. Environmental Protection Agency (USEPA) Method 8011. Sample volumes, preservatives, and holding times are summarized in **Table 4** in Appendix B. Sampling personnel will wear clean nitrile gloves when transferring soils. The goal is to transfer the soil samples into the containers as quickly as possible to prohibit EDB loss by volatilization. Procedures for collecting soil samples are provided in standard operating procedure 2 (SOP-2) in Appendix C.

3.3.1 Sample Custody and Documentation

Samples for chemical analysis will be stored in a cooled ice chest pending transportation to a certified analytical laboratory under chain-of-custody protocol, as described in SOP-3 in Appendix C. At the time of writing, the proposed laboratory is Eurofins Test America in Spokane Valley, Washington. Samples being submitted to Eurofins Test America will be packaged in coolers with ice and shipped overnight.

3.3.2 Sample Identification Protocol

Soil samples from split-spoons collected during drilling will be labeled as follows:

- BH – for borehole soil sample.
- 5SR, 5DR, 11S, or 12S – to identify the monitoring well borehole.
- S – for soil.
- XX – feet of depth below surface from which the sample was taken.

For example, BH-11S-S-10 is a soil sample collected from the MW-11S borehole at a depth of 10 feet.

QC samples (see Section 5.0) will be identified as follows:

- Rinsate Blank – equipment rinsate blank.
- Field Blank – field blank collected from potable or distilled water used for decontamination.

- Trip Blank – for trip blank.
- Matrix spike/matrix spike duplicate (MS/MSD): MS and MSD will be appended to the end of the original sample ID.
- Soil duplicates: duplicate samples will be identified similarly to the original soil sample but will be given a fictitious sample depth (such as ”00”) and sample time.

Field notes and photo documentation will record time, location, and identification of each sample (see SOP-1 in Appendix C).

3.4 Well Development

Following well installation, each well will be surged and pumped to set the filter pack and remove fine sediment from the well. Each well will be developed using a sequence of surging and pumping. Surging the well forces groundwater to flow in and out of the well, breaking particle bridges and setting the sand filter pack up against the well screen. The well is then pumped to remove fine sediments that have been pulled through the screen during surging. Monitoring wells will be considered developed when the well is relatively free of sediment and once parameters of temperature, pH, turbidity, and specific conductivity are stabilized; at a minimum, 10 well casing volumes will be removed and a maximum of 15 well casing will be volumes removed

3.5 Well Surveying

A Washington-licensed surveyor will survey the monitoring wells to the top of the PVC well casing and to the ground surface at the base of the protective well casing. Wells to be surveyed include new wells MW-5SR, MW-5DR, MW-11S, and MW-12S. Elevation of the well casing will be determined using conventional differential leveling techniques yielding an accuracy of ±0.01 foot. The location survey will have an accuracy of ±0.5 foot.

The surveyor will be responsible for identifying the closest benchmarks to the project site. An attempt will be made to use the “Warden” benchmark used by Ecology for the survey of wells MW-1 through MW-5. If the “Warden” benchmark previously used to survey wells at the SGS site cannot be found or has been destroyed, then previously surveyed wells (MW-1 through MW-5) will be re-surveyed to the new benchmark.

3.6 Investigation-Derived Waste Handling

Investigation-derived waste (IDW) generated during monitoring well installation is anticipated to include soil cuttings, decontamination water, and development water. Because the IDW may be contaminated, it will be containerized pending characterization. These materials will be placed in U.S. Department of Transportation (DOT)-approved 55-gallon drums and temporarily stored on site. IDW drums will be labeled to indicate contents and the date and origin/location of collection. Soils will be drummed separately from liquids.

Based on analytical results, the following handling of IDW will occur:

- Soil IDW: Soil will be placed in DOT 55-gallon steel drums with proper labeling and stored on site. Simplot will determine proper disposal of soil cuttings derived from drilling activities pending laboratory analysis.

- Water IDW: Water from purging groundwater monitoring wells and decontamination of drilling equipment during monitoring well installation will be placed in DOT 55-gallon steel drums with proper labeling and stored on site. Simplot will determine proper disposal of water IDW drums pending laboratory analysis.

Sampling will be by hand using nitrile gloves. Gloves, paper towels, empty water containers, etc. generated during sampling will be disposed of as municipal waste.

4 Groundwater Compliance Monitoring

4.1 Scope

Groundwater compliance monitoring will be conducted following completion of soil treatment, final backfilling and compaction of the excavated areas, and construction of monitoring wells MW-5SR and MW-5DR. In accordance with the CAP (Ecology 2019), compliance monitoring involves collecting groundwater samples from the monitoring well network semi-annually (twice per year). Sampling will take place in August and January to coincide with maximum and minimum groundwater recharge from the East Low Canal. The semi-annual compliance monitoring is intended to confirm that natural attenuation is taking place and that contaminated groundwater does not migrate off site (Ecology 2019).

A total of 13 wells (MW-1, MW-2, MW-3, MW-5SR, MW-5DR, MW-6S, MW-7S, MW-7D, MW-8S, MW-9S, MW-10S, MW-11S, and MW-12S) will be monitored as part of the groundwater compliance monitoring.

Groundwater compliance monitoring will take place until EDB concentrations in the 13 groundwater monitoring wells are below the cleanup level (CUL) of 0.05 µg/L for two consecutive monitoring events, as established in the CAP (Ecology 2019). It is expected that groundwater CULs will be reached within a maximum 20 years (Ecology 2019).

City of Warden is monitoring City Well #5 for EDB. The City of Warden will provide Ecology with the EDB data from City Well #5 when it is available. The results from the monitoring of City Well #5 will be included in the cleanup action report and future semiannual review reports (see Section 7.2) to help assess the effectiveness of the selected cleanup action (see Section 7.1).

4.1.1 Groundwater Sampling Procedures

Once the proposed wells are constructed and developed, groundwater samples will be collected from 13 wells (MW-1, MW-2, MW-3, MW-5SR, MW-5DR, MW-6S, MW-7S, MW-7D, MW-8S, MW-9S, MW-10S, MW-11S, and MW-12S) semi-annually in August and January. Groundwater sampling will follow low-flow purging and sampling procedures, and sample water will be pumped directly into laboratory-supplied glass containers for EDB analysis by USEPA Method 8011. Sample volumes, preservatives, and holding times are summarized in **Table 4** in Appendix B. Sampling personnel will wear clean nitrile gloves when filling sample containers. The goal is to fill the containers as quickly as possible to prohibit EDB loss by volatilization. Procedures for collecting groundwater samples are provided in SOP-5 in Appendix C. Characteristics of low-flow purging and sampling include the following:

- Pump purge flow rate: 0.1 to 1.0 liters per minute (L/min) (goal is to pump at a constant rate of 1 L/min or less without continual drawdown of the water level in well per EPA guidance (EPA. 1996.).
- Pumps: A low-flow submersible pump will be used for groundwater sampling.
- Pump placement: mid-point of the well screen.
- Water-level indicator: continuous reading during pumping (±0.01 feet).
- Drawdown: goal is not to exceed 0.3 feet (see SOP-5 in Appendix C for situations exceeding this goal).
- Parameter monitoring: Flow-through cell system with monitoring of pH, conductivity, dissolved oxygen (DO), and oxygen reduction potential (ORP). Turbidity will also be measured on using a turbidity meter on aliquots of water samples obtained just before or after sample acquisition. Turbidity measurements shall be recorded to the nearest 0.1 NTU when less than 1 NTU; the nearest 1 NTU when between 1 and 10 NTU; and the nearest 10 NTU when between 10 and 100 NTU.
- Stabilization parameters: pH ±0.1 unit; temperature ±3 percent, specific conductivity ±3 percent; DO ±10 percent or 0.5 milligrams per liter (mg/L), whichever is greater, and (ORP) ±10 millivolts (mV). Stabilization is reached when three consecutive readings meet the stabilization criteria.

4.1.2 Sample Identification Protocol

Groundwater samples collected from monitoring wells will be labeled as follows:

- MW-XXX – for monitoring well sample.

For example, MW-5DR is a groundwater sample collected from monitoring well MW-5DR.

QC samples (see Section 5.1.2) will be identified as follows:

- Rinsate Blank – equipment rinsate blank.
- Field Blank – field blank collected from potable or distilled water used for decontamination.
- Trip Blank – for trip blank.
- MS/MSD: MS and MSD will be appended to the end of the original sample ID.
- Groundwater duplicates: duplicate samples will be given a fictitious well number (such as MW-13) and collection time.

Field notes and photo documentation will record time, location, and identification of each sample (see SOP-1 in Appendix C).

4.1.3 Sample Custody and Documentation

Samples for chemical analysis will be stored in a cooled ice chest pending transportation to a certified analytical laboratory under chain-of-custody protocol, as described in SOP-3 in Appendix C. At the time of writing, the proposed laboratory is Eurofins Test America in Spokane Valley,

Washington. Samples being submitted to Eurofins Test America will be packaged in coolers with ice and shipped overnight.

4.1.4 Investigation Derived Waste Handling

Water from purging groundwater monitoring wells during sampling will be placed in DOT 55-gallon steel drums with proper labeling and stored onsite. Simplot will determine proper disposal of water IDW drums pending laboratory analysis.

5 Quality Assurance/Quality Control

The overall QA objective for this investigation is to evaluate if laboratory and field data on which decisions are based is technically sound, statistically valid, and properly documented. There are two parts to the QA/QC program for this project: field and laboratory. Field QA/QC includes properly documenting field activities and sampling/handling procedures.

5.1.1 QA/QC Soil Samples

Field QA/QC soil samples will consist of the following:

- Equipment rinsate blank from decontaminated sampling equipment (e.g., split-spoon sampler) at a minimum frequency of one sample per week of field activities.
- Trip blank per cooler of samples (analysis for EDB).
- Field blank taken from potable or distilled water used for decontamination at a minimum frequency of one sample per week of field activities.
- MS/MSD at a minimum frequency of 5 percent of soil samples collected. MS/MSD samples will be selected by the field geologist and three times the normal sample volume will be collected to accommodate the extra sample required to perform the MS/MSD analysis.
- Soil duplicate at a minimum frequency of 10 percent of soil samples collected. Duplicate samples will be collected by taking a second soil sample from the same depth in the split-spoon sampler as the original sample.

5.1.2 QA/QC Water Samples

Field QA/QC groundwater samples will consist of the following:

- Equipment rinsate blank from decontaminated sampling equipment (e.g., non-dedicated pump) at a frequency of one sample per event.
- Trip blank per cooler of samples (analysis for EDB).
- Field blank taken from potable or distilled water used for decontamination, at a frequency of one sample per event.
- MS/MSD at a frequency of one sample per event. MS/MSD samples will be three times the normal sample volume to accommodate the extra sample required to perform the MS/MSD analysis.

- Groundwater duplicate at a frequency of one sample per event. Duplicate samples will be collected by taking a second groundwater sample from the same well as the original sample and alternating the filling of original and duplicate sample containers (e.g. vials).

5.1.3 Data Validation and Evaluation

Data evaluation will include checking holding times, method blank results, surrogate recovery results, field and laboratory duplicate results, completeness, detection limits, laboratory control sample results, and chain-of-custody forms. Data management and documentation will include checking QA/QC parameters, including holding times, method blanks, surrogate recoveries, spike recoveries, field and laboratory duplicates, completeness, detection limits, laboratory control samples, and chain-of-custody forms (see quality assurance project plan [QAPP] in Appendix D). After the data has been checked, it will be entered into the project database with assigned data qualifiers.

6 Health and Safety Plan

The contractor will prepare a site HASP (under separate cover), which will describe health and safety measures, including protection monitoring necessary during construction activities. In addition, the HASP will include COVID-19 protocols that are consistent with local and state requirements. The provisions and procedures outlined in the HASP apply to personnel on site who are conducting work associated with the remedial action. Contractors, subcontractors, other oversight personnel, and other persons involved with the work activities described are required to comply with the HASP and develop and comply with their own HASP that is equal to or more encompassing.

6.1 Equipment and Personnel Decontamination

Equipment and personnel decontamination will be performed as described in the HASP prepared under separate cover. Sampling equipment (e.g., stainless steel bowls or spoons) decontamination procedures are described in SOP-4 in Appendix C. Heavy equipment (e.g., drill rig) will be steam-cleaned prior to coming on the site. The contractor's HASP will address equipment decontamination.

Rinsate blanks (see SOP-4 in Appendix C) will be collected as a QA/QC measure for the decontamination procedures when non-disposable equipment is used.

7 Reporting

7.1 Monitoring Well Installation Report

Monitoring well installation, soil sampling, and soil analytical results will be summarized in a report and submitted to Ecology.

7.2 Semiannual Groundwater Compliance Monitoring Reports

The groundwater compliance monitoring program data results will be incorporated into semiannual reports to Ecology. The CAP (Ecology 2019) states that compliance monitoring will occur semi-annually until CULs in groundwater have been achieved in two or more consecutive monitoring

events. The reports will summarize each (semi-annual) round of groundwater compliance monitoring conducted following completion of soil treatment and final backfilling and compaction of the excavated areas. The reports will include the following:

- Groundwater compliance monitoring data compiled to date and an interpretation of results.
- Figure showing groundwater gradients.
- Figure showing analytical results at each monitoring well.
- Data validation evaluation and results.
- Data table showing data from previous sampling events in wells before the cleanup action was implemented.

8 References

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A

Figures

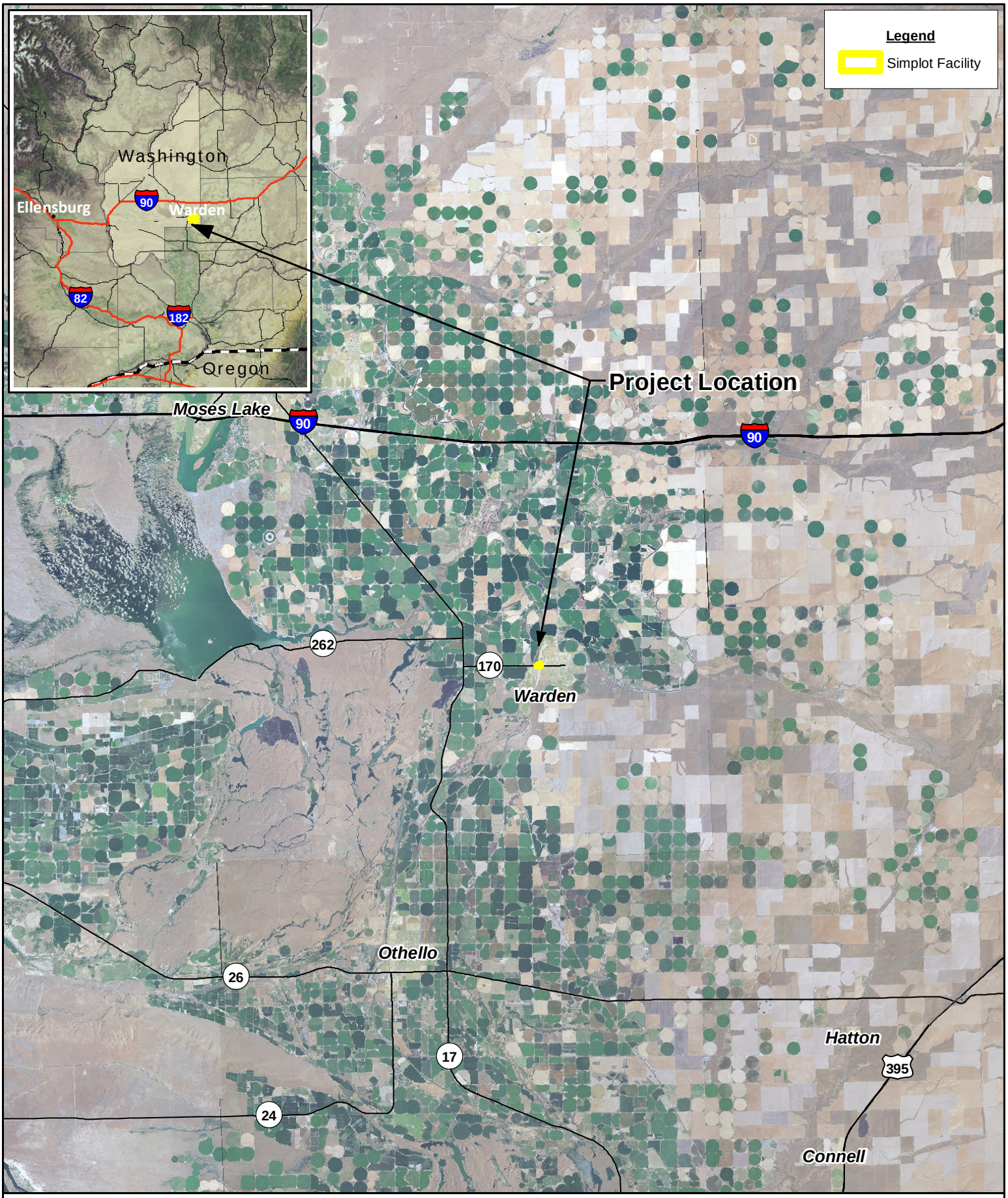


Figure 1. Vicinity Map
Simplot Grower Solutions,
1800 W 1st St., Warden, WA 98857

Imagery: 2017 NAIP 1 meter resoltion
Source: NRCS/USDA Digital Gateway
Other Data Sources: US Census Bureau; Washington Department of Transporation; Washington Department of Revenue

Map Date: 3/14/2018
Document: Q:\Simplot\CityofWarden\map_docs\Vicinity2017.mxd

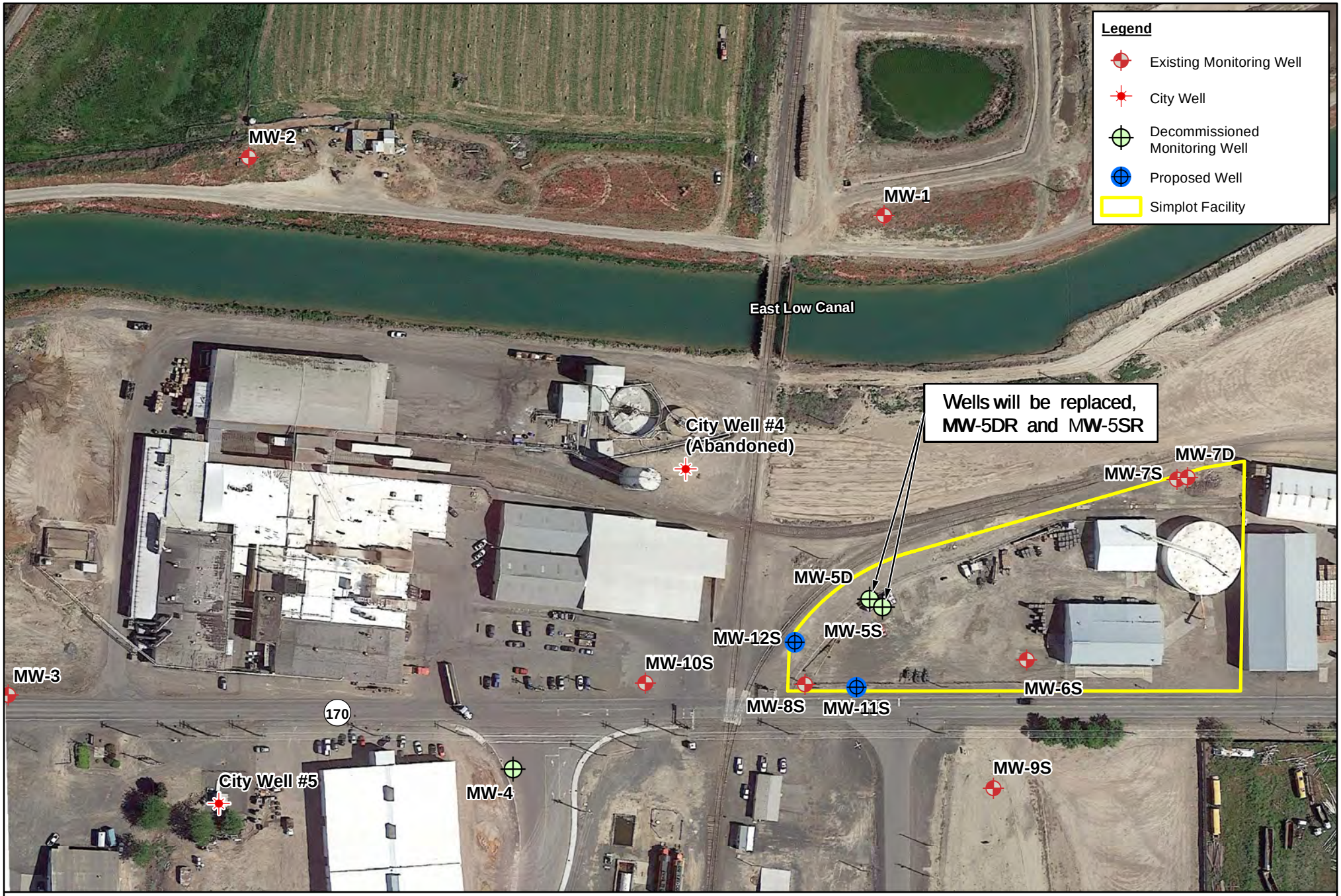
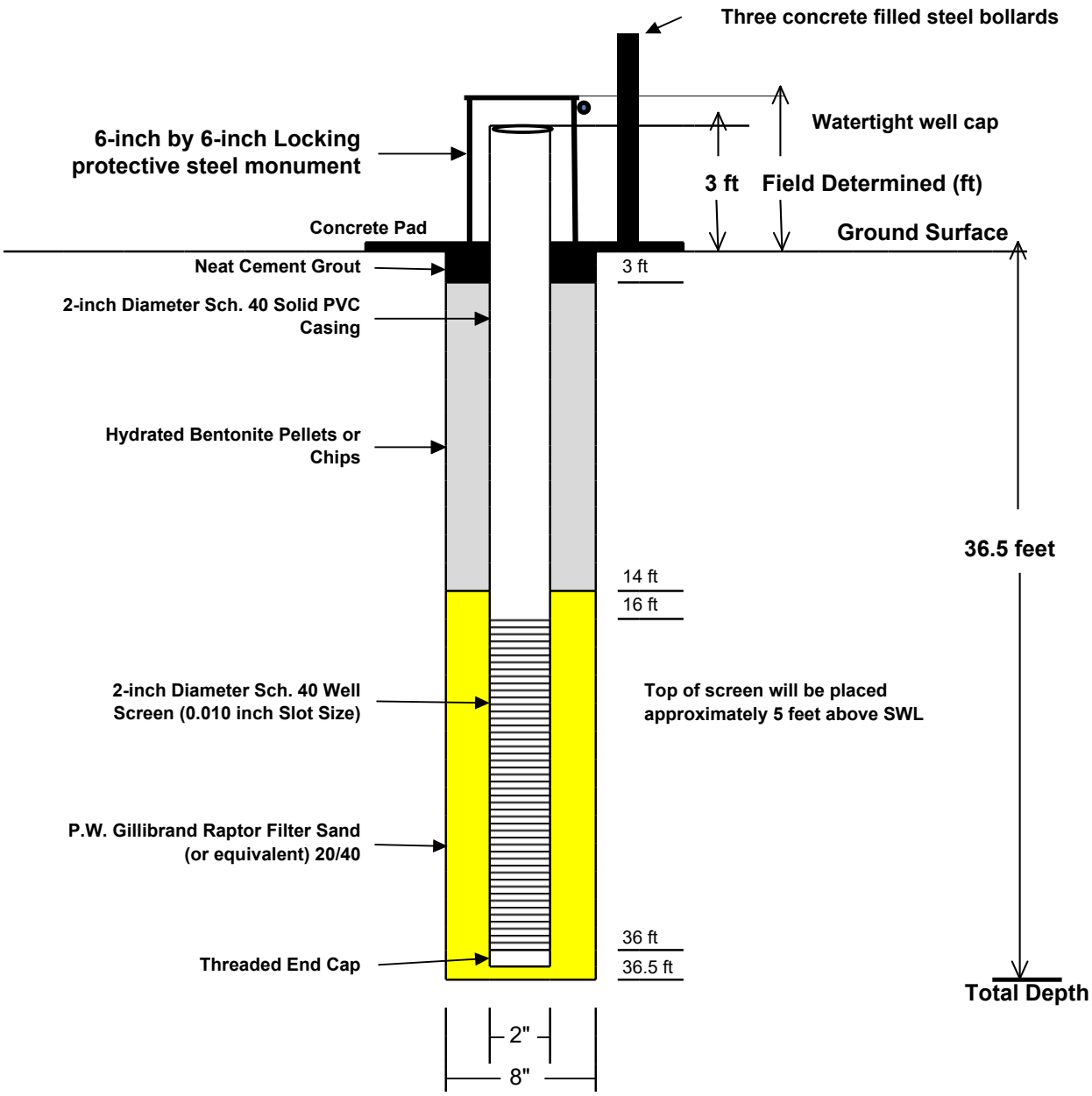


Figure 2. Compliance Monitoring Well Network
Simplot Grower Solutions,
1800 W 1st St., Warden, WA 98857

Imagery: Google Earth, Date 5/27/2017; Source: ©2019 Google
Other Data Sources: US Census Bureau; Washington Department of Transporation; Washington Department of Revenue; Washington Department of Ecology (WDOE)

0 150 300
Feet

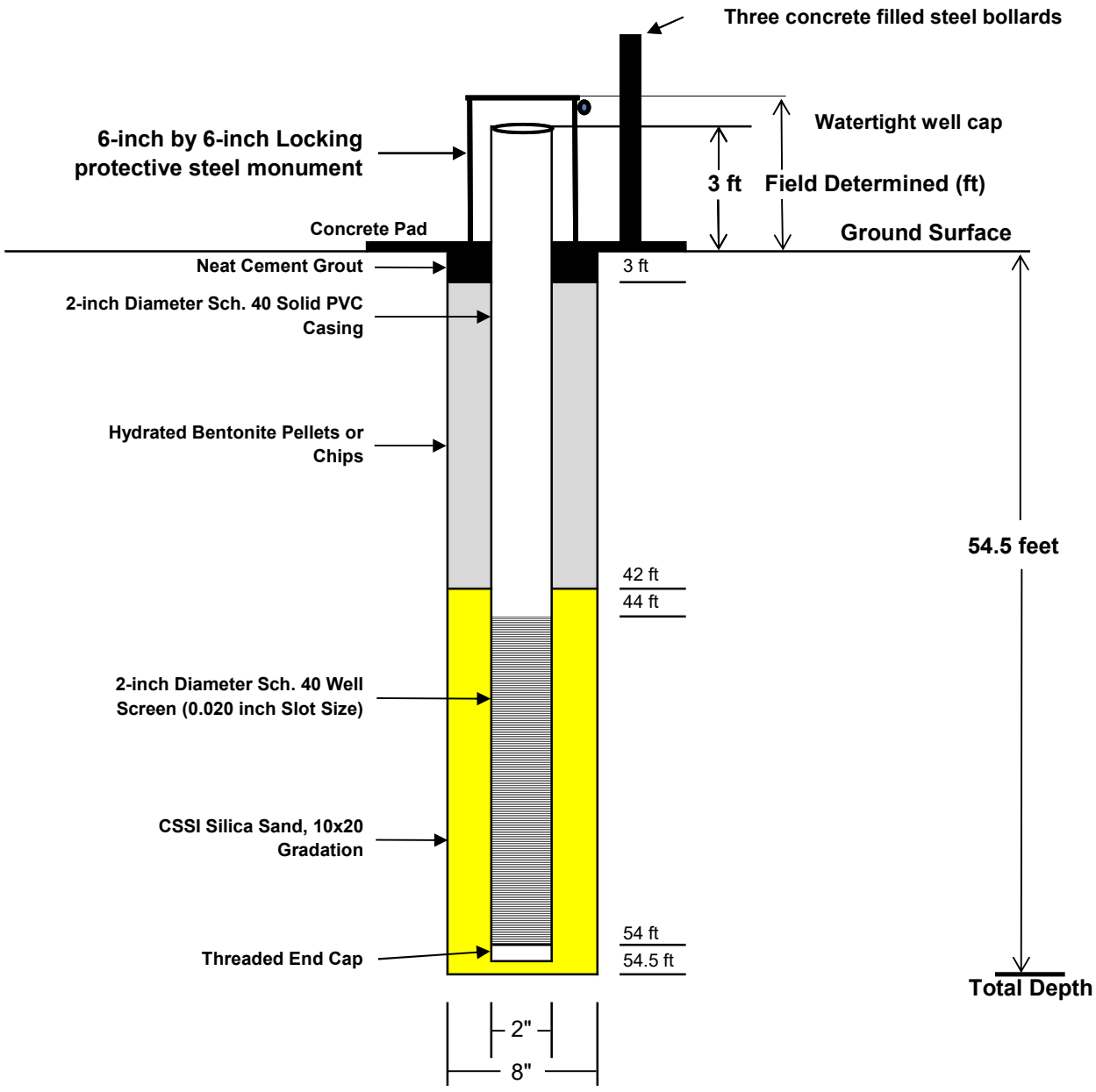
Map Date: 9/21/2020
Document: Q:\Simplot\CityofWarden\map_docs\ComplianceMonitoringWellNetwork.mxd



Note: casing lengths and depths may vary based on borehole findings.

Drawing not to scale

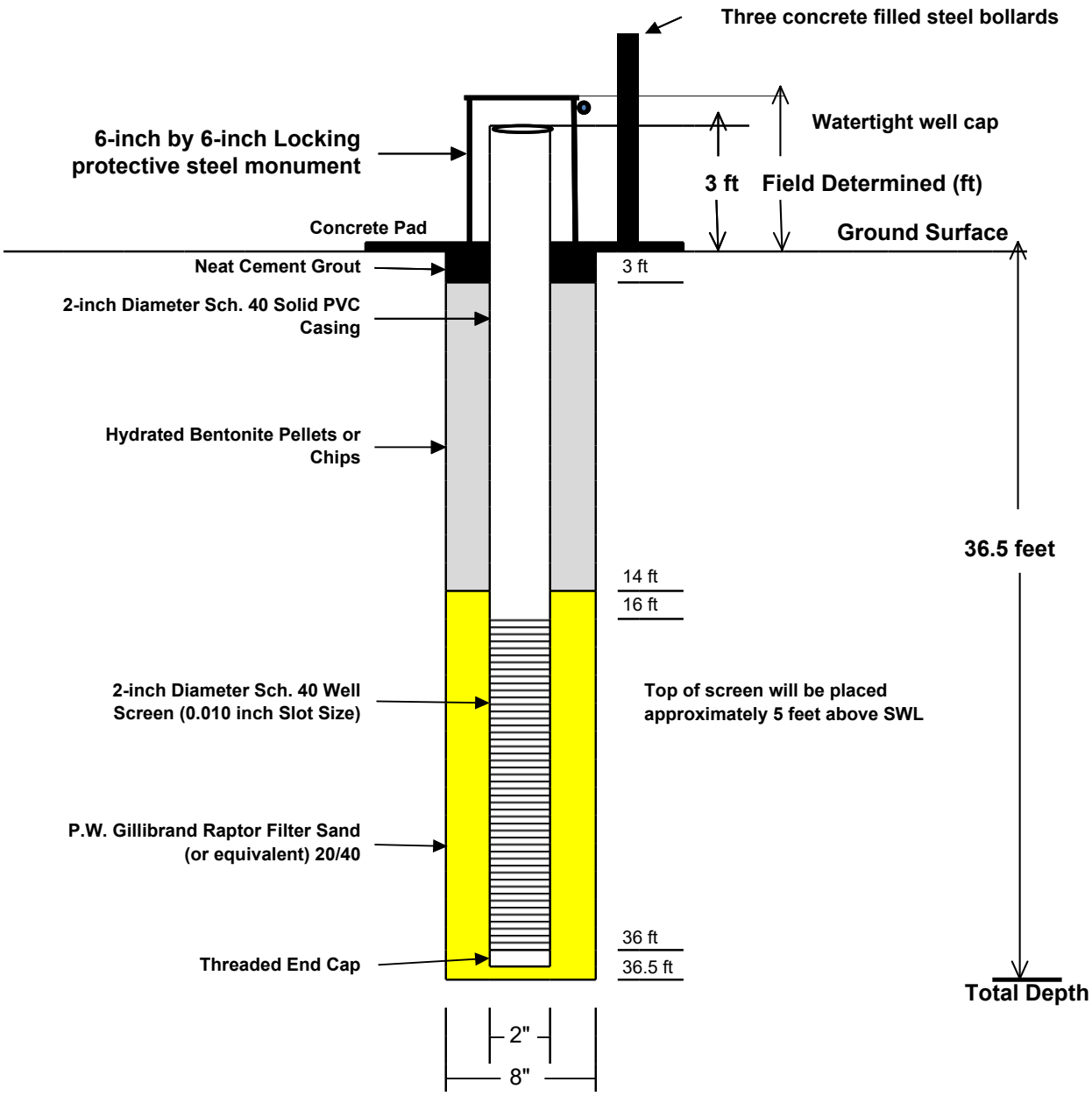
Figure 3. Proposed Well Design - MW-5SR
Simplot Grower Solutions, Warden, WA



Note: casing lengths and depths may vary based on borehole findings.

Drawing not to scale

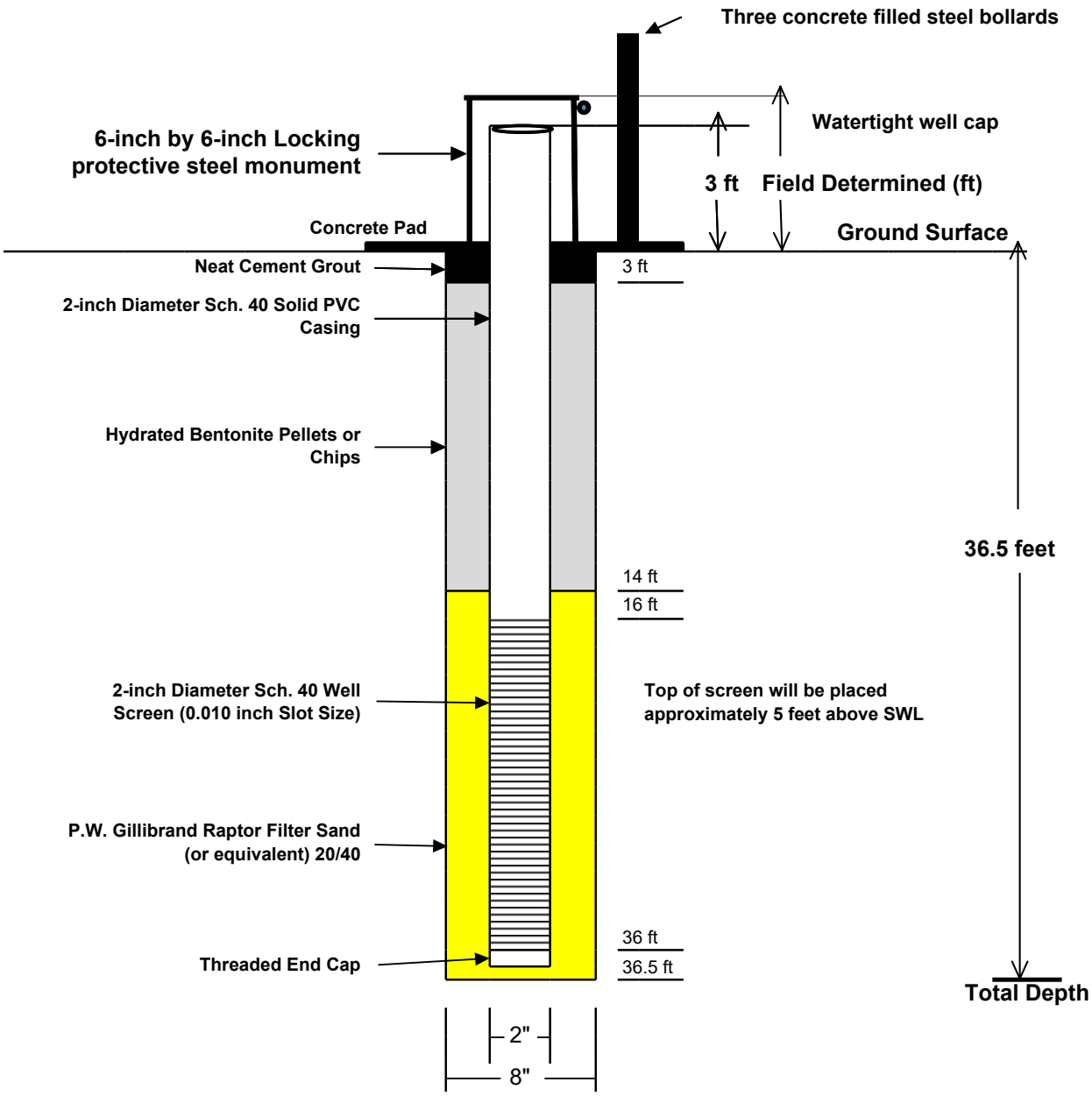
Figure 4. Proposed Well Design - MW-5DR
Simplot Grower Solutions, Warden, WA



Note: casing lengths and depths may vary based on borehole findings.

Drawing not to scale

Figure 5. Proposed Well Design - MW-11S
Simplot Grower Solutions, Warden, WA



Note: casing lengths and depths may vary based on borehole findings.

Drawing not to scale

Figure 6. Proposed Well Design - MW-12S
Simplot Grower Solutions, Warden, WA

B

Tables

Table 1. Existing Monitoring Well Construction Summary

	MW-1	MW-2	MW-3	MW-4[1]	MW-5D[2]	MW-5S[2]	MW-6S	MW-7D	MW-7S	MW-8S	MW-9S	MW-10S
Ecology Unique ID	APK 353	APK 354	APK 355	APK 356	APK 357	BCE 296	BCE 297	BCE 298	BCE 299	BHP-139	BHP-507	BHP-508
Installation Dates	8/14/06	8/15/06	8/15/06	8/16/06	8/16/06	12/5/11	12/5/11	12/7/11	12/6/11	1/16/13	7/8/13	7/8/13
Measuring Point Coordinates[3]												
Northing	600643.42	600712.43	600077.54	599989.55	600190.13	600180.56	600118.69	600334.17	600331.8	600089.61	599967.53	600091.31
Easting	1999635.94	1998885.78	1998600.99	1999197.52	1999618.84	1999634.23	1999804.74	1999994.82	1999981.87	1999542.40	1999765.18	1999354.01
Elevations[3]												
Ground Surface Elevation, feet	1243.22	1244.49	1240.88	1244.72	1245.14	1245.06	1245.36	1248.51	1248.36	1244.52	1244.77	1242.82
Measuring Point (PVC) Elevation, feet	1245.62	1247.09	1240.88	1244.72	1247.54	1247.66	1247.86	1251.01	1250.86	1248.84	1247.27	1245.32
Top of Screen Elevation, feet	1197.22	1179.99	1191.38	1195.22	1201.14	1228.56	1235.36	1206.51	1231.36	1230.52	1237.77	1227.82
Bottom of Screen Elevation, feet	1187.22	1169.99	1181.38	1185.22	1191.14	1208.56	1215.36	1196.51	1211.36	1210.52	1227.77	1207.82
Depths												
Top of Screen, feet bgs	46	64.5	49.5	49.5	44	16.5	10	42	17	16	7	15
Bottom of Screen, feet bgs	56	74.5	59.5	59.5	54	36.5	30	52	37	36	17	35
Bottom of Well Casing, feet bgs	N/A	N/A	N/A	N/A	N/A	37	30.4	52.4	37.4	36.5	17.5	35.5
Depth of Borehole, feet bgs	60	75	60	60	55	39.5	37	52.5	38.5	36.5	17.5	35.5

[1] MW-4 decommissioned in April 2015 at landowner's request.

[2] MW-5D and MW-5S decommissioned in June 2020.

[3] Survey conducted by Permit Surveying, Inc.

Table 2. Proposed Monitoring Well Construction Summary

	MW-5SR	MW-5DR	MW-11S	MW-12S
Depths (feet bgs)				
Depth of Borehole	36.5	54.5	36.5	36.5
Bottom of Well Casing	36	54	36	36
Screen Interval	16-36	44-54	16-36	16-36
Filter Pack Interval	14-36.5	42-54.5	14-36.5	14-36.5
Bentonite Seal Interval	3-14	3-42	3-14	3-14
Concrete Backfill (Neat Cement Grout)	0-3	0-3	0-3	0-3
Materials				
Casing and Screen Material	Sch. 40 PVC	Sch. 40 PVC	Sch. 40 PVC	Sch. 40 PVC
Casing and Screen Diameter, Nominal, inches	2	2	2	2
Screen Slot Size, inches	0.020	0.020	0.020	0.020
Filter Pack Material	#10-20 gradation CSSI silica sand			
Bentonite Seal Material	3/8-inch bentonite chips or pellets, hydrated			
Well Completion	Stick-up; 3-ft	Stick-up; 3-ft	Stick-up; 3-ft	Stick-up; 3-ft
Well Protection	Locking steel casing w/ concrete pad	Locking steel casing w/ concrete pad	Locking steel casing w/ concrete pad	Locking steel casing w/ concrete pad

Table 3. Proposed Soil Sampling

Boring	Sample and depth (feet bgs)	Rationale
MW-11S	1-3 Top of caliche zone 10-12 20-22 30-32 36-38	Samples will be collected in the unsaturated and saturated zone to evaluate the presence of EDB in soils with depth. Samples provide information on a potential source area and on upgradient sources. Samples will be collected at the surface, first encountered caliche zone, and at 10-foot intervals to the final depth of drilling.
MW-12S	1-3 Top of caliche zone 10-12 20-22 30-32 36-38	

Table 4. Proposed Analyses for Soil and Groundwater Samples

Matrix	Analytical Parameter	Method	Preservative	Volume and Container	Holding Times
Soil	Ethylene Dibromide (EDB); Moisture	USEPA 8011	4°C	100 grams; 8-oz amber glass jar	14 days prep; 40 days after extraction
Water	Ethylene Dibromide (EDB)	USEPA 8011	4°C; Sodium Thiosulfate	3 x 40-mL vials w/ Teflon septa	14 days

USEPA = U.S. Environmental Protection Agency; °C = degrees Celsius; mL = milliliters; oz = ounce

C

Standard Operating Procedures

STANDARD OPERATING PROCEDURE 1 - GENERAL PROCEDURES FOR FIELD PERSONNEL

1 Purpose

This Standard Operating Procedure (SOP) provides guidance for the general field practices to be followed during field activities at the Simplot Warden facility; review is mandatory prior to the start of each field event. This SOP provides general guidance; see Groundwater Monitoring Well Construction and Monitoring Plan for details.

2 Personnel Qualifications and Responsibilities

Field activities will be directed by the Field Team Leader (FTL), an environmental professional (engineer, geologist or scientist) with experience in performing and directing the planned activities. Field staff will be junior to mid-level environmental professionals or environmental technicians. Field work will be conducted by persons with experience in performing the planned activities.

The FTL will provide direction to field staff to ensure work is performed in accordance with the project documents (Quality Assurance Project Plan [QAPP], work plan, Health and Safety Plan [HASP], and SOPs). The field staff will carefully review the project documents, conduct the work as planned, seek direction from the FTL when questions or problems arise, and carefully complete field documentation.

3 Equipment and Supplies

The required equipment and supplies will be identified in the SOPs for the specific field activities to be performed and in the project Groundwater Monitoring Well Construction and Monitoring Plan. Field activities should not proceed until the proper tools and equipment are available and in good working order.

Each team will have use of a vehicle during field activities. An initial safety check should be performed at the start of each shift to confirm the vehicle is in good working condition. The vehicle should then be checked daily for damage or required maintenance.

4 Procedure

4.1 Start-Up Activities

4.1.1 Office

Prior to leaving the office for field work, the Project Manager (PM) will assign an FTL to direct field activities and coordinate with project personnel. Task specific responsibilities of the FTL will be addressed in the appropriate SOP; general responsibilities include:

a. Review Groundwater Monitoring Well Construction and Monitoring Plan, HASP, and QAPP.

b. Work with PM to properly staff the field activity.

c. Coordinate sampling activities with the project chemist and analytical laboratory.

d. Confirm availability and condition of equipment and order additional equipment/supplies for delivery prior to the start of each event.

e. Prepare field forms and other documentation for the planned event.

f. If work is to be subcontracted, review the subcontract agreement, Groundwater Monitoring Well Construction and Monitoring Plan, and HASP.

g. Confirm that field staff have a state-issued Driver's License (or other picture identification) prior to leaving the office.

4.1.2 Field

After arrival on site, but prior to commencement of operations, the following activities will be performed:

- Complete equipment and supply checklists and verify that required documentation and equipment for field activities are on site.
- Review condition of equipment; inventory field supplies and laboratory-provided sampling supplies.
- Review locations for planned field activities for hazards, determine requirements for site preparation and clearance, and select location for the storage of purge and decontamination waters.
- Conduct team safety meetings as required by the HASP.
- Conduct team review of the project documents including SOPs to be utilized.

4.2 Field Operations

Field staff responsibilities are project specific. At a minimum, field personnel will perform the following activities:

1. Document field activities in a logbook for each team and/or field records as required by the Groundwater Monitoring Well Construction and Monitoring Plan or SOPs.
2. Record the following additional information for field measurements:
    a. The identification number and calibration results for each field instrument
    b. The numerical value and units of each measurement
    c. A description of any unexpected delays or problems observed during sampling activities
3. Complete required data collection/sample control forms (e.g., Chain-of-Custody, Field Sampling Report, etc.).
4. Communicate with the PM regarding site conditions and variances that might be required due to site conditions.
5. Perform following activities daily before leaving the site:
    a. Decontaminate and check condition of field equipment.
    b. Provide logbooks and other field documentation to FTL for review and scanning.
    c. Properly dispose of trash, debris and used personal protective equipment (PPE).
    d. Make arrangements for shipment of samples (if applicable) and follow-up with the analytical laboratory to confirm samples arrived in good condition.
    e. Complete activity-specific field reports as required by applicable SOPs.
    f. Complete the Daily Field Report and submit to PM.

4.3 Field Logbooks and Documentation

Logbooks will be used by each field team in addition to documentation required by activity-specific SOPs.

- The first entry for each field event will list the following information:
    - Project name and number
    - Sample team leader and members (full names) and initials
- At minimum, the logbook will describe general activities performed, samples collected, date and time, personnel, and weather conditions. Field equipment calibration and maintenance records will be documented in the logbook. Communications with the FTL, PM or project chemist regarding field activities will be documented. Additional field data will be recorded in the logbook if other field records are not used.
- Any deviations from the QAPP or Groundwater Monitoring Well Construction and Monitoring Plan will be noted in the logbooks.
- Errors will be crossed out with a single line, the correction added and the entry initialed.

- Each page will be numbered and dated. A diagonal line will be drawn through any unused portion of a page containing an entry. To indicate the end of an entry, personnel are required to initial and date the page at the conclusion of each day.

4.4 Closeout

Upon the completion of field activities, the FTL will view each site to verify the area has been cleared and restored as closely as possible to its prior condition. Trash will be removed from the site, and surface damage, including ruts caused by vehicles, will be repaired.

Confirm all equipment is accounted for and properly decontaminated and in good working condition. Notify PM if repairs are needed. Properly package and ship rental equipment to the vendor. When shipping equipment, use the proper HDR FedEx number and insure the package for the cost of the equipment. Rental vehicles should be fueled and returned to the rental company as soon as possible. Work areas should be cleaned with tools and equipment properly stored.

The FTL will make a final check of all logbooks and other field records to ensure there are no blanks or missing data and the entries are legible. FTL will organize scanned forms in proper order and transmit to PM.

The FTL will complete Field Event Closeout Report and submit to PM.

5 Data and Records Management

Field forms and logbook entries will be scanned and copied to the project folder on the HDR network file share drive within one week of the field event completion. Photographs taken during the field event will be uploaded along with a typed photograph log (date, project and subject) to the HDR network file share drive. The photographs will then be erased from the camera. The PM be sent a link for the data.

6 Quality Control and Quality Assurance

Work will be performed in accordance with the QAPP, the Groundwater Monitoring Well Construction and Monitoring Plan, and applicable SOPs. Field activities will be recorded in the logbooks in sufficient detail to reconstruct the events. No erasures or mark outs will be made on field forms or logbooks. A single line will be used to strike out errors and will be annotated with the initials and date of the editor.

Field Event Startup Report

Prepared by: Date:

Event Name:

Project-Activity Number:

Summary of Planned Event:

Planned Performance Period: _____to_____

Project Documents - Title, Date

Groundwater Monitoring Well Construction and Monitoring Plan:

Health and Safety Plan:

Other SOPs – List number/revision and title:

Field Event Staffing

Position	Name	OSHA Cert. (Y/N)	First Aid/ CPR (Y/N)	Driver's License (Y/N)	Proj. Plans reviewed (Y/N)	Experience (Hi-Med-Low-None)
Field Team Leader						

Field Equipment

Name/Use	Mfr./Model No.	Condition	Calibration Req'd.(Y/N)	Calibration supplies	Other supplies (batteries, etc.)

Rental Equipment

Name/Use	Mfr./Model No.	Condition	Calibration Req'd.(Y/N)	Calibration supplies	Other supplies (batteries, etc.)

Lab-provided Sampling Supplies

Sample Type	Number	Supplies

Additional Tools/Supplies

Camera
Field forms (list):
Sample supplies (list):
Water/Ice cooler
Sample cooler

Final Check

1. All required equipment/tools received and condition checked

Yes ___ No ___ Comment:

2. Initial equipment calibration completed

Yes ___ No ___ Comment:

3. Vehicles inspected

Yes ___ No ___ Comment:

4. Field locations reviewed

Yes ___ No ___ Comment:

5. Weather forecast checked

Yes ___ No ___ Comment:

6. Staff documents (OSHA, DL) checked

Yes ___ No ___ Comment:

7. Review of project plans confirmed and activities discussed

Yes ___ No ___ Comment:

8. Initial Safety Meeting held and HASP signed

Yes ___ No ___ Comment:

Daily Field Report

Project Number/Activity:	**Date:**
Project Name:	**Field Team Leader:**
Brief Work Description:	

Weather:	**Temp:**

Previous Day's Samples received at laboratory – Y / N Comment:

Time	Description

Name/Organization of Field Staff, Subcontractors and Site Visitors	

Samples Collected

Problems or Deviations from Groundwater Monitoring Well Construction and Monitoring

Tasks to be completed next workday

_____ _____ _____

Name **Signature** **Date**

Field Event Close-Out Report

Prepared by: Date:

Event Name:

Project-Activity Number:

Performance Period: _____to_____

Field Team Leader:

Field Staff:

Summary of Completed Event:

Field problems and/or changes from planned activities:

Change in number/type of samples collected:

Health and Safety problems/Injuries:

Close-out Checklist

1. Logbook and field forms scanned and originals placed in project file

Yes ___ No ___ Comment:

2. Equipment/tools decontaminated

Yes ___ No ___ Comment:

3. Rental equipment shipped to supplier

Yes ___ No ___ Comment:

4. Rental vehicles returned

Yes ___ No ___ Comment:

5. DDMT equipment and tools properly stored

Yes ___ No ___ Comment:

6. List damaged equipment

Yes ___ No ___ Comment:

7. Replacement supplies ordered

Yes ___ No ___ Comment:

8. Field locations inspected and trash/debris removed

Yes ___ No ___ Comment:

9. Field shop/office cleaned

Yes ___ No ___ Comment:

STANDARD OPERATING PROCEDURE 2 – SURFACE AND SUBSURFACE SOIL SAMPLING (DRILL RIG)

1 Purpose and Summary

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of representative soil samples. Sampling is assumed to be from split-spoon samplers or other discrete sampler advanced with a drill rig. Analysis of soil samples may define the extent of contamination, determine whether concentrations of specific contaminants exceed established action levels, or if the concentrations of contaminants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and any changes described in a site report.

2 Personnel Qualifications and Responsibilities

Field activities will be directed by the Field Team Leader (FTL) and a qualified junior to mid-level scientist or geologist. The FTL will provide direction to field staff to ensure work is performed in accordance with the project documents (Quality Assurance Project Plan [QAPP], work plan, Health and Safety Plan [HASP], and SOPs). The field staff will carefully review the project documents, conduct the work as planned, seek direction from the FTL when questions or problems arise, and carefully complete field documentation.

3 Equipment and Supplies

Field activities should not proceed until the proper tools and equipment are available and in good working order. Usual equipment/supplies for soil sampling will include: site maps, safety equipment, tape measure, GPS, survey stakes/flags, camera, ziptop bags, labels, sample containers, cooler, ice, chain of custody, and decontamination equipment

The team will have use of a vehicle during field activities. An initial safety check should be performed at the start of each shift to confirm the vehicle is in good working condition. The vehicle should then be checked daily for damage or required maintenance.

4 Procedure

Procedures for conducting a surface or subsurface soil sampling event are below.

4.1 Preparation

- Notify the Washington Utilities Coordinating Council (Call Before You Dig, 1-800-424-5555) to identify utilities prior to soil probing
- Determine the extent of the sampling effort, the analytes to be determined, the sampling methods to be employed, and the types and amounts of equipment and supplies required to accomplish the assignment.
- Obtain the necessary sampling equipment.
- Prepare schedules and coordinate with staff, driller, client, and regulatory agencies, as appropriate.
- Perform a general site reconnaissance survey prior to site entry in accordance with the HASP.
- Use stakes or flags to identify and mark all sampling locations. Specific site factors, including extent and nature of contamination, should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared prior to soil sampling; utility clearances must be confirmed before beginning intrusive work.
- Inspect the drill rig and materials to ensure they arrived on site in a clean condition and are free of oil, grease, and debris. The field manager shall inspect the rig for any significant fluid leaks. If leaking fluids are present, repair or contain them
- Set up the decontamination area for sampling equipment, and decontaminate any non-disposable sampling equipment prior to use
- Pre-clean and decontaminate equipment in accordance with the work plan and SOP-4 and ensure that it is in working order.
- If required, obtain the anticipated number of solid and liquid 55-gallon drums required to contain the soil and decontamination waste, and have drums ready for drilling activities.

4.2 Soil Sampling

To collect discrete soil samples from boreholes, perform the following:

- Drill to the top of the desired sample interval, attach and advance a decontaminated split-spoon or other discrete soil sampler into undisturbed soil, then withdraw the sampler.
- For each sample, record the following in the field logbook:
    - Date and time of collection
    - Depth of sample collection
    - Sample recovery
    - Qualitative description of the soil sample

- As specified in the work plan, collect a representative soil sample and place it in the appropriate sample container(s). Soil transfer can be accomplished by hand (using clean nitrile gloves) or with tools such as trowels, and scoops. Avoid sampling sticks, rocks, vegetation and other debris. The following procedure is used to collect soil samples:
    1. For VOCs analysis: Place soil sample directly into appropriate, labeled containers and secure the caps tightly.
    2. If not for VOCs: Accumulate an adequate volume of soil, based on the type(s) of analyses to be performed, in a stainless, plastic or other appropriate container. Thoroughly mix the soil to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly, or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.
    3. Label each sample container and document the sample collection in the field logbook. Place all samples on ice and compete the chain-of-custody form. Sample labeling, control, and documentation will be in accordance with SOP-3.
- Sampling personnel shall remove outer gloves (latex) and discard them between samples to minimize the potential for sample cross-contamination.
- Decontaminate the split-spoon sampler and any other non-disposable sampling equipment between each sampling interval as described in the work plan and SOP-4.

5 Quality Control and Quality Assurance

For this project, the following field QA/QC samples will be collected:

- Equipment rinsate blank from decontaminated sampling equipment (e.g. split-spoons) at a minimum frequency of 1 sample per week of field activities.
- Trip blank per cooler of samples (analysis for EDB).
- Field blank, taken from distilled water used for decontamination, at a minimum frequency of 1 sample per week of field activities.
- Matrix spike/matrix spike duplicate (MS/MSD) at a minimum frequency of 5 percent of soil samples collected. MS/MSD samples will be selected by the field geologist and three times the normal sample volume will be collected to accommodate the extra sample required to perform the MS/MSD analysis.
- Soil duplicate at a frequency of 10 percent of soil samples collected. Duplicate samples will be collected by taking a second grab sample adjacent to the original sample from the same split-spoon sampler.

In addition, the following general QA procedures apply:

- Data must be documented in field logbooks or on field data sheets. The following data is typically recorded: Sampler's name, sample number, sample location, sample depth, type of analyses to be performed, sample description, date and time of sample collection, weather conditions at time of sampling, method of sample collection, sketch of sample location.
- Refer to SOP-4 for decontamination and rinsate blanks used for QA/QC.

STANDARD OPERATING PROCEDURE 3 – SAMPLE CONTROL AND DOCUMENTATION

1 Purpose and Summary

This Standard Operating Procedure (SOP) provides guidance for sample control and identification, data recording, and proper completion of chain-of-custody (COC) forms.

2 Personnel Qualifications and Responsibilities

Sample control activities will be directed by the Field Team Leader (FTL), an environmental professional (engineer, geologist or scientist) with experience in sampling activities. The field staff, environmental professionals or technicians, are responsible for proper sample handling and documentation of the sample collection.

3 Equipment and Supplies

The field staff will use a pen with blue or black waterproof ink to record field activities and document sample handling in a field logbook and on field data sheets. A laptop computer with laboratory-provided software may also be used for sample documentation.

4 Procedure

Proper field sampling and documentation help ensure sample authenticity and data integrity. These procedures describe sample collection documentation and sample handling, tracking, and custody procedures to ensure that sample integrity and custody are maintained.

If the computer is being used to scan the samples as they are collected the data recorded by the computer should be checked for correctness. The date and time on the computer should be checked prior to scanning of any samples. The sample label should be completed when the sample is collected. If a handwritten COC will be used, all information should be recorded in a logbook as to the type of sample, date and time collected and number of sample containers. The COC can then be filled out back at the field office in a quiet environment without disturbances to avoid errors.

Corrections to the COC, field logbook or field data forms will be made by a single line to strike out errors and annotated with the initials and date of the editor; the correct information will be inserted as appropriate.

The number of sample containers on the COC should be physically checked against the number of containers collected. Once this is confirmed the sample crew can properly store the samples for shipment.

4.1 Start-Up Activities

4.1.1 Office

The FTL will work with the project chemist (PC) to:

- See Groundwater Monitoring Well Construction and Monitoring Plan.
- Coordinate with the analytical laboratory and ensure that COC forms and return shipping labels are shipped to the site.

4.1.2 Field

After arrival on site, but prior to commencement of operations, the FTL will confirm that required documentation and equipment for field activities are on site.

4.2 Field Operations

4.2.1 Sample Identification

Individual samples will be identified by a unique alphanumeric code (also referred to as a sample ID number or field number) which will be written on the sample label and recorded on the COC form. See Groundwater Monitoring Well Construction and Monitoring Plan for details on sample ID. Additional information to be written on the label includes sample ID, time and date of sample, sampler's initials, and the analytical methods to be performed, as described in Section 4.2.3 of this SOP.

The location of field duplicates will be recorded in the field notebook. At the end of the sampling event, the FTL will send the PM and PC the final field notes and include notes on any changes from the Groundwater Monitoring Well Construction and Monitoring Plan and SOPs.

4.2.2 Field Documentation

4.2.2.1 Logbook

The logbook is a written record of sampling activities to be completed in the field during sampling. The purpose is to document field conditions or procedural exceptions that may aid in the analysis of data generated from sampling activities. The logbook will have sequentially numbered pages and information will be recorded in blue or black waterproof ink. The recorder will sign and date each entry.

Information pertaining to environmental conditions at the site during the field investigation will be noted in the field logbook for each day. The following information will be recorded for each activity:

1. Activity
2. Location

3. Date and time
4. Weather conditions
5. Field team members present

For field sampling activities, the following information will be recorded, if a sampling form is not used:

1. Sample type and sampling method
2. The identity, date, and collection time of each sample and the depth(s) from which it was collected
3. Sample description (e.g. color, odor, clarity)
4. Identification of sampling devices used
5. Identification of sampling conditions that might affect the representativeness of a sample (e.g. refueling operations, damaged casings)

4.2.2.2 Daily Field Reports

Each day the FTL will prepare a Daily Field Report. The report will include daily weather, time and description of field activities, samples collected, and any problems or changes in scope that occurred that day. The report also lists field staff, subcontractors and site visitors.

4.2.2.3 Photographs

Photographs taken for the purpose of project documentation will be noted in the field logbook. The sequential number of the photograph, photographer, date, time, location, description, and orientation of the photograph will be recorded in the logbook as the photographs are taken. The photographs and documentation will be loaded on the HDR network project file.

4.2.3 Sample Labels/Tags

Sample labels will be filled out for each sample with an indelible pen. The label will be protected from water and solvents with clear label protection tape. Any change in the pre-prepared label information will be initialed by the sampler.

4.2.4 Sample Custody

Sample custody is an important part of a quality field or laboratory operation. Custody of a sample is defined as:

1. Having physical possession
2. Being in view, after being in possession
3. Having possession, then being placed in a secure area
4. Being maintained in a secure area by the person who had possession last

These custody practices will be observed in the field. They will be performed according to the procedures described in the following subsections.

4.2.4.1 COC Records

A hand-written three-part COC will be completed, in triplicate. The first two pages will accompany the cooler to the laboratory, and the bottom copy will be retained in the files at the field office after it is scanned into the computer file.

The information specified on the COC record will contain the same level of detail found in the field logbook, with the exception that on-site measurement data will not be recorded. The custody record will include at least the following information:

- Name of person collecting the samples
- Sample ID
- Date and time samples were collected
- Type of sampling conducted (composite/grab)
- Number and type of containers used
- Sample matrix (soil/groundwater)
- Analyses requested
- Location of sampling station (including the site location)
- Signature of the HDR person relinquishing samples to a non-HDR person (such as a FedEx agent), with the date and time of transfer noted, and the cooler designation

If samples will require rapid turnaround in the laboratory because of project time constraints or analytical concerns such as extraction time or sample retention period limitations, these constraints will be noted in the remarks section of the custody record. The FTL or designee will contact the laboratory to confirm the turnaround time can be achieved.

It is not practicable to seal the sample coolers or cartons at a FedEx office; they will be sealed beforehand. The custody record will, therefore, have the signature of the relinquishing field technician with the date and time, but the “relinquished to” box will not be completed.

The duplicate custody record will then be placed in a plastic bag, taped to the underside of the cooler lid, and the cooler closed. COCs for air samples will be included in the carton. The container will be tightly bound with filament tape. Finally, custody seals will be signed by the individual relinquishing custody and affixed in such a way that the cooler or carton cannot be opened without breaking the seals.

The original and duplicate custody records and the airway bill or delivery note together constitute a complete record. The FTL will email a copy of the airbill and the COC to the PC, who will maintain the custody records as part of the analytical data file.

4.3 Closeout

Before leaving the site daily, the following procedures will be performed by on-site personnel:

- Maintain custody of samples, maintaining them as specified for the analyses to be performed.
- Prepare samples for shipment to the laboratory.
- Complete the COC forms.
- Contact the laboratory to inform them that samples will be shipped and remind them of any special requirements for the sample analyses.
- Verify completion of logbook, ensuring that required information has been recorded.

Upon the completion of sample collection and shipment, copies of the COCs will be scanned and sent to interested parties to include the PM. The FedEx tracking numbers will be checked each day to confirm the samples were delivered and the laboratory will be contacted to check on problems with the samples or COCs.

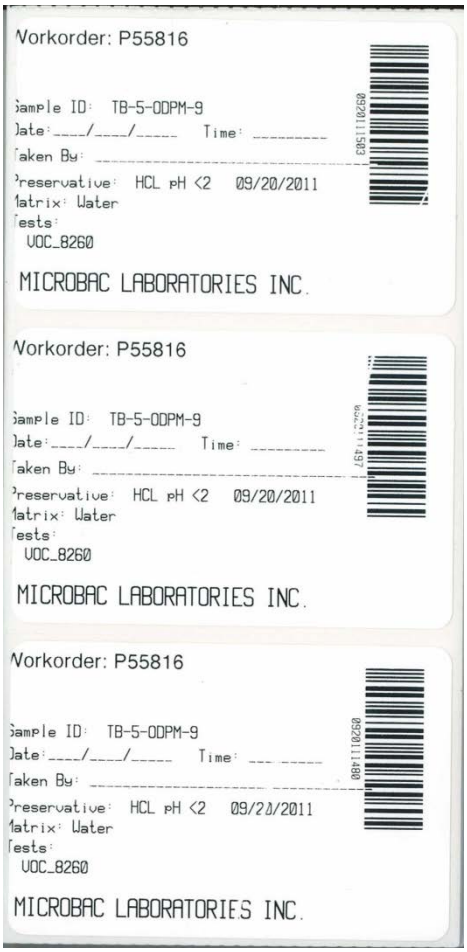
5 Data and Records Management

All field forms, COCs, and logbook entries will be scanned and copied to a project folder on the HDR network within one week of the field event completion. All original forms will be stored in the HDR project files. The PM will be sent a link for the data.

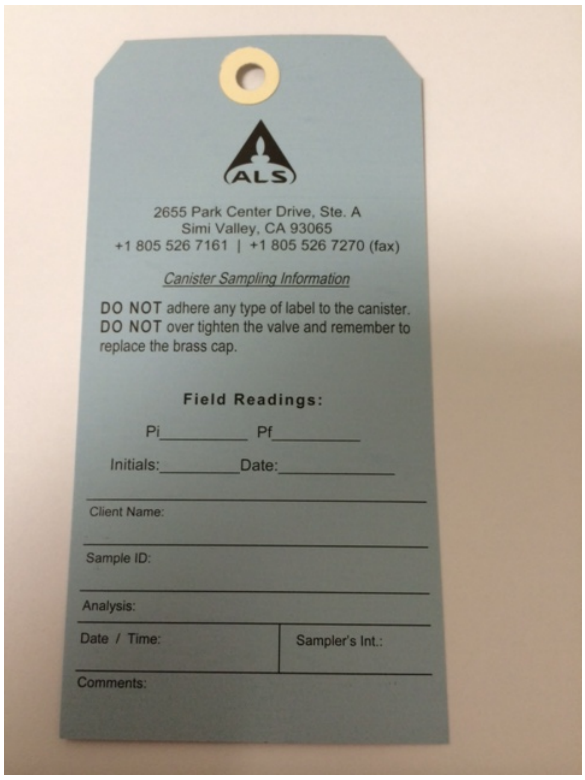
6 Quality Control and Quality Assurance

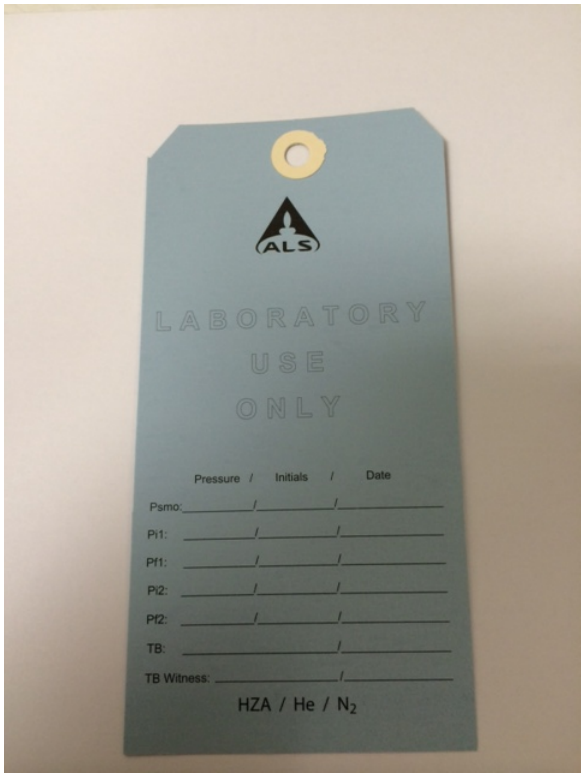
Work will be performed in accordance with the QAPP, the specific work plan, and applicable SOPs. Field activities will be recorded in the logbooks in sufficient detail to reconstruct the events and forms provided with the SOP will be completed. No erasures or mark outs will be made on field forms or logbooks. A single line will be used to strike out errors and will be annotated with the initials and date of the editor; the correct information will be inserted as appropriate.

EXAMPLE: Sample Labels

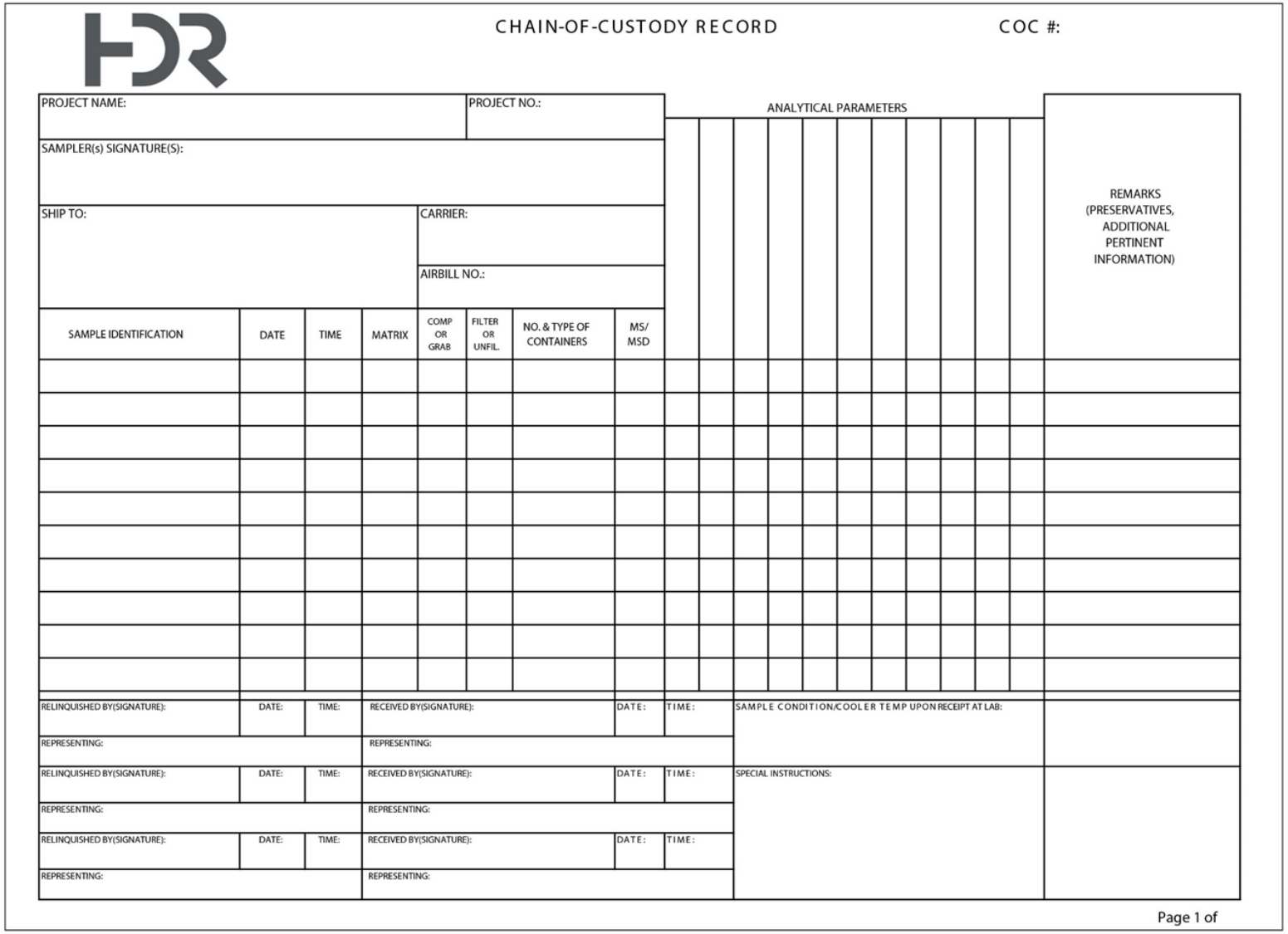


EXAMPLE: Sample Labels for Air Samples





EXAMPLE: HDR Chain-of-Custody Form (Hand)



CHAIN-OF-CUSTODY RECORD

COC #:

PROJECT NAME:	PROJECT NO.:
SAMPLER(s) SIGNATURE(S):	
SHIP TO:	CARRIER:
	AIRBILL NO.:

ANALYTICAL PARAMETERS

SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	COMP OR GRAB	FILTER OR UNFIL.	NO. & TYPE OF CONTAINERS	MS/ MSD											REMARKS (PRESERVATIVES, ADDITIONAL PERTINENT INFORMATION)

RELINQUISHED BY(SIGNATURE):	DATE:	TIME:	RECEIVED BY(SIGNATURE):	DATE:	TIME:	SAMPLE CONDITION/COOLER TEMP UPON RECEIPT AT LAB:	
REPRESENTING:			REPRESENTING:				
RELINQUISHED BY(SIGNATURE):	DATE:	TIME:	RECEIVED BY(SIGNATURE):	DATE:	TIME:	SPECIAL INSTRUCTIONS:	
REPRESENTING:			REPRESENTING:				
RELINQUISHED BY(SIGNATURE):	DATE:	TIME:	RECEIVED BY(SIGNATURE):	DATE:	TIME:		
REPRESENTING:			REPRESENTING:				

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STANDARD OPERATING PROCEDURE 4 –EQUIPMENT DECONTAMINATION

1 Purpose and Summary

This Standard Operation Procedure (SOP) provides guidance for proper decontamination of equipment used in sampling and collection of equipment rinsates to evaluate effectiveness of decontamination procedures.

2 Personnel Qualifications and Responsibilities

Sampling equipment decontamination and rinsate sample collection will be directed by the Field Team Leader (FTL), an environmental professional (engineer, geologist or scientist) with experience in equipment decontamination and sampling activities. The field staff, environmental professionals or technicians, are responsible for following these procedures and seeking direction from the FTL when questions or problems arise.

3 Equipment and Supplies

The required equipment and supplies will consist of buckets, brushes, Alconox soap, distilled or deionized water, tap water, paper towels, and sample containers.

4 Procedure

Proper equipment decontamination will prevent cross-contamination of samples due to residual contamination from previous sample locations and spread of contamination via sampling equipment. Proper decontamination also supports the legal defensibility of data generated during site activities.

Decontamination procedures will be evaluated by the collection of equipment rinsate samples. These samples consist of reagent water collected from final rinse of sampling equipment after the decontamination procedure has been performed. The samples are analyzed with the environmental sample to assess the adequacy of the decontamination performed.

4.1 Start-Up Activities

4.1.1 Office

The FTL will confirm that sufficient equipment and supplies are available at the site based on the number of samples and estimated field days.

4.1.2 Field

After arrival on site, but prior to commencement of operations, the FTL will confirm that decontamination supplies and equipment are available on site and review procedures with field staff.

4.2 Field Operations

4.2.1 Decontamination Water Source

Potable water from the municipal water system, or distilled water, will be used as a rinse in the decontamination procedure. The FTL will be responsible for coordinating with the site personnel to secure an adequate supply of potable or distilled water for decontamination procedures.

4.2.2 Decontamination Procedures

The required decontamination procedure for sampling equipment is:

1. Wash and scrub with Alconox soap solution and nylon brushes.
2. Double potable or distilled water rinse.
3. Air dry.
4. Store decontaminated sampling equipment in a clean area or in clean plastic bags until next use.
5. Collect all decontamination rinse water in 5 gallon buckets. Rinse water will be combined with any other wastewater generated during sampling activities and disposed of according to the work plan.

4.2.3 Field Blank Collection

For this project, a field blank will be created by taking potable or distilled water used for decontamination and pouring the water directly from the container to the laboratory supplied sample containers. This will occur at the frequency described in the work plan.

4.2.4 Equipment Rinsate Blank Collection

When non-dedicated sampling equipment is used, the equipment will be decontaminated before initial use and after each sample is collected. An equipment rinsate blank sample will be collected for each equipment type (e.g. split-spoon sampler, non-dedicated bladder pump). At least one equipment rinsate blank will be collected for each sampling protocol (e.g. soil sampling) at the frequency described in the work plan. Equipment rinsate blank samples will be collected to be representative of field decontamination procedures.

Sampling Equipment: Equipment rinsate blank samples will be obtained from decontaminated pumps, stainless steel split-spoons, hand tools, and bowls using distilled water or deionized water.

The equipment rinsate blank protocol will be as follows:

a. Label Sample Container - Label the sample container.

b. Collect Sample – After the project sample has been collected and the equipment has been decontaminated as described above, an equipment rinsate blank will be collected. Distilled or deionized water will be poured over and through the sampling equipment and into the laboratory supplied sample containers.

c. Custody, Handling and Shipping - Complete the procedures as outlined in SOP 3 – Sample Control and Documentation.

4.3 Closeout

Before leaving the site daily, the following procedures will be performed by the FTL or designated field staff:

- Confirm all equipment is decontaminated and properly stored in a clean location.
- Note equipment decontamination activities and rinsate blank sample collection on the Daily Field Report.

5 Data and Records Management

Field forms and log book entries will be scanned and copied to the HDR server within one week of field activity completion.

6 Quality Control and Quality Assurance

Work will be performed in accordance with the Quality Assurance Project Plan (QAPP), the specific work plan, and applicable SOPs.

STANDARD OPERATING PROCEDURE 5 – GROUNDWATER SAMPLING

1 Purpose and Summary

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of groundwater samples from monitoring wells. This SOP provides general guidance; see Groundwater Monitoring Well Construction and Monitoring Plan for details. The objective of groundwater sampling is to collect representative samples of groundwater. To meet this objective, the sampling equipment, sampling method, monitoring well construction, monitoring well operation and maintenance, and sample handling procedures should not alter the chemistry of the sample. Analysis of groundwater samples may determine whether concentrations of specific contaminants exceed established action levels, or if the concentrations of contaminants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and any changes described in a site report.

2 Personnel Qualifications and Responsibilities

Field activities will be directed by the Field Team Leader (FTL) and a qualified junior to mid-level scientist or geologist. The FTL will provide direction to field staff to ensure work is performed in accordance with the project documents (Quality Assurance Project Plan [QAPP], work plan, Health and Safety Plan [HASP], and SOPs). The field staff will carefully review the project documents, conduct the work as planned, seek direction from the FTL when questions or problems arise, and carefully complete field documentation.

3 Equipment and Supplies

Field activities should not proceed until the proper tools and equipment are available and in good working order. Usual equipment/supplies for groundwater sampling will include:

- Safety equipment.
- Toolbox – All needed tools for all site equipment used.
- Sample bottles, sample preservation supplies, sample labels, coolers, ice, and chain-of-custody forms.
- Well keys and map of monitoring well locations.
- Approved work plan.
- Well construction, field, and water quality data from the previous sampling event.

- Field logbook and calculator.
- Decontamination supplies.
- Depth-to-water measuring device – An electronic water-level indicator with marked intervals of 0.01-foot.
- Groundwater sampling pump – Bladder pumps with adjustable rate controls. Pumps are to be constructed of inert materials, such as stainless steel.
- Tubing – Polyethylene tubing will be used for all samples.
- Power source – If a combustion type (gasoline or diesel-driven) generator is used, it must be placed downwind of the sampling area.
- Flow measurement supplies – Graduated cylinder and a stopwatch.
- Multi-parameter meter with flow-through cell – This can be one instrument or more contained in a flow-through cell. The water quality indicator parameters that are monitored are pH, temperature, specific electrical conductance (conductivity), dissolved oxygen (DO), and oxidation reduction potential (ORP). Calibration fluids for all instruments should be NIST-traceable and there should be enough for daily calibration throughout the sampling event. The inlet of the flow cell must be located near the bottom of the flow cell and the outlet near the top. The size of the flow cell should be kept to a minimum and a closed cell is preferred. The flow cell must not contain any air or gas bubbles when monitoring for the water quality indicator parameters.
- Groundwater sampling log forms – A suggested groundwater sampling log form is provided at the end of this SOP.

The team will have use of a vehicle during field activities. An initial safety check should be performed at the start of each shift to confirm the vehicle is in good working condition. The vehicle should then be checked daily for damage or required maintenance.

4 Groundwater Sampling Procedures

The following describes the purging and sampling procedures of the low-flow method for the collection of groundwater samples. Water in the monitoring wells might be contaminated; therefore, purge water will be containerized and staged on-site in DOT-approved 55-gallon drums.

4.1 Pre-Sampling Activities

1. Sampling must begin at the monitoring well with the least contamination, generally up-gradient or farthest from the site or suspected source. Then proceed systematically to the monitoring wells with the most contaminated groundwater.
2. Check and record the condition of the monitoring well for damage or evidence of tampering.

3. Unlock well head. Record the location, time, date, and appropriate information in a field logbook and groundwater sampling log form.
4. Note wind direction. Stand upwind from the well to avoid contact with gases/vapors emanating from the well. Place generator downwind of the well to be sampled.
5. Measure the depth to water (measured to nearest 0.01 foot) relative to a reference measuring point on the well casing with an electronic water level indicator and record in field logbook and groundwater sampling log form. Measure the depth to water a second time to confirm initial measurement; measurement should agree within 0.01 foot or re-measure.
6. Pre-clean and decontaminate non-dedicated equipment in accordance with project SOPs and ensure that it is in working order.

4.2 Purging and Sampling Activities

1. Record the depth of the pump intake on the groundwater sampling log form. Set pump intake at mid-screen, or deeper if less than one-half of the well screen is submerged.
2. Measure the depth to water (measured to nearest 0.01 foot) and record the reading on the groundwater sampling log form. Leave water level indicator probe in the monitoring well.
3. Start pumping the well at a low flow rate (0.2 to 1.0 liter per minute) and slowly increase the speed. Check depth to water. Maintain a steady flow rate while maintaining a drawdown of less than 0.3 foot. If the minimum drawdown achieved exceeds 0.3 foot, but remains stable, continue purging.
4. Measure the discharge rate of the pump with a graduated cylinder and a stopwatch. Also, measure the depth to water and record both flow rate and depth to water on the groundwater sampling log form. Continue purging, monitor and record depth to water and pump rate every three to five minutes during purging. Pumping rates should be kept at minimal flow to ensure minimal drawdown in the monitoring well.
5. During the purging, a minimum of one tubing volume (including the volume of water in the pump) must be purged prior to recording the water quality indicator parameters. At the Simplot Warden site, the volume of this initial purge at all wells is 1 gallon. Then monitor and record the water quality indicator parameters every three to five minutes. The water quality indicator parameters are pH, temperature, specific electrical conductance (conductivity), dissolved oxygen (DO), and oxidation/reduction potential (ORP). Turbidity will not be measured but will be observed visually and recorded. The stabilization criteria are based on three successive readings of the water quality indicator parameters; the following are the criteria which will be used:

Parameter	Stabilization Criteria
pH	+/- 0.1 pH unit
Temperature	3%
Specific Electrical Conductance (Conductivity)	3%
Dissolved Oxygen (DO)	10% for values greater than 0.5 mg/L; if values are less than 0.5 mg/L, consider values as stabilized
Oxidation/Reduction Potential (ORP)	+/- 10 mV

Source: USEPA, 2017

Once the criteria have been successfully met indicating that the water quality indicator parameters have stabilized, then sample collection can take place. If field parameters have not stabilized after purging three times the volume of water standing in the well, collect sample anyway. Note this on the sampling log.

6. In wells with partially submerged well screens, if a stabilized drawdown in the well can't be maintained, reduce the flow rate or turn the pump off (for 15 minutes) and allow for recovery. It should be noted whether the pump has a check valve. A check valve is required if the pump is shut off. Under no circumstances should the well be pumped dry. Begin pumping at a lower flow rate, and if drawdown again does not stabilize, turn pump off and allow for recovery. If two tubing volumes (including the volume of water in the pump and flow cell) have been removed during purging, then sampling can proceed the next time the pump is turned on. This information should be noted in the field logbook or groundwater sampling log form with a recommendation for a different purging and sampling procedure.
7. Label sample containers using sample identification as described in the Groundwater Monitoring Well Construction and Monitoring Plan.
8. Maintain the same pumping rate or reduce slightly for sampling (0.2 to 1.0 liter per minute) in order to minimize disturbance of the water column. Disconnect the pump's tubing from the flow-through cell so that the samples are collected directly from the pump's discharge tubing. Filtered (dissolved) samples are collected last. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. When filling VOC sample vials, a meniscus must be formed over the mouth of the vial to eliminate the formation of air bubbles and head space prior to capping.
9. Immediately place all filled sample containers into a cooler with ice. Samples should not be exposed to sunlight after collection. Keep the samples from freezing when outside temperatures are below freezing. Samples for constituents with short holding times are recommended to be shipped or delivered to the laboratory daily. Ensure that samples

that are to be cooled remain at 4 degrees C, but do not allow any of the samples to freeze.

10. For dedicated pumps, disconnect the tubing that extends from the wellhead or cap. For non-dedicated pumps, remove the pump from the well and discard the tubing.
11. Close and lock the well.
12. Decontaminate the water level measuring device and pump (if a non-dedicated pump is used) in accordance with the procedures in SOP-4. If a non-dedicated bladder pump is used, install a new bladder before moving to the next well.

5 Quality Control and Quality Assurance

There are five primary areas of concern for quality assurance (QA) in the collection of representative groundwater samples:

1. Obtaining a sample that is representative of water in the aquifer. Verify log documentation that the well was purged of the required volume. Verify that the water quality indicator parameters stabilized before samples were extracted.
2. Ensuring that the purging and sampling devices are made of materials and utilized in a manner that will not interact with or alter the analyses.
3. Generating results that are reproducible.
4. Preventing cross-contamination. Sampling should proceed from least to most contaminated wells, if known.
5. Ensuring that samples are properly preserved, packaged, and shipped. Chain-of-custody procedures will follow SOP-3.

Additional precautions to ensure accurate and representative sample collection are as follows:

- If the sample bottle contains no preservatives, the bottle should be rinsed with sample water, which is discarded before sampling. Bottles for sample analyses that require preservation should be prepared before they are taken to the well. Care should be taken to avoid overfilling bottles so that the preservative is not lost.
- Clean sampling equipment should not be placed directly on the ground or other contaminated surfaces either prior to sampling or during storage and transport.

It is especially important to clean thoroughly the portion of the equipment that will be in contact with sample water. Prevent surface soils from contacting the purging or sampling equipment.

5.1 QA/QC Samples

For this project, the following field QA/QC samples will be collected:

- Equipment rinsate blank from decontaminated sampling equipment (e.g. non-dedicated pumps) at a frequency of 1 sample per event.

- Trip blank per cooler of samples (analysis for EDB).
- Field blank taken from potable or distilled water used for decontamination, at a frequency of 1 sample per event.
- Matrix spike/matrix spike duplicate (MS/MSD) at a frequency of 1 sample per event. MS/MSD samples will be three times the normal sample volume to accommodate the extra sample required to perform the MS/MSD analysis.
- Groundwater duplicate at a frequency of 1 sample per event. Duplicate samples will be collected by taking a second groundwater sample from the same well as the original sample and alternating the filling of original and duplicate sample containers (e.g. vials).

6 Post-Sampling Activities

Several activities need to be completed and documented once groundwater sampling has been completed. These activities include, but are not limited to:

- Ensuring that all field equipment has been decontaminated and returned to proper storage location.
- Transfer purge water to drums and properly label the drums.
- Compiling all field data for site records.
- Verifying all analytical data processed by the analytical laboratory against field sheets to ensure all data has been returned to sampler.

Upon receipt of the final report from the contract laboratory check for accuracy and completeness based on what analyses were scheduled and expected. Input results into tracking worksheets.

7 References

U.S. Environmental Protection Agency Region 1, 2017. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, EQASOP-GW4, Revision Number 4, September 19, 2017.

GROUNDWATER MONITORING / SAMPLING LOG FORM

Facility Name:	Sampler Name(s):
Monitoring Location:	Date/Time:
Sample Number:	Weather Conditions:
PID Readings:	Wellhead Conditions:

Visual Inspection:

1. Survey Mark Present: (Yes/No) _____
2. Collision/Vandalism Damage: (Yes/No) _____
3. Casing Degradation: (Yes/No) _____
4. Well Subsidence: (Yes/No) _____
5. Standing/Ponded Water (Yes/No) _____
6. Frost Heaving (Yes/No) _____
7. Lock in Place (Yes/No) _____

Groundwater Measurements and Purge data:

1. Static Water Level (±0.01 ft) _____
2. Bottom of casing (±0.01 ft) _____
3. Casing Diameter (inches) _____
4. Casing Volume (gal) _____
5. 3 X Casing Volume (gal) _____
6. Actual Volume of Water Purged (gal) _____

6a. Purge Water Characteristics: Odor _____
Color _____
Turbidity _____

7. Water Level Measuring Equipment _____
8. Purge Equipment Used _____
9. Dedicated? (Yes/No) _____
10. Intake depth (ft) _____
11. Purge rate (if pump used) _____ mL/min
12. Time to purge well _____
13. Drive Gas (Air/Nitrogen) _____
14. Notes: _____

Time	Total Volume Purged (gal)	Depth to Water (ft)	Temperature (˚C)	Conductivity (µS/cm)	pH	D.O. (mg/L)	ORP (mV)	Turbidity (visual)

Well evacuated to dryness? (Yes/No) _____ Time to recharge _____ hrs. _____ min.

1. Sample Filtered? (Yes/No) _____
2. Sampling Equipment Used _____
3. Drive Gas (Air/Nitrogen) _____
4. Pump Rate _____ mL/min
5. Sample Appearance _____
   - Odor _____
   - Color _____
   - Turbidity (High/Med/Low/Clear) _____
6. Method of Sample Preservation:

Notes:

Decontamination Procedures: _____

Instrument Type: _____
Instrument Calibration Date: _____
Instrument Calibration Time: _____
pH Standard (S.U.) _____
Reading (S.U.) _____
Adjustment (S.U.) _____
Conductivity Standard (µS/cm) _____
Reading (µS/cm) _____
ORP Standard (mV) _____
Reading (mV) _____
D.O. Standard Slope _____
Reading (mg/L) _____
Turbidity Standard (NTU) _____
Reading (NTU) _____

D

Quality Assurance Project Plan

Draft
Quality Assurance Project Plan (QAPP)

For

Groundwater Monitoring Well Construction and Monitoring

Simplot Grower Solutions
J.R. Simplot Company

Warden, Washington
February 9, 2021

Prepared by:
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Prepared for:
J.R. Simplot Company

Quality Assurance Project Plan
for Simplot Grower Solutions, 1800 W. 1st St. Warden, WA

The *Quality Assurance Project Plan* for Simplot Warden facility provides direction for implementing the *Groundwater Monitoring Well Construction and Monitoring Plan* as part of the remedial actions at the above listed site. Preparation of these plans incorporates contributions and feedback from project managers and technical staff from Simplot, HDR Engineering, Inc., Washington Department of Ecology, and Eurofins TestAmerica. This signature page indicates agreement on the plan content among those individuals assigned to implement the study, conduct the field sampling, and perform the analytical analyses.

Signature: 	Date:
Printed Name: Michael R. Murray Title: HDR Project Manager	
Signature:	Date:
Printed Name: Title:	
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Printed Name: Title:	
Signature:	Date:
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Tables

Appendices

Acronyms

Acronym	Definition
µg/Kg	micrograms per kilogram
AO	agreed order
CAP	cleanup action plan
COC	chain-of-custody
CUL	cleanup level
DQOs	data quality objectives
HDR	HDR Engineering, Inc.
Ecology	Washington Department of Ecology
EDB	ethylene dibromide
LCS	laboratory control sample
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RAOs	remedial action objectives
RI/FS	remedial investigation/feasibility study
RPD	relative percent difference
SGS	Simplot Grower Solutions
Simplot	J.R. Simplot Company
SOP	standard operating procedure
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code

Introduction

This *Quality Assurance Project Plan* (QAPP) describes the sampling plan, quality standards, and procedures for conducting soil and groundwater sampling as outlined in the *Groundwater Monitoring Well Construction and Monitoring Plan* (HDR 2021a). The *Groundwater Monitoring Well Construction and Monitoring Plan* describes the procedures that the J.R. Simplot Company (Simplot) will perform during the groundwater compliance monitoring at the site, Simplot Grower Solutions (SGS) facility in Warden, Washington. The groundwater compliance monitoring is being conducted pursuant to Agreed Order (AO) DE 16890 and the Model Toxics Control Act (MTCA) regulations (Chapter 173-340 Washington Administrative Code [WAC]) to implement the remedies specified in the *Cleanup Action Plan* (CAP; Ecology 2019). The *Groundwater Monitoring Well Construction and Monitoring Plan* is consistent with the requirements of WAC 173-340-410. Simplot entered into AO DE 16890 with the Washington Department of Ecology (Ecology) on May 7, 2020, to implement the CAP in accordance with the scope of work and schedule attached to the AO DE 16890.

1 Project Management

1.1 Distribution List

This QAPP will be distributed to the following organizations. The roles, responsibilities, key personnel, and contact information for each organization are detailed in Section 1.2.

- Simplot;
- HDR Engineering, Inc. (HDR);
- Eurofins TestAmerica; and
- Ecology.

1.2 Project Organization

Under contract with Simplot, HDR is responsible for sampling to support groundwater compliance monitoring at the SGS site. A driller will be retained to install new monitoring wells to support compliance monitoring after excavation and backfilling are complete. (Remedial actions including excavation, soil treatment, and soil monitoring are addressed under separate cover in the *Cleanup Action Implementation Compliance Monitoring Plan* [HDR 2021b] and *Final Engineering Design Report* [HDR 2021c]). HDR, as consultant for Simplot, will collect soil samples during drilling, and conduct groundwater compliance monitoring. This QAPP provides the quality assurance/quality control (QA/QC) requirements for the soil sampling and groundwater compliance monitoring described in the *Groundwater Monitoring Well Construction and Monitoring Plan*. The QAPP is applicable to the QA/QC aspects of field sampling and laboratory chemical analysis and outlines the specifics of the field sampling program.

HDR has prepared and is responsible for maintaining this QAPP, which was developed according to the corresponding U.S. Environmental Protection Agency (USEPA) guidance, *Guidance for Quality Assurance Project Plans* (2002), and Ecology guidance. Field teams are responsible for collecting all proposed field samples, including the QC samples, and for shipping and transferring custody of the samples to the laboratory (Eurofins TestAmerica). Eurofins TestAmerica is responsible for QA/QC

within their laboratory operations. HDR is responsible for laboratory coordination. Key personnel and their roles are described in **Table 1**.

Table 1. Summary of Key Personnel and Roles

Personnel	Contact Information	Responsibilities
Simplot	PO Box 912 1130 W. Hwy 30 Pocatello, ID 83204	
Molly Dimick (Prickett)	Molly.Dimick@simplot.com	Project Lead, responsible for overall project investigation for Simplot
HDR Engineering, Inc.	412 E. Parkcenter Blvd., Suite 100 Boise, ID 83706-6659	
Mike Murray, Project Manager	Mike.Murray@hdrinc.com 208-387-7033	Responsible for developing and executing overall project scope, oversight, deliverables, and schedule.
Adam Kessler, Licensed Geologist	Adam.Kessler@hdrinc.com (763) 278-5902	Responsible for overseeing and reviewing monitoring well construction plan, well construction, and well construction report.
Internal QA/QC Manager	Corrie.Hugaboom@hdrinc.com 208-387-7032	Responsible for overseeing HDR internal QA/QC review.
Alyssa Veatch, Field and Data Manager	Alyssa.Veatch@hdrinc.com 208-387-7113 (office) 208-800-9030 (cell)	Responsible for logging soil cuttings, overseeing drilling and installation of monitoring wells, design of monitoring wells, groundwater sampling, data management and analysis, and reporting.
Eurofins TestAmerica	Eurofins TestAmerica Seattle 5755 8th Street East Tacoma, WA 98424	
Elaine Walker Project Manager	elaine.walker@testamericainc.com (253)248-4972	Responsible for executing and reporting laboratory work and associated QA/QC protocols.

1.3 Project Background and Objectives

Simplot entered into AO 8241 with Ecology, on May 27, 2011, to address the presence of ethylene dibromide (EDB), a fumigant in soil and groundwater at the SGS site at 1800 W. 1st Street, Warden, Washington. As part of AO 8241, Simplot completed a remedial investigation/feasibility study (RI/FS) (HDR 2018). The RI/FS recommended a remedial approach that included removing and treating EDB-impacted soils and conducting groundwater compliance monitoring to confirm groundwater protection.

After completing the RI/FS, and in cooperation with Simplot, Ecology completed a CAP (2019). The CAP is Ecology's decision document for the site and provides the rationale for selecting the cleanup alternative. In summary, Ecology concluded:

> *Upon completion of the soil cleanup action, groundwater compliance monitoring will take place in order to evaluate the effectiveness of the cleanup action with regards to groundwater protection. Compliance monitoring will involve collection of groundwater samples from the monitoring well network semi-annually (August and January) until*

cleanup levels (0.05 µg/L) in groundwater in two consecutive monitoring events have been achieved.

The CAP also calls for replacing monitoring wells MW-5S and MW-5D, which were decommissioned in June 2020 because they are in the area of corrective action involving soil excavation, scheduled for late winter 2021. In addition, the CAP requires two additional downgradient wells to aid in compliance monitoring.

Simplot entered into another AO (DE 16890) with Ecology on May 7, 2020, to address EDB remedial actions, which requires Simplot to implement the CAP in accordance with the scope of work and schedule attached to AO DE 16890. (AO 8241 was for activities through the completion of the RI/FS report.) Remedial actions including excavation, soil treatment, and soil monitoring are addressed in the *Cleanup Action Implementation Compliance Monitoring Plan* (HDR 2021b) and *Final Engineering Design Report* (HDR 2021c).

New groundwater monitoring wells MW-5SR, MW-5DR, MW-11S, and MW-12S will be installed, and groundwater compliance monitoring conducted as described in the *Groundwater Monitoring Well Construction and Monitoring Plan.* Soil samples from monitoring well borings will be collected and analyzed to confirm presence or absence of EDB in soils, and groundwater samples will be collected from monitoring wells semi-annually until the EDB cleanup level (CUL) of 0.05 µg/L is reached in groundwater for two consecutive monitoring events.

Samples will be submitted for EDB analysis per USEPA Method 8011 on a standard turnaround basis.

1.4 Project Task Description and Schedule

To meet project objectives, the tasks for implementing groundwater compliance monitoring activities are as follows.

- **Prepare for field activities**

  Preparations for field activities include coordinating with the laboratory to obtain supplies, coordinating activities with the drilling contractor, coordinating activities with Simplot and Ecology, arranging for utilities to be located, and organizing and prepping field equipment.

- **Field sampling**

  The soil sampling and groundwater compliance monitoring approach is described in the *Groundwater Monitoring Well Construction and Monitoring Plan* and briefly described above.

- **Laboratory analysis and reporting**

  Samples are analyzed for EDB (**Table 2)**. The laboratory provides results and associated QA/QC data in electronic format to the data manager.

- **Review, verification and validation of data**

  The analytical QA/QC manager reviews, verifies, and validates the analytical data according to the appropriate USEPA data validation guidelines.

- **Data entry into database**

  Reviewed, verified, and validated analytical and field data is uploaded into the database for access by data users.

- **Data usability assessment**

  The analytical QA/QC manager produces data usability assessments, which discuss the analytical QC results and potential impacts to project objectives based on the results of the data validation.

The constituent of concern for this project, which the remedial action is based on, is EDB. **Table 2** summarizes the analytical method and method performance criteria.

Table 2. Method and Performance Criteria for Ethylene Dibromide (EDB) in Soils and Groundwater

Criteria	EDB Soil	EDB Groundwater
Cleanup Level for Project[1]	0.27 µg/Kg	0.05 µg/L
Method	USEPA 8011	USEPA 8011
Reporting Limit[2]	0.055 µg/Kg	0.0099 µg/L
Method Detection Limit	0.013 µg/Kg	0.0020 µg/L
Surrogate Spike – 1,2-Dibromopropane	60 to 140% recovery	60 to 140% recovery
Laboratory matrix spike (MS) and matrix spike duplicate (MSD)	60 to 140% recovery and RPD limit 20%	60 to 140% recovery and RDP limit 20%
Laboratory Control Sample (LCS) and duplicate	60 to 140% recovery and RPD limit 20%	60 to 140% recovery and RPD limit 20%
Laboratory Method Blank	Non-detect	Non-detect

[1] See *Cleanup Action Plan* (Ecology 2019) for details on cleanup level (CUL).

[2] Eurofins TestAmerica provided QC criteria for EDB.

RPD = relative percent difference; µg/L = micrograms per liter; µg/Kg = micrograms per kilogram

A generalized schedule of the activities associated with groundwater compliance monitoring is provided in **Table 3**. While the QAPP is generally adaptable to modification, including the schedule, it is recommended that a regular task schedule be established and followed.

Table 3. Generalized Schedule of Activities Associated with Groundwater Compliance Monitoring

Activities	Time Period
Completion of excavation, soil treatment, and backfilling	Fall 2021
Construct new monitoring wells (4) w/ soil sampling	Fall 2021
Begin semi-annual groundwater compliance monitoring	January 2022
Laboratory analysis and reporting	2 weeks after field sampling
Review, verification, and validation of data	4 weeks after laboratory reporting
Data entry into database	1 week after data validation
Data usability assessment	1 week after data validation

1.5 Quality Objectives and Criteria

The remedial action objective is to reduce potential EDB risks to human health and the environment. The remedial action objectives (RAOs) are developed to prevent unacceptable risk to current and future receptors.

The RAO for groundwater is as follows:

- For protection of human health, reduce EDB concentrations in groundwater, where the groundwater CUL is 0.05 µg/L EDB in drinking water.

The QC requirements set forth in this QAPP support the project objectives by identifying the correct type, quantity, and quality of data needed, and by establishing appropriate processes and procedures to support the collection and management of this data. Specific quality objectives are described in Sections 1.5.1 and 1.5.2 as data and measurement quality objectives.

1.5.1 Data Quality Objectives

Data quality objectives (DQOs) refer to quality objectives at the decision level. They specify how good a decision must be, but do not directly set criteria for the quality of the data or express data quality characteristics. DQOs for the groundwater compliance monitoring are to describe and implement field and laboratory procedures that ensure: 1) data will be representative of actual environmental conditions, and 2) data are of known and acceptable quality. Measurements will be made to yield accurate and precise results representative of the media and conditions measured. Data will be calculated and reported in units consistent with those used by regulatory agencies to allow for comparability of data. In summary, the principle objective is to collect groundwater samples of sufficient quality to support the determination if site groundwater EDB concentrations have met the RAO (listed in Section 1.5).

1.5.2 Measurement Quality Objectives

Measurement quality objectives specify the criteria that data must meet in order to support the program data quality objectives. The measurement quality objectives describe the expected performance or acceptance criteria for individual data quality indicators, such as precision, bias, lower reporting limit, and completeness. Therefore, the measurement quality objectives serve two critical functions. First, they provide the basis for determining the procedures that should be used for sampling and analysis because they specify the level of quality that generated data must achieve. Second, they establish benchmarks against which collected data are compared to determine whether the data are of sufficient quality to be used in the program.

1.5.2.1 PRECISION

Precision is the degree of agreement between replicate analyses of a sample under identical conditions. It is a measure of the random error associated with the analysis, usually expressed as relative percent difference (RPD). Precision will be determined on both field data and laboratory analysis by analyzing field duplicates, laboratory replicates, and matrix spikes duplicates (MSDs). Calculation of RPD between these paired measurements will evaluate precision. Duplicate laboratory sample error values include laboratory and field variability. The data quality indicators for laboratory parameters were developed in consultation with the contracted laboratory and are shown in **Table 2**.

1.5.2.2 ACCURACY AND BIAS

Accuracy is the measure of the difference between an analytical result and the true value, usually expressed as percent. The accuracy of a result is affected by both systematic errors (bias) and random errors (imprecision). Bias is a systematic error in one direction. Accuracy and bias will be assessed by using laboratory blanks, matrix spikes (MS), and check standards (**Table 2)**.

1.5.2.3 REPRESENTATIVENESS

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at the sampling point, or an environmental condition. Samples for analysis will consistently be collected from pre-determined sampling sites following pre-determined sampling methods.

Standard operating procedures (SOPs) for sample collection, included in the *Groundwater Monitoring Well Construction and Monitoring Plan*, are designed to minimize variations, potential contamination, and other types of degradation in the chemical and physical composition of the sample. Field staff will follow SOPs for collecting representative samples. Laboratory representativeness is achieved by proper preservation and storage of samples along with appropriate sub-sampling and preparation for analysis.

1.5.2.4 COMPLETENESS

Completeness is defined as the total number of samples analyzed for which acceptable analytical data are generated, compared to the total number of samples collected. Sampling at existing wells with known position coordinates in favorable conditions and at the appropriate time points, along with adherence to standardized sampling and testing protocols set out by the QAPP will aid in providing a complete data set. The goal for completeness is 90 percent.

1.5.2.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This goal is achieved through using standardized techniques to collect and analyze representative samples, along with using standardized data validation and reporting procedures. All data should be reported and calculated in units consistent with standard reporting procedures to enable comparison.

1.5.2.6 SENSITIVITY

Sensitivity is the ability of the method or instrument to detect the target analytes at the level of interest. Data will be compared to regulatory limits as shown in **Table 2**, and the laboratory's method reporting limits (MRLs) will be less than these limits where possible.

1.6 Special Training and Certifications

The contracted laboratory maintains the appropriate certifications and participates in periodic auditing programs that establish its level of performance.

1.7 Documentation and Records

HDR will maintain the following program quality records in their Boise, Idaho office in electronic format:

- QAPP, including any approved modifications, updates, and addendums;
- Project work plans, including any approved modifications, updates and addendums;

- Field documentation;
- Chain-of-custody records;
- Laboratory documentation;
- Data validation and usability reports;
- Project database; and
- Final project reports/deliverables.

Electronic documents are maintained on a secure HDR server with a routine backup schedule.

2 Data Generation and Acquisition

This section of the QAPP outlines specific QA/QC procedures related to generating, compiling, reporting, and archiving data. The consistent use of SOPs in these areas is critical to the overall project objective to generate data of known and acceptable quality.

2.1 Sampling Process Design, Locations, and Frequency

The *Groundwater Monitoring Well Construction and Monitoring Plan* includes a sampling and analysis plan. Field and analytical data will undergo data review, verification, and validation procedures to establish their usability for supporting project objectives. Sampling plan components are described in the *Groundwater Monitoring Well Construction and Monitoring Plan*.

2.2 Sampling Methods

Data will be collected in accordance with the requirements of this QAPP and the SOPs documented in this *Groundwater Monitoring Well Construction and Monitoring Plan*. The reader is referred to those documents for soil and groundwater sampling method details.

2.2.1 Soil and Groundwater Samples

See the *Groundwater Monitoring Well Construction and Monitoring Plan* for details on soil and groundwater sampling approach and SOPs.

Standard sample volumes, preservatives, filtration needs, and hold times are summarized in **Table 4**.

Table 4. Standard Sample Volumes, Preservatives, Filtration, and Hold Times

Bottle Type	Analysis	Lab Method	Preservative	Temperature	Hold Time[1]	Comments
Water						
40 mL VOA (3)	EDB	USEPA 8011	Sodium Thiosulfate	4° C	14 days	Unfiltered
Soils						
(1) 8 oz jar	EDB	USEPA 8011	None	4° C	14 days (extraction), 40 days (analysis)	Unfiltered

[1]Holding times for soil taken from the 2017 Ecology *Fact Sheet: How DEQ Evaluates Sample Collection and Data Analysis for UST closures and Release Investigation* and from information provided by Eurofins TestAmerica (both soil and groundwater).

mL = milliliters; oz = ounce; VOA = volatile organic analyte; USEPA = U.S. Environmental Protection Agency; °C = degrees Celsius

2.2.2 Sample Handling

Upon request from HDR, the laboratory will be responsible for shipping the necessary coolers and sample bottles – of appropriate size, number, labels, and preservative content – to HDR for each sample event. The laboratory will also send chain-of-custody (COC) forms, custody tape, gel ice, and deionized water as appropriate. Sample preservation will be achieved by using sample bottles with preservative (as appropriate) from the laboratory and immediately placing the sample bottles into a cooler(s) with gel or wet ice to achieve a holding temperature of 4 degrees Celsius (°C). If multi-day sampling events are required, samples will be stored in a locked storage room and kept on fresh gel or wet ice to ensure sample holding temperatures will be maintained. The samples will be shipped to the laboratory within the allowable standard holding times, and with a laboratory-provided temperature blank to check compliance with the holding temperature. Sample containers will be packed to prevent breakage or contamination via spillage.

Each sample container will have a waterproof label of sufficient size to make each sample easily identifiable. Sample labels will include the following information:

- Project name;
- Date and time (24-hour clock);
- Sample identification codes; and
- Personnel – initials of sampling personnel.

Samples to be used for MS and MSD will be labeled identically to the parent sample and designated as MS/MSD on the COC form. Field duplicates will be noted in the field notes as such, but will be labeled with unique sample numbers so that laboratory staff are unable to tell that these samples are QC samples. Field blanks and trip blanks will be labeled as such. QC samples are labeled according the protocol shown in **Table 5**.

Table 5. Quality Control Sample Labeling System

QC Sample Type	Naming Convention	Numbering Convention	Time Stamp	Description
Matrix spike and matrix spike duplicate	Same as parent sample	Not applicable	Same as parent sample	Water sample to which a known concentration of certain target analytes are added at the laboratory. Matrix spike duplicates are replicated of the matrix spike sample.
Field (sample) duplicate	Different name than original sample	Named as a separate sample that does not exist in order to distinguish it from the parent sample.	Sampled at same time as parent, but time stamp should be offset from that of the parent sample by at least 15 minutes	Duplicate is collected using the same sampling technique as the original sample.
Trip blank	Trip Blank	Mark this sample as a trip blank	At time taken	Water sample in sample bottle provided by laboratory and accompanies sample bottles.
Field Blank	Field Blank	Labeled as a field blank	At time taken	Pour distilled water directly into appropriate sample bottles.

Equipment rinsate blank	Rinsate Blank	Labeled as a rinsate blank	At time taken	After decontamination of sample equipment, distilled water is poured over the equipment and collected into sample bottles.

2.2.3 Chain of Custody

A COC form will be filled out as the samples are collected, in chronological order. The COC form will accompany the samples until delivery to the laboratory. If the samples are left unattended, chain-of-custody protocols will be followed with samples held in a secure location with tamper-proof, chain-of-custody tape to secure the cooler lids in place. Field staff and laboratory staff will sign and date the COC form provided by the analytical laboratory. Field staff will copy the original COC form before sending it to the laboratory with the samples. See the *Groundwater Monitoring Well Construction and Monitoring Plan* for SOP for COC. The collected samples will be shipped to the contracted analytical laboratory and analyzed for the soil and groundwater quality parameters.

2.3 Analytical Methods

Laboratories will document the following conditions in which samples are received:

- Cooler temperature;
- Condition of sample bottles;
- Completeness of chain-of-custody documentation; and
- Record of custody seal presence.

Laboratory analytical methods, method detection limits (MDLs), and reporting limits are shown in **Table 2**. These analytical methods are standard methods for soil and water sample analysis and detect analytes at the level necessary to compare to regulatory criteria (**Table 2**).

2.4 Quality Control

QC samples will be collected and analyzed as part of the data validation process to evaluate compliance with the measurement quality objectives. These samples provide a means to evaluate the performance of field and laboratory SOPs by measuring the effect of inherent variability. Refer to **Table 5** for a summary of the QC samples to be collected.

2.4.1 Field QC Samples - Soil

The following field QC soil samples will be collected during monitoring well installation:

- Equipment rinsate blank from decontaminated sampling equipment (e.g. split-spoon sampler) at a minimum frequency of 1 sample per week of field activities.
- Trip blank per cooler of samples (analysis for EDB).
- Field blank taken from potable or distilled water used for decontamination, at a minimum frequency of 1 sample per week of field activities.
- Matrix spike/matrix spike duplicate (MS/MSD) at a minimum frequency of 5 percent of soil samples collected. MS/MSD samples will be selected by the field geologist and three times

the normal sample volume will be collected to accommodate the extra sample required to perform the MS/MSD analysis.

- Soil duplicate at a minimum frequency of 10 percent of soil samples collected. Duplicate samples will be collected by taking a second soil sample from the same depth in the split-spoon sampler as the original sample.

2.4.2 Field QC Samples – Groundwater

The following field QC groundwater samples will be collected during groundwater compliance monitoring:

- Equipment rinsate blank from decontaminated sampling equipment (e.g. non-dedicated pump) at a frequency of 1 sample per event.
- Trip blank per cooler of samples (analysis for EDB).
- Field blank taken from potable or distilled water used for decontamination, at a frequency of 1 sample per event.
- Matrix spike/matrix spike duplicate (MS/MSD) at a frequency of 1 sample per event. MS/MSD samples will be three times the normal sample volume to accommodate the extra sample required to perform the MS/MSD analysis.
- Groundwater duplicate at a frequency of 1 sample per event. Duplicate samples will be collected by taking a second groundwater sample from the same well as the original sample and alternating the filling of original and duplicate sample containers (e.g. vials).

2.4.3 Laboratory QC Samples

An MS is prepared by the laboratory (for the samples explicitly collected for this purpose by field staff) by adding a solution of analytes with known concentrations to a field sample. The MS/MSD samples are used to determine the accuracy of analysis for a given matrix. The contracted laboratory will split field samples (producing a laboratory duplicate) to determine laboratory precision. The difference between total variability and laboratory variability provides an estimate of the field variability. The laboratory will also run deionized water through the entire sample preparation and analysis procedure; therefore, this method blank is used to assess laboratory practices. Finally, the laboratory will run one laboratory control sample (LCS), a sample of known concentration, to evaluate laboratory processes. These QC samples comprise the standard USEPA QA/QC protocol consisting of a laboratory blank, one laboratory duplicate, one LCS, and one MS for each applicable analysis. However, the laboratory is ultimately responsible for determining the proper type and frequency of QA/QC samples for its analyses. The contracted laboratory will inform the project manager or principal investigator as soon as possible if any sample is lost, damaged, has a lost tag, or gives an unusual result.

2.5 Instrument and Equipment Testing, Inspection, Maintenance, and Calibration

Field managers are responsible for field equipment maintenance decisions. As appropriate, field meters (e.g., pH and conductivity) will be calibrated against known standards prior to each day's field activities. Calibration events will be documented in field notebooks and/or field forms. Additional

accuracy checks will be conducted as determined appropriate by field managers; for example, checks may occur when measurements are outside of expected ranges or when measurements are not stabilizing. Equipment will be inspected in full prior to leaving for the field to help prevent in-field equipment problems, including changing dissolved oxygen (DO) membranes or pH salts, if needed.

The contracted laboratory is responsible for laboratory equipment maintenance and calibration decisions and documentation. Should an equipment maintenance event or failure affect the analytical schedule, the laboratory will be responsible for notifying HDR of the delay.

2.6 Inspection/Acceptance of Supplies and Consumables

The field manager from HDR is responsible for obtaining and maintaining supplies and consumables for each sampling event. Equipment lists, as well as a safety gear list, are included in SOPs presented in the *Groundwater Monitoring Well Construction and Monitoring Plan*. **Table 6** shows vendors that provide commonly used supplies.

Table 6. Consumable Supplies and Vendors

Consumable	Product Description	Item Number	Vendor
pH standards (4.0, 7.0, 10.0)	KTO: pH Buffer Solution Kit, 4 liters each	2507200	Hach Company 1-800-227-4224
Conductivity standard	Conductivity standard, 1.412 mS/cm, 1 liter	013620HY	Hach Company 1-800-227-4224
Silicone for Hydrolab O-rings	Silicone compound, net weight ¼ oz, 2 packets	000298HY	Hach Company 1-800-227-4224
Dissolved oxygen (DO) membranes	DO standard membrane	002589HY	Hach Company 1-800-227-4224
pH junction	Teflon pH junction	003883HY	Hach Company 1-800-227-4224
DO electrolyte	Electrolyte, DO, 59 mL	000537HY	Hach Company 1-800-227-4224
pH electrolyte	pH reference electrode saturated KCl and AgCl, 100 mL	005308HY	Hach Company 1-800-227-4224
Hydrolab rubber replacement cap	Hydrolab rubber replacement cap	000465	Hach Company 1-800-227-4224
0.45 µm filters	GWE high capacity filters, 50 per pack	ET-GF-50	Enviro-Tech Services Company 1-800-468-8921
Silicone tubing	3/16 x 3/8 inch silicone tubing size 15…T16, sold by the foot	RYN-0575-054	Enviro-Tech Services Company 1-800-468-8921
Polyethylene tubing	0.17 x ¼ inch polyethylene tubing…T5, sold by the foot	RYN-0525-016	Enviro-Tech Services Company 1-800-468-8921
Blue sharpies	Sharpie permanent ultra-fine point markers, blue, 12 per pack	451880	Office Depot www.officedepot.com
Rite-in-the-Rain copier paper	Rite in the Rain All Weather Copier Paper, 8 ½ x 11, 200 sheets per pack	3XFR7	Grainger www.grainger.com
Strapping tape	Cantech 0179 48 mm x 55 mm, 24 rolls per case	Cantech 0179 48 mm x 55 mm	Keystone Tape & Supply of Texas, Inc. 817-439-8898

Table 6. Consumable Supplies and Vendors

Consumable	Product Description	Item Number	Vendor
2-gallon zip lock bags	13” x 15” heavy weight 2-gallon zip lock freezer bags, 100 per pack	130F41315 100	The WEBstaurant Store http://www.webstaurantstore.com/

mS/cm = microSiemens per centimeter; oz = ounce; mL = milliliter; µm = micrometer

The contracted laboratory is responsible for inspecting and checking supplies and consumables (sample reference materials and reagents) associated with the analytical procedures. This includes any standards needed for laboratory QC (described in Section 2.4.3).

2.6.1 Existing Data

Extensive data exist for the site; see *Groundwater Monitoring Well Construction and Monitoring Plan*.

2.7 Data Management

HDR will maintain the following program data in their Boise, Idaho office.

- QAPP;
- Work plans;
- Addendums;
- Field notes;
- Chain-of-custody records;
- Laboratory documentation;
- Data validation records;
- Summary reports; and
- Deliverables.

Hardcopies of field notes, COC forms, and laboratory reports will be filed and maintained for the duration of the project. Likewise, electronic documents, such as laboratory reports, will be filed in the project directory. The project directory is hosted on a secure server with regular on-site and off-site backup procedures.

2.7.1 Data Collected in the Field

Field staff will record site information in a field notebook and/or field form at the time of sample collection. This information will include documentation of the sample method (i.e., intermediate equipment used or individual sample containers) and observations of conditions that could affect the quality of the samples (e.g., clarity, weather). Field staff will use standardized field forms to record field parameter measurements (i.e., conductivity, pH, temperature). See SOPs in the *Groundwater Monitoring Well Construction and Monitoring Plan*. Notes and data will be recorded in indelible ink, weather permitting; in adverse weather conditions (i.e., very cold or very wet), pencil may be used. Any written mistakes will be crossed out once (not erased) and initialed, and the correct information will be written in. Field notebook and datasheet entries will include the following information at minimum:

- Project name;
- Monitoring well/sample location;

- Personnel – names and affiliation of sampling personnel;
- Date and time of sample collection;
- Samples collected; and
- Field measurements and observations.

Field staff will fill out a COC form at the conclusion of the sampling day. A sample COC form and SOP are outlined in the CAICM *Groundwater Monitoring Well Construction and Monitoring Plan*. The COC form will include the following information at minimum:

- Project name;
- Monitoring well/sample name;
- Personnel - initials of sampling personnel;
- Date and time of sample collection;
- Type of sampling conducted (composite/grab); and
- Sample matrix (soil/groundwater) and requested analysis.

Data recorded in field notebooks, field forms, and on COC forms will be backed up at the end of each field day (i.e., by scanning or photocopying). Field data will be archived in original form upon return to the office.

2.7.2 Laboratory Data

Laboratory data will be delivered in an electronic format (called the electronic data deliverable in this QAPP) to minimize the chances of transcription error. The laboratory will provide a USEPA Level 2 data validation package and includes the following information:

- Case narrative;
- Field and laboratory sample identification;
- Sample collection, receipt, preparation and analysis date/time;
- Sample conditions upon receipt and chain-of-custody;
- Preparation and analysis methods and batch number/identification;
- Sample result, method detection limits and reporting limits;
- Laboratory data qualifiers and data qualifier definitions;
- Dilution factors and sample volumes; and
- QC data, acceptance criteria, and frequency for the following QC samples:
    - Field and laboratory MS/MSD;
    - Laboratory duplicates;
    - Laboratory method and instrument blanks; and
    - Laboratory calibration check standards.

Both the electronic data deliverable and validation package associated with each sampling event will be archived in original form on the project directory. The laboratory sample data will then be uploaded to the project database. QC results will also be uploaded to the database and used to evaluate data accuracy and determine whether the measurement quality objectives were met.

2.7.3 Database Development

HDR will develop an Excel database to efficiently store soil and groundwater quality data. The database stores sampling site information, static water level and water level elevation information,

analytical laboratory results and qualifiers, quality control sample results, regulatory limits, and other associated data.

Prior to incorporation in the database, all data will be subject to review as described in this QAPP to verify accuracy and completeness.

3 Assessment and Oversight

3.1 Assessments and Reports to Management

Field and laboratory systems and performances will undergo regular QC review. HDR will perform internal reviews as appropriate. Review procedures will be consistent with those described by USEPA in *Guidance on Technical Audits and Related Assessments for Environmental Data Operations* (2000).

HDR internal reviews of field activities verify that the procedures established by this QAPP are being followed. Internal field reviews may include evaluation of field and instrument records, sample collection and handling, and documentation procedures. The findings of internal reviews will be shared with the field team to facilitate corrective actions being taken (if needed).

If HDR suspects any issues affecting the quality of the laboratory analytical data, HDR will request a QA/QC report from the laboratory as conducted by laboratory personnel in accordance their QA manual regarding laboratory performance. The request will include documentation of the laboratory's review of sample receiving and handling, chain-of-custody procedures, sample preparation and analysis, and instrument operating records.

3.2 Corrective Actions

Corrective actions refer to the process of implementing measures to counter QC problems identified through the assessments outlined above. Corrective actions may occur during field or laboratory activities or during data validation and assessment. If QC results indicate problems with data, the prescribed procedures will be followed to resolve the problems. Corrective steps may include the following:

- Modifying sampling or measurement procedures;
- Re-calibrating instruments;
- Re-analyzing samples (within holding time requirements);
- Modifying analytical procedures; and
- Re-collecting samples (if time and resources allow).

If none of these measures can be taken within practical time and budget constraints, then the data will be qualified appropriately in the analysis and report. Even if qualified data are eventually unacceptable for use in the project (i.e., rejected), these data are archived throughout the project life. No data are discarded.

Corrective actions or other modifications to the QAPP will be tracked and produced semi-annually. Modifications constitute minor changes made in the implementation of the QAPP according to staff discretion. For example, a site that was not visited or sampled during a sampling event due to lack of

water or unsafe field conditions would constitute a modification. Corrective actions and modifications taken will be documented when implemented and produced semi-annually.

4 Data Review, Verification, and Validation

Data review, verification, and validation procedures are established to confirm that the data obtained are complete, accurate, and of appropriate quality. These steps are critical to verifying that the collected data meets project objectives. Data review, verification, and validation will be completed for data produced by the semi-annual groundwater sampling events.

4.1 Data Review, Verification, and Validation

4.1.1 Data Review

Data review refers to the process of examining data for correct and complete recording, transmission and processing (USEPA 2002). Both field and laboratory data undergo review processes.

Raw field data are entered directly into field notebooks and/or sample forms at the time of the site visit. The field crew will check their field notebooks for missing or improbable measurements before leaving each site. In addition, spot checks for transcription errors will occur as data are recorded in the field. Following field activities, recorded field data are archived in original form and entered into the project database. One hundred percent of the field data entry will be checked against the original sample forms for errors and omissions. Missing or unusual data will be brought to the attention of the field manager for consultation and resolution.

Internal laboratory data review procedures will be according to laboratory SOPs. Upon receipt of lab results, HDR will check for missing and improbable data. A standard case narrative of laboratory QA/QC results will be sent to the project manager for each set of samples.

4.1.2 Data Verification and Validation

Data verification refers to the process of evaluating a data set for completeness – that data requested from the laboratory has been received and complies with specified requirements. Data validation describes an analyte- and sample-specific process of evaluating that a data set meets method, procedure, and contract requirements. Procedural criteria are documented throughout this QAPP.

Generally, verification and validation procedures are conducted together by the QA/QC manager according to established procedures. For this project, 100 percent of laboratory data will undergo Stage 2B validation. Briefly, Stage 2B validation comprises completeness and compliance checks of sample receipt conditions, and sample- and instrument-related QC checks.

Data compliance with acceptance criteria established by this QAPP is determined through the process of data verification and validation. Data beyond acceptance criteria will be evaluated and qualified appropriately. The data qualification flags used in this project are shown in **Table 7**. Once verification and validation is complete, the appropriate data qualification flags are attached to the corresponding data in the “validated” version of the electronic data deliverable. This electronic data deliverable is uploaded to the project database, and the validation flags follow the corresponding data throughout the life of the project. Although data may be rejected for use, no data are deleted in

this process. Problems identified through this process will be addressed according to the corrective actions outlined in Section 3.2. The results of the data validation process for each sampling event are presented in a data validation report.

Table 7. Data Qualification Flags

Data Qualification Flag	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting the QC criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

4.2 Reconciliation with User Requirements (Data Usability)

The data usability assessment takes the results of data review, verification, and validation processes and determines whether the qualified data meet the overall project DQOs. In the usability assessment, data and measurement quality objectives are verified for meeting the standards set forth in this QAPP. A sample usability assessment is given in Appendix A. A data summary and data usability assessment will be produced semi-annually.

Additionally, the project objectives will be reviewed annually to identify any changes. The QAPP will accordingly be reviewed and updated annually, subject to approval, to reflect any changes and to maintain alignment of data collection and QA/QC procedures to the overall project goals.

5 References

Ecology [Washington State Department of Ecology]

2019. *Cleanup Action Plan*. Warden City Water Supply Wells 4 & 5. Warden, WA. FSID 2802409, CSID 1618.

HDR [HDR Engineering, Inc.]

2018. *Final Remedial Investigation and Feasibility Study Report*. Simplot Grower Solutions. Warden Washington. September 2018.

2021a *Groundwater Monitoring Well Construction and Monitoring Plan*. Simplot Grower Solutions, Warden, Washington. February 2021.

2021b *Cleanup Action Implementation Compliance Monitoring Plan*. Simplot Grower Solutions, Warden, Washington. January 2021.

2021c. Final Engineering Design Report. Simplot Grower Solutions, Warden, Washington. January 2021.

USEPA [United States Environmental Protection Agency]

2000 Guidance on Technical Audits and Related Assessments for Environmental Data Operations. EPA QA/G-7. USEPA Office of Environmental Information, Washington, DC. http://www.epa.gov/quality/qa_docs.html. Accessed March 2012.

2002 Guidance for Quality Assurance Project Plans. EPA QA/G-5. USEPA Office of Environmental Information, Washington, DC. http://www.epa.gov/quality/qa_docs.html. Accessed March 2012.

A

Data Usability Assessments

Data Usability Assessment

Name of Data Set:
Prepared By:
Date:

Data or Measurement Quality Objective	Yes	No	Comments
Planning documents available?			
Project objectives identified?			
Sample design described?			
QA/QC procedures defined?			
Field documents available for review?			
Sample site locations/description provided?			
Sample types and numbers defined?			
Field SOPs defined?			
Field calibrations recorded?			
QC samples documented?			
COC record documents?			
Complete data packages available?			
Specified methods used and detection limits met?			
Accuracy of data appropriate?			
Precision of data appropriate?			
Representativeness of data appropriate?			
Completeness of data appropriate?			
Comparability of data appropriate?			
Sensitivity of methods appropriate?			
Do the data satisfy the project goals and meet the quality objectives?			