



DEPARTMENT OF
ECOLOGY
State of Washington

FINAL CLEANUP ACTION PLAN

Warden City Water Supply Wells 4 & 5
Warden, WA
FSID 2802409, CSID 1618

May 2020

Washington Department of Ecology
Toxics Cleanup Program
Eastern Regional Office
Spokane, WA

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LIST OF ACRONYMS

ARAR	Applicable, Relevant, and Appropriate Requirements
bgs	Below ground surface
CLARC	Cleanup Levels and Risk Calculation (Ecology)
CAP	Cleanup Action Plan
CSID	Cleanup Site Identification Number (Ecology)
CUL	Cleanup Level
DCA	Disproportionate Cost Analysis
DOH	Washington Department of Health
Ecology	Washington Department of Ecology
EDB	Ethylene Dibromide or 1,2-Dibromoethane
ECMP	Excavation Compliance Monitoring Plan
FS	Feasibility Study
FSID	Facility Identification Number (Ecology)
GCMP	groundwater compliance monitoring plan
MCL	Maximum Contaminant Level
MTCA	Model Toxics Control Act
O & M	oversight and maintenance
PID	photo ionization detector
PLP	potentially liable person
PQL	practical quantification limit
QAPP	quality assurance project plan
RCW	Revised Code Washington
RIFS	Remedial Investigation/Feasibility Study
SVE	soil vapor extraction
SVEP	Soil vapor ex
TEE	terrestrial ecological evaluation
µg/kg	microgram per kilogram
µg/l	microgram per liter
US EPA	United States Environmental Protection Agency
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

This document presents the Cleanup Action Plan (CAP) for the Warden City Water Supply Wells 4 and 5 Site (Site) at 1800 West First Street in the City of Warden, Grant County, WA 98857. This CAP was prepared by the Washington State Department of Ecology (Ecology) in collaboration with J.R. Simplot Company (Simplot). The CAP is Ecology's decision document for the Site and provides the rationale for selecting the cleanup alternative. This CAP describes the selected cleanup action to remove ethylene dibromide-(EDB) contaminated soil and groundwater. This CAP has been prepared to meet the requirements of the Model Toxics Control Act (MTCOA). Ecology has determined that actual or threatened releases of EDB from this Site, if not addressed by implementing the proposed cleanup action, present a threat to human health and the environment. Table 1 presents pertinent Site information.

The Site has been a retail outlet for agro-chemicals since 1971. Between 1971 and 1992 Simplot operated at the Site under the name of Soilbuilders. During that time EDB was stored and handled at the Site until 1984 when EDB was banned from use. EDB handled at the Site was used as a soil fumigant to control pests in soil.

The Site is located within the Quincy basin on top of windblown fine sand and silt (loess) resting on top of basalt. Groundwater occurs in the lower portion of the loess approximately 22 feet below ground surface. The City of Warden obtains its water supply from a number of wells within the City boundary completed in fractured basalt from about 100 to 800 feet below the ground surface (bgs). The City had observed EDB contamination in Wells No. 4 and 5 since 1989. In June 2003, the City reported EDB concentrations exceeding Federal and State maximum allowable EDB concentration of 0.05 micrograms per liter ($\mu\text{g}/\text{l}$) in drinking water to Ecology. Ecology conducted two initial investigations in 2004 and 2009 and discovered EDB contamination in soils and shallow water on Simplot's nearby property to the east and southeast of the affected City wells.

In 2011 Ecology and Simplot entered into an Agreed Order, under which Simplot carried out a remedial investigation and feasibility study (RI/FS). The purpose of the RI/FS study that was finalized in 2018, was to delineate the EDB source in soil and groundwater and to select a remedial action for the Site.

The results from the RI showed EDB-contaminated soil in the western portion of the Site with one detection of EDB in soil at the central portion of the Site. Contaminated groundwater was only encountered on-site in shallow groundwater.

Three remedial alternatives were proposed by the Potentially Liable Person (PLP) in the FS. Ecology completed an evaluation of the alternatives and has determined that Alternative 3 is Ecology's selected remedy. The remedial action consists of excavation and treatment of EDB-contaminated using an applied vacuum to the soil and collection of the EDB vapors from the soil. The vapors will be captured using a filter and treated through destruction in an incinerator. Clean soils will be removed and stockpiled so that contaminated soils can be excavated, treated, and returned to the excavation. Treated soils with EDB concentrations less than the soil cleanup level (CUL) of 0.27 micrograms per kilogram ($\mu\text{g}/\text{kg}$) will be returned to the excavation and the

ground restored to its original condition. Upon completion of the soil cleanup action compliance groundwater monitoring will take place in order to evaluate the effectiveness of the cleanup action with regards to groundwater protection.

1.0 INTRODUCTION

This report presents the Washington State Department of Ecology's proposed cleanup action for the Warden City Water Supply Wells 4 & 5 Site (Site) (Facility Site #2802409, Cleanup Site #1618), located at 1800 W 1st St, Warden, in Grant County, Washington (see Figure 1). This Cleanup Action Plan (CAP) is required as part of the site cleanup process under the Model Toxics Control Act (MTCA), Ch. 70.105D RCW, implemented by the Washington State Department of Ecology (Ecology). The cleanup action decision given herein is based on the Remedial Investigation/Feasibility Study (RI/FS) and other relevant documents in the administrative record. Ecology named J.R. Simplot Company (Simplot) as the potentially liable person (PLP) for the Site. Simplot has completed investigation activities under Agreed No. 8421 with Ecology.

This CAP outlines the following:

- The history of operations, ownership, and activities at the Site;
- The nature and extent of contamination as presented in the RI;
- Cleanup levels for the Site that are protective of human health and the environment;
- The selected remedial action for the Site; and
- Any required compliance monitoring and institutional controls.

Ecology has made a preliminary determination that a cleanup conducted in conformance with this CAP will comply with the requirements for selection of a remedy under WAC 173-340-360 through 390.

1.1 DECLARATION

Ecology has selected this remedy because it will be protective of human health and the environment. Furthermore, the selected remedy is consistent with the preference of the State of Washington as stated in RCW 70.105D.030(1)(b) for permanent solutions.

1.2 APPLICABILITY

Cleanup standards specified in this CAP are applicable only to the Warden City Wells 4 & 5 Site. They were developed as a part of an overall remediation process under Ecology oversight using the authority of MTCA, and should not be considered as setting precedents for other sites.

1.3 ADMINISTRATIVE RECORD

The documents used to make the decisions discussed in this CAP are on file in the administrative record for the Site. Major documents are listed in the reference section. The entire administrative record for the Site is available for public review by appointment at Ecology's Eastern Regional Office, located at 4601 N. Monroe Street, Spokane, WA 99205-1295. Results from applicable studies and reports are summarized to provide background information pertinent to the CAP. These studies and reports include:

- *Preliminary Investigation of Ethylene Dibromide Contamination. April, 2007.*
- *Phase II Preliminary Investigation, April 2009*
- *Final Remedial Action and Feasibility Study Work Plan, November 2011*
- *Phase II Work Plan to Support Remedial Investigation and Feasibility Study, May 2013*
- *Final Remedial Action and Feasibility Study Report, September 2018*

1.4 CLEANUP PROCESS

Cleanup conducted under the MTCA process requires the preparation of specific documents either by the PLP or by Ecology. Procedural tasks and these resulting documents, along with the MTCA section requiring their completion, are listed below with a brief description of each task.

- *Public Participation Plan – WAC 173-340-600*
Public Participation Plans summarize the methods that will be implemented to encourage coordinated and effective public involvement. This document is prepared by Ecology with PLP participation.
- *Remedial Investigation and Feasibility Study - WAC 173-340-350*
The RI/FS documents the investigations and evaluations conducted at the Site from the discovery phase to the RI/FS document. The Remedial Investigation (RI) collects and presents information on the nature and extent of contamination, and the risks posed by the contamination. The Feasibility Study (FS) presents and evaluates site cleanup alternatives and proposes a preferred cleanup alternative. The document is prepared by the PLP, accepted by Ecology, and undergoes public comment.
- *Cleanup Action Plan - WAC 173-340-380*
The CAP sets cleanup standards for the Site, and selects the cleanup actions intended to achieve the cleanup standards. The document is prepared by Ecology, and undergoes public comment.
- *Engineering Design Report, Construction Plans and Specifications - WAC 173-340-400*
The report outlines details of the selected cleanup action, including any engineered systems and design components from the CAP. These may include construction plans and specifications with technical drawings. The document is prepared by the PLP and approved by Ecology. Public comment is optional.
- *Operation and Maintenance Plan(s) - WAC 173-340-400*
These plans summarize the requirements for inspection and maintenance of cleanup actions. They include any actions required to operate and maintain equipment, structures, or other remedial systems. The document is prepared by the PLP and approved by Ecology.

- *Cleanup Action Report - WAC 173-340-400*
The Cleanup Action Report is completed following implementation of the cleanup action, and provides details on the cleanup activities along with documentation of adherence to or variance from the CAP. The document is prepared by the PLP and approved by Ecology.
- *Compliance Monitoring Plan - WAC 173-340-410*
Compliance Monitoring Plans provide details on the completion of monitoring activities required to ensure the cleanup action is performing as intended. It is prepared by the PLP and approved by Ecology.

2.0 SITE DESCRIPTION

2.1 SITE HISTORY

The site is a former Simplot Grower Solutions (also known as Simplot Soilbuilders) facility. Simplot Grower Solutions are retail outlets for agro-chemicals (fertilizers, pesticides, soil amendments) that offer customized fertilizer blending, application services, and consulting. Environmental Data Resources conducted a chain-of-title search and reported the following for the 1800 W. First Street facility (2011):

- 1940 to 1971: site owned by Burlington Northern, Inc. (formally Northern Pacific Railroad Company)
- 1971 to current: J.R. Simplot Company

Simplot actively operated the Simplot Soilbuilders facility from 1971 through 1992, where they stored, blended, and transported agro-chemicals, including EDB. Most of the Simplot workers familiar with the site are retired (many no longer living). Little information is available about the storage and use of EDB and if there were any observed spills.

EDB was used in the past as a pesticide for potato crops and as an additive for leaded gasoline fuel. Potatoes are a common crop in the Warden area, and there are potato processing facilities in the industrial section of the city. Although the chemical was banned for use as a soil fumigant in 1984, elevated levels of EDB were found in City of Warden wells (City Wells #4 and #5) in 2003, which led to multiple investigations to find the source of the EDB. (Figure 2).

City Well 4 is located approximately 250 feet northwest of the Site. EDB was discovered in the well with a concentration exceeding the maximum contaminant level (MCL) of 0.05 micrograms per liter ($\mu\text{g/L}$) in March 1989. The well was permanently decommissioned by the City of Warden in January 2011. The well was abandoned because of the presence of EDB and also because of the presence of industrial activities and railroads within the well's 100-foot sanitary control area. (HDR, 2018)

City Well 5 is located approximately 800 feet west-southwest of the Site. EDB was detected in groundwater collected from the well in February 1990. The City of Warden installed a packer in this well in 2004 to isolate the lower portion of the well for water production and to prevent shallow potentially EDB-contaminated water from entering the well. The city periodically pumps the well for irrigation use at a wastewater land application site. (HDR, 2018)

2.2 CURRENT SITE USE

The Simplot property is currently used by Simplot for storing agricultural products (e.g., packaged fertilizers) in warehouses. The property consists of two warehouse buildings, an unpaved parking area, and several storage bins. Figure 1 and Figure 2 are aerial photographs of the site and surrounding area that provide an indication of current land use. The parcel and surrounding parcels are listed by Grant County as "trade-general merchandise." Land use within

1/2 mile of the property includes commercial and light industry, undeveloped open space, and agricultural. Simplot anticipates continuing to use the property for storage of agricultural products for the near future and has not identified any long-term changes to property use.

The area immediately around the Simplot Growers Solutions property is industrial (agricultural), with irrigated agricultural areas on the north and west sides of the East Low Canal. A railroad spur borders the property to the north and west, with industrial buildings to the east, West First Street to the south, and industrial facilities to the west. The Washington Potato Company is located to the west of the Simplot property and Pure Line Seeds, Columbia Seeds, Greater Pacific Cold Storage, and ConAgra Lamb Weston (formerly Ochoa Ag Unlimited Foods and Basin Frozen Foods) are located to the east of the Simplot property. Further to the southeast across First Street, there is an auto wrecking lot. To the south across First Street there is a facility belonging to Pacific Coast Canola, and to the southwest is Skone Irrigation, CHS Sun Basin Growers, and the Warden Airport. The nearest residential properties (single family homes) are located approximately 1,500 feet east-southeast from the Site.

2.3 CONTAMINATION DISCOVERY AND SUBSEQUENT PRELIMINARY SITE INVESTIGATIONS

The City made its first detections of EDB in city water supply in 1989. The EDB contamination has been known to Ecology since 1990. Between 1992 and 2002 the EDB concentrations in city wells 4 and 5 were below the MCL. During this time, the City, the Washington State Department of Health, and Grant County Health District (GCHD) conducted monitoring and oversight of the EDB observed in the wells (DOH, 2005). Information regarding EDB detections in the two City wells is provided in Table 2.

On December 22, 2003, after the EDB exceedances in June, Ecology received a discovery notice from GCHD that EDB concentrations in City of Warden Wells 4 and 5 exceeded the MCL during the June 2003 sampling event. Ecology conducted an initial investigation and sent an early notice letter to the City on May 18, 2004. Ecology entered the Site into its database for hazardous waste sites. On February 1, 2005 the GCHD conducted a site hazard assessment and determined that the Site had a moderate risk, i.e. a number 3 on a scale from 5 (low risk) to 1 (high risk)

Ecology conducted two preliminary site investigations in 2007 and 2009 (PGG, 2007 and Ecology, 2009). Ecology performed the first preliminary investigation of the City of Warden's well field in response to the discovery of EDB in City Wells 4 and 5 (PGG, 2007). Under contract with Ecology, Pacific Groundwater Group (PGG) installed five groundwater monitoring wells (MW-1, MW-2, MW-3, MW-4, and MW-5D) and completed groundwater sampling. Figure 3 shows the location of the groundwater monitoring wells. Additionally, Ecology collected two water samples from adjacent agricultural processing facilities and three water samples from the City of Warden's wastewater treatment ponds. Between the two preliminary investigations, Ecology sampled the monitoring wells every other month starting in November 2006 until February 2009 (Ecology, 2009)

Ecology conducted a second phase of the preliminary site investigations between November and December 2008 (Ecology 2009). Ecology advanced and sampled a total of 22 borings (borings

SB-1 through SB-22 shown in Figure 4). Ecology also performed additional sampling and EDB analysis of agricultural process water from adjacent potato processing plants. (HDR, 2018).

The two preliminary site investigations identified two on-site areas with soils contaminated with EDB: one area within the central portion at boring SB-5; and a larger area at the western portion located at well MW-5D and boring SB-12. Ecology also discovered EDB contamination in groundwater monitoring well MW-5D.

EDB concentrations were also identified in the potato processing water in the facilities west of the Site. After the facilities stopped using water from the City Wells 4 and 5 no more detections of EDB were noted in the process water (Ecology, 2009).

2.4 PHYSICAL SITE CHARACTERISTICS

2.4.1 Topography and Climate

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 region is arid, receiving around 9 inches of precipitation annually. The majority of the precipitation occurs in late fall through early spring; winter precipitation is usually in the form of snow. Summers are warm and dry. The annual mean temperature is about 50°F.

2.4.2 Surface Water

The nearest surface water body from the Site is East Low Canal and it is located approximately 250 feet to the north of the facility (see Figure 2). The canal is filled with water during the growing season from approximately April to October and dry during the rest of the year. The nearest major natural surface water body is Warden Lake located approximately four miles to the west.

2.4.3 Geology

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).

The upper unconsolidated sediments consist of 17-64 feet thick silty, fine sand of the Palouse Formation. Layers of caliche (hardened soil created by carbonate and sulfate precipitation) occur in the upper 25 feet of site boreholes. The caliche layers are thinner and not as well-defined in the center of the property. Approximately 5 to 15 feet of weathered basalt is encountered beneath the Palouse Formation. The weathered basalt is underlain by competent basalt. The average depth to the loess-basalt contact within the Site ranges from about 45 feet in the northwest to 25 feet in the southeast. Further descriptions of the regional and Site geology are found in PGG (2007), Ecology (2009), and in HDR (2018).

2.3.5 Hydrogeology

The Site and surrounding area lies in the Odessa groundwater management sub-area, 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 (Hansen et al. 1994; HDR, 2018).

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. Currently there are twelve groundwater monitoring wells installed both on-site and off-site. Installation details for these twelve wells are presented in the RI/FS report (HDR, 2018). Monitoring wells designated with a “D” refer to wells screened at least partially within the weathered basalt whereas monitoring wells with no designation or with an “S” designation are screened in the unconsolidated Palouse Formation. Groundwater elevations for the on-site wells measured during the RI are presented in the RI/FS report (HDR, 2018).

Shallow groundwater in the Palouse Formation has a southerly to southwesterly flow direction. Deeper groundwater flow in the basalt fluctuates between a northerly flow direction in winter and a southerly direction in summer. The southerly flow during summer is caused by groundwater recharge from the canal. Beyond the City water supply wells 4 and 5, no other groundwater extraction wells in the area have been identified by Ecology to contain EDB.

3.0 REMEDIAL INVESTIGATION

Based on the results from the two preliminary Ecology site investigations, Simplot prepared an initial RI/FS work plan in 2011 followed by two supplemental RI/FS work plans in 2012 and 2013. RI/FS work was performed from 2011 through 2013, followed by one groundwater monitoring event in 2017.

3.1 SUBSURFACE STRUCTURES AND SOIL

Prior to the soil investigation, a geophysical survey was conducted to determine if any tanks, piping, or subsurface infrastructure was present as a potential source; none were found.

In February 2012, Simplot drilled seven push probe borings (GP-1 through GP-7) in areas that were not sampled during Ecology's earlier investigations; boring locations are shown in Figure 4. Two to three soil samples were collected from each boring at depths ranging from one foot down to eighteen feet below the ground surface.

Between December 2011 and July 2013, Simplot drilled and sampled six additional soil borings that were converted into groundwater monitoring wells (MW-5S through MW-10S). Simplot collected soil samples from these borings for EDB analysis.

Additional EDB soil contamination was found in the western portion of the Site in samples collected from the new soil borings, GP-7 and MW-5S, drilled adjacent to well MW-5D. Simplot did not detect any EDB in samples collected from borings drilled adjacent to SB-5 within the central portion of the Site. EDB was found primarily in the caliche at depths ranging from approximately 10 to 20 feet below ground surface. (PGG, 2007; Ecology, 2009; HDR, 2018). Detected EDB concentrations ranged from 3.2 $\mu\text{g}/\text{kg}$ (SB-12) with a maximum of 218 $\mu\text{g}/\text{kg}$ (MW-5S). Figure 4 shows the estimated extent of EDB-contaminated soil. Table 3 provides information regarding detections of EDB in the soil borings.

3.2 GROUNDWATER

Groundwater monitoring wells MW-5S through MW-10S were completed within the shallowest portion of the water table and one well (MW-7D) was completed within the deeper portion of the shallow aquifer into the basalt (Figure 3)

EDB has been found in groundwater primarily in shallow well MW-5S, which is screened at the top of the water surface. Detections with concentrations ranging from 5.7 $\mu\text{g}/\text{l}$ to 234 $\mu\text{g}/\text{l}$ have been observed in this well. Shallow well MW-6S has also had detections of EDB ranging from non-detect to 26.8 $\mu\text{g}/\text{l}$. Monitoring well MW-5D, which is screened at the unconsolidated groundwater/basalt interface, has shown non-detect to low ($< 0.27 \mu\text{g}/\text{l}$) EDB concentrations during the RI monitoring period, even though higher concentrations of EDB had been detected in this well in the previous preliminary investigations (Ecology, 2009). EDB has not been detected

in any off-site monitoring wells. Table 4 shows the EDB detections in the groundwater monitoring wells during the RI.

3.3 RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

EDB evaporates quickly upon exposure to the air and dissolves in groundwater to some extent. It is moderately persistent in the soil environment, with a representative half-life of 100 days. Generally, EDB degrades readily near the surface and becomes more persistent with depth. Further information regarding the properties of EDB and EDB risks to human health and the environment is found in the RI/FS report (HDR, 2018). Three EDB sources have been identified at the Site (HDR, 2018):

1. soil at the site;
2. groundwater at the site, and
3. deep Wanapum basalt aquifer in the area of City Wells 4 and 5.

Transport and/or migration pathways define those mechanisms by which humans are exposed to a chemical released from a site. A pathway is comprised of four elements:

- A source and mechanism for release of a chemical into the environment
- A transport medium (e.g., soil, air, and water)
- A point of potential human contact (exposure point)
- A human exposure route (ingestion, inhalation, dermal contact)

In the soil, contaminant mass remains in the caliche, which is not currently a direct contact exposure risk due to its depth. However, it continues to represent a source to leach to the groundwater.

Groundwater, particularly the shallow groundwater, remains a completed exposure pathway, due to the impacted groundwater's connection to the drinking water aquifer. Receptors may be exposed through current or future ingestion or direct contact with contaminated groundwater.

Due to the high volatility of EDB, vapors from contaminated soil and groundwater represent sources to air. However, there are no current exposures since buildings are not currently present in areas directly over contamination; however, future buildings could potentially trap and concentrate vapors.

The closest surface water is the East Low Canal, which is a losing stream through the project area during the summer months. In wintertime, the gradient is relatively flat or to the southwest. Water is flowing from the canal towards the Site when it is filled during the summer months. Therefore, the EDB in groundwater does not enter the canal and consequently, there is no complete pathway for EDB contamination into canal surface water or sediments.

The development of exposure scenarios is based on the conceptual site model, information obtained during the RI, and on State of Washington risk assessment guidance. Potential exposure scenarios included residential, industrial, utility worker, and agricultural.

Completed EDB pathways do not currently exist at the Site, as long City Well 5 is not used for human consumption.

Future exposure scenarios could include on-site exposure to impacted soil and groundwater by Site personnel. Also, because there are detectable levels of EDB in groundwater beneath the site, there is a potential for off-site migration. Future groundwater exposures via ingestion, inhalation, and dermal contact by Site personnel is possible, if groundwater production for human consumption takes place within the Site vicinity.

4.0 CLEANUP STANDARDS

4.1 OVERVIEW

MTCA requires the establishment of cleanup standards for individual sites. The two primary components of cleanup standards are CULs and points of compliance. CULs determine the concentration at which a substance does not threaten human health or the environment. All media exceeding a cleanup level is addressed through a cleanup remedy that prevents exposure to the contaminated material. Points of compliance represent the locations on the site where CULs must be met.

The process for establishing cleanup levels involves the following:

- Determining which analytical method to use;
- Developing cleanup levels for individual contaminants in each media;
- Determining which contaminants contribute the majority of the overall risk in each media (indicators); and
- Adjusting the cleanup levels downward based on total site risk.

MTCA provides three options for establishing cleanup levels: Methods A, B, and C.

- Method A may be used to establish cleanup levels at routine sites or sites with relatively few hazardous substances.
- Method B is the standard method for establishing cleanup levels and may be used to establish cleanup levels at any site.
- Method C is a conditional method used when a CUL under Method A or B is technically impossible to achieve or may cause significantly greater environmental harm. Method C also may be applied to qualifying industrial properties.

MTCA defines the factors used to determine whether a substance should be retained as an indicator for the Site. When defining cleanup levels at a site contaminated with several hazardous substances, Ecology may eliminate from consideration those contaminants contributing a small percentage of the overall threat to human health and the environment. WAC 173-340-703(2) provides a substance may be eliminated from further consideration based on:

- The toxicological characteristics of the substance which govern its ability to adversely affect human health or the environment relative to the concentration of the substance;
- The chemical and physical characteristics of the substance which govern its tendency to persist in the environment;
- The chemical and physical characteristics of the substance which govern its tendency to move into and through the environment;
- The natural background concentration of the substance;
- The thoroughness of testing for the substance;

- The frequency of detection; and
- The degradation by-products of the substance.

4.2 SITE USE

The evaluation of both cleanup levels and ecological exposures depends on the nature of the Site use. Options under MTCA are either an unrestricted property or an industrial property. Industrial properties are defined in WAC 173-340-200; the definition includes properties characterized by transportation areas and facilities zoned for industrial use. Industrial properties are further described in WAC 173-340-745(1) with the following factors:

- People don't normally live on industrial property;
- Access by the general public is generally not allowed;
- Food is not grown/raised;
- Operations are characterized by chemical use/storage, noise, odors, and truck traffic;
- Ground surface is mostly covered by buildings, paved lots and roads, and storage areas; and
- Presence of support facilities serving the industrial facility employees and not the general public.

The Site is currently zoned as industrial (City of Warden designation: M1-Light Manufacturing), which does not allow for daycare centers and residential use. Therefore, the Site does qualify for industrial site use. Current Site use is as a distribution center for agricultural supplements such as fertilizers and therefore Method C CUL apply for risk from direct soil contact. Since aquifers beneath the Site are used for human consumption, groundwater Method B CULs will apply. Potential ecological exposure to Site contamination is discussed further in Section 4.3.

4.3 TERRESTRIAL ECOLOGICAL EVALUATION

WAC 173-340-7490 requires that sites perform a terrestrial ecological evaluation (TEE) to determine the potential effects of soil contamination on ecological receptors. A site may be excluded from a TEE if any of the following are met:

- All contaminated soil is or will be located below the point of compliance;
- All contaminated soil is or will be covered by physical barriers such as buildings or pavement;
- The site meets certain requirements related to the nature of on-site and surrounding undeveloped land; or
- Concentrations of hazardous substances in soil do not exceed natural background levels.

For the Site, a TEE is not required because it meets the third criteria above. The site has less than 1.5 acres of contiguous undeveloped land on the site or within 500 feet of any area of the site affected by hazardous substances, other than those substances listed in WAC 173-340-7491(1)(c)(ii).

4.4 SITE CLEANUP LEVELS

The RI and previous investigations have documented the presence of EDB contamination in soil and groundwater at the Site. Therefore, CULs will be developed for both soil and groundwater.

4.4.1 Groundwater

Because this Site meets the requirements identified in WAC 173-340-704 for groundwater, a Method B CUL for EDB will apply. Table 5 shows the cleanup level development including the Federal and State MCL, Method A CUL, and Method B CULs. The site-specific groundwater CUL of 0.0219 $\mu\text{g/l}$ is calculated using the MTCA Method B equation and taking the cancer risk into account.

4.4.2 Soil

Since groundwater is contaminated at concentrations that exceed the Method B CUL as described above, soil CULs need to consider the leaching pathway and be set at concentrations protective of groundwater in accordance with Method B guidance. The CUL for surface soils must also be protective from the risk posed by the direct-contact pathway. Table 5 shows the site-specific CULs for soil direct exposure from contaminated soil. The CUL protective of groundwater is lower than the CUL protective of the direct contact pathway for industrial properties. For EDB in soils, Ecology has selected the soil CUL that is protective of groundwater. Based upon the MTCA Method B equation, the Site-specific soil EDB CUL is calculated to be 0.27 $\mu\text{g/kg}$.

4.5 POINT OF COMPLIANCE

MTCA defines the point of compliance as the point or points where cleanup levels shall be attained. Once cleanup levels are met at the point of compliance, the Site is no longer considered a threat to human health or the environment.

WAC 173-340-740(6) gives the point of compliance requirements for soil. For soil cleanup levels based on protection of ground water, the point of compliance shall be established in the soils throughout the Site under WAC 173-340-740(6). For soil cleanup levels based on human exposure via direct contact, the point of compliance is within in the soils throughout the Site from the ground surface to fifteen feet below the ground surface. If groundwater is contaminated, the soil point of compliance is all soil from the ground surface down to the groundwater table.

At the Site the soil point of compliance is from the ground surface down to the top of groundwater approximately 22 feet below the ground surface, due to the presence of EDB-contaminated groundwater.

WAC 173-340-720(6) gives the point of compliance requirements for groundwater. The standard groundwater point of compliance is established throughout the site from the uppermost level of

the saturated zone extending vertically to the lowest most depth which could potentially be affected by the site.

At the Site a standard groundwater point of compliance will apply throughout the extent of the plume. Groundwater cleanup levels shall be attained in all groundwater from the point of compliance to the outer boundary of the hazardous substance plume.

5.0 CLEANUP ACTION SELECTION

5.1 REMEDIAL ACTION OBJECTIVES

The remedial action objectives are statements describing the actions necessary to protect human health and the environment by eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route. They are developed considering the characteristics of the contaminated media, the characteristics of the hazardous substances present, migration and exposure pathways, and potential receptor points.

Soil and groundwater have been contaminated by past activities at the Site. Given the current status of the Site, people may be exposed to contaminated soil via dermal contact or inhalation of dust, or contaminated groundwater via dermal contact or ingestion. While a water well is not currently installed in the area of contaminated groundwater, future groundwater use must be protected. Potential human receptors include on-site workers, trespassers, residents, and recreational users. As described in Section 4.3 above, exposure to both plant and animal receptors is not likely under the current and proposed Site use. Given these potential exposure pathways, the following are the remedial action objectives for the Site:

- Prevent direct contact, ingestion, or inhalation of contaminated soil by humans
- Prevent direct contact or ingestion of contaminated groundwater by humans
- Prevent or minimize the potential for migration of contaminants from soil to groundwater

5.2 CLEANUP ACTION ALTERNATIVES

Cleanup alternatives to meet these remedial action objectives were evaluated as part of the RI/FS process. The FS evaluated multiple alternatives for addressing all contaminated media at the Site. The following four alternatives are based on the proposals made by the PLPs in the FS. Technology options for soils generically included containing/stabilizing soils in place, treating the soils in place to remove EDB, or removing soils for treatment or disposal. For groundwater, options included containing and/or actively treating groundwater underground, pumping groundwater to the surface and treating it, or relying primarily on soil cleanup to reduce groundwater concentrations. Several specific technologies or treatments were excluded by the PLPs due to various factors; these can be reviewed in detail in the RI/FS. The retained technologies were combined into the four alternatives to address contaminated soil and groundwater.

5.2.1 Alternative 1: No Action

The Site would remain in its current state with no cleanup action.

Alternative 1 does not meet MTCA requirements that prohibit reliance on natural processes alone to clean up contaminated sites where more active remedial measures are practicable. In particular, this alternative does not include a provision for monitoring as required by MTCA

(WAC 173-340-360(2)(a)(iv)). Additionally, this alternative does not fulfill the MTCA requirement to remove contaminants of concern to the maximum extent practicable. This alternative is therefore not considered further.

5.2.2 Alternative 2: Institutional Controls and Monitored Natural Attenuation

This alternative includes institutional controls for land use, which would remain until the cleanup standards are met for groundwater through the monitored natural attenuation of EDB.

Institutional controls are measures taken to limit or prohibit activities that may interfere with the integrity of a cleanup action, or result in exposure to hazardous substances remaining at the Site. Here, the institutional control would be an environmental covenant filed with the property deed that would restrict groundwater usage and limit site uses such as where buildings could be built on the property.

Monitored natural attenuation refers to the natural physical, chemical, and/or biological processes that reduce the mass, toxicity, or mobility of EDB in the subsurface over time. Monitored natural attenuation involves sampling and analysis of groundwater samples to verify that concentrations of EDB are reducing.

Monitoring would involve collection of groundwater samples from the existing monitoring well network twice per year. Two new monitoring wells would also be added to the compliance monitoring network at the site boundary. The semi-annual compliance monitoring would ensure that EDB contamination would not leave the Site property boundary. In addition, soil samples would be collected annually to assess if EDB in soils meet the soil CUL.

5.2.3 Alternative 3: Institutional Controls, Soil Excavation and Treatment, and Monitored Natural Attenuation of Groundwater

Institutional controls and monitored natural attenuation for groundwater would be the same as Alternative 2. This alternative would add the targeted excavation of EDB-impacted soil including soil at the soil/groundwater interface where EDB is detected. All soil exceeding the EDB CUL of 0.27 $\mu\text{g}/\text{kg}$ would be excavated. Confirmation sampling would be performed in the excavation to confirm that all contaminated soil had been removed. Excavated soil would be treated on-site through an *ex-situ* vapor extraction process. After testing confirms the soil is clean, it would be returned to the excavation pit and the site re-graded. As an alternative, the treated soil could be used for other uses such as fill material. Compliance monitoring would be used to confirm natural attenuation was taking place and to ensure that contaminated groundwater does not migrate off-site. A 20 –year maximum restoration time frame is assumed for the site.

5.2.4 Alternative 4: Institutional Controls, Soil Excavation, Soil Off-Site Disposal, and Monitored Natural Attenuation of Groundwater:

This alternative is the same as Alternative 3, except that contaminated soils are transported to an off-site landfill instead of treated on-site. Imported clean fill tested for potential contaminants

will be used to backfill the excavation. Institutional controls and monitored natural attenuation for groundwater would be the same as Alternatives 2 and 3. The compliance monitoring and periodic review procedures would be the same as for Alternative 3. The restoration time frame would be the same as Alternative 3.

5.3 REGULATORY REQUIREMENTS

MTCA sets forth the minimum requirements and procedures for selecting a cleanup action. A cleanup action must meet each of the minimum requirements specified in WAC 173-340-360(2), including certain threshold and other requirements. These requirements are outlined below.

5.3.1 Threshold Requirements

WAC 173-340-360(2)(a) requires that the cleanup action shall:

- Protect human health and the environment;
- Comply with cleanup standards (see Section 4.0);
- Comply with applicable state and federal laws (see Section 5.3.4); and
- Provide for compliance monitoring.

5.3.2 Other Requirements

In addition, WAC 173-340-360(2)(b) states the cleanup action shall:

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and
- Consider public concerns

WAC 173-340-360(3) describes the specific requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable. A permanent solution is defined as one where cleanup levels can be met without further action being required at the Site other than the disposal of residue from the treatment of hazardous substances. To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, a disproportionate cost analysis is conducted. This analysis compares the costs and benefits of the cleanup action alternatives and involves the consideration of several factors, including:

- Protectiveness
- Permanent reduction of toxicity, mobility and volume
- Cost
- Long-term effectiveness
- Short-term risk
- Implementability
- Consideration of public concerns

The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment.

WAC 173-340-360(4) describes the specific requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time-frame.

5.3.3 Cleanup Action Expectations

WAC 173-340-370 sets forth the following expectations for the development of cleanup action alternatives and the selection of cleanup actions. These expectations represent the types of cleanup actions Ecology considers likely results of the remedy selection process; however, Ecology recognizes that there may be some sites where cleanup actions conforming to these expectations are not appropriate.

- Treatment technologies will be emphasized at sites with liquid wastes, areas with high concentrations of hazardous substances, or with highly mobile and/or highly treatable contaminants;
- To minimize the need for long-term management of contaminated materials, hazardous substances will be destroyed, detoxified, and/or removed to concentrations below cleanup levels throughout sites with small volumes of hazardous substances;
- Engineering controls, such as containment, may need to be used at sites with large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable;
- To minimize the potential for migration of hazardous substances, active measures will be taken to prevent precipitation and runoff from coming into contact with contaminated soil or waste materials;
- When hazardous substances remain on-site at concentrations which exceed cleanup levels, they will be consolidated to the maximum extent practicable where needed to minimize the potential for direct contact and migration of hazardous substances;
- For sites adjacent to surface water, active measures will be taken to prevent/minimize releases to that water; dilution will not be the sole method for demonstrating compliance;
- Natural attenuation of hazardous substances may be appropriate at sites under certain specified conditions (see WAC 173-340-370(7)); and
- Cleanup actions will not result in a significantly greater overall threat to human health and the environment than other alternatives.

5.3.4 Applicable, Relevant, and Appropriate State and Federal Laws, and Local Requirements

WAC 173-340-710(1) requires that all cleanup actions comply with all applicable state and federal law. It further states the term “applicable state and federal laws” shall include legally applicable requirements and those requirements that the department determines “...are relevant and appropriate requirements.” This section discusses applicable state and federal law, relevant and appropriate requirements, and local permitting requirements, which were considered and were of primary importance in selecting cleanup requirements. If other requirements are identified at a later date, they will be applied to the cleanup actions at that time.

MTCA provides an exemption from the procedural requirements of several state laws and from any laws authorizing local government permits or approvals for remedial actions conducted under a consent decree, order, or agreed order. [RCW 70.105D.090] However, the substantive requirements of a required permit must be met. The procedural requirements of the following state laws are exempted:

- Ch. 70.94 RCW, Washington Clean Air Act;
- Ch. 70.95 RCW, Solid Waste Management, Reduction, and Recycling;
- Ch. 70.105 RCW, Hazardous Waste Management;
- Ch. 75.20 RCW, Construction Projects in State Waters;
- Ch. 90.48 RCW, Water Pollution Control; and
- Ch. 90.58 RCW, Shoreline Management Act of 1971.

WAC 173-340-710(4) sets forth the criteria Ecology evaluates when determining whether certain requirements are relevant and appropriate for a cleanup action. Table 6 lists the state and federal laws containing the applicable or relevant and appropriate requirements (ARARs) that apply to the cleanup action at the Site. Local laws, which may be more stringent than specified state and federal laws, will govern where applicable.

5.4 EVALUATION OF CLEANUP ACTION ALTERNATIVES

The requirements and criteria outlined in Section 5.3 are used to conduct a comparative evaluation of the cleanup action alternatives and to select a cleanup action from those alternatives. Table 7 provides a summary of the ranking of the cleanup alternatives against the various criteria set forth in MTCA. Note that as stated in Section 5.2.1, Alternative 1 is not a viable alternative under MTCA and is not considered further or evaluated. The comparative evaluation of the cleanup action alternatives against the requirements and criteria are summarized below.

5.4.1 Threshold Requirements

5.4.1.1 *Protection of Human Health and the Environment*

- **Soil Contamination:** Alternatives 2 would reduce the risk posed from site-related contamination, as it would no longer be available for direct contact by human and ecological receptors; however, it may not eliminate the soil-to-groundwater pathway. Alternatives 3 and 4 would eliminate the risk posed from site-related contaminated soil through complete removal of soil exceeding the CULs.
- **Groundwater Contamination:** Alternative 2 likely does not achieve protection of human health and the environment within a reasonable time-frame, because it does not address vertical migration of EDB from contaminated soil into groundwater. Alternatives 3 and 4 would achieve protection of human health and the environment in a much shorter time-frame because they include removing contaminated soil that would be a continuing source to groundwater.

5.4.1.2 Compliance with Cleanup Standards

- **Soil Contamination:** Alternative 2 may not achieve the EDB soil CUL within the projected 20-year maximum restoration time frame. Alternatives 3 and 4 would achieve the EDB soil CUL through complete removal of EDB-contaminated soil.
- **Groundwater Contamination:** Alternative 2 is not anticipated to achieve cleanup standards in groundwater because achieving the CULs in soil is not assured. Alternatives 3 and 4 are anticipated to achieve CULs in shallow groundwater through complete removal of the EDB soil source.

5.4.1.3 Compliance with Local, State, and Federal Laws

Alternative 2 does not comply with applicable State and Federal laws because it may not achieve groundwater standards. Alternatives 3 and 4 are expected to comply with all applicable laws due to the removal and treatment of all EDB-contaminated soil above the CUL. Local laws, which may impact the final implementation of the chosen cleanup action will be considered when preparing the cleanup action engineering design document.

5.4.1.4 Provision for Compliance Monitoring

There are three types of compliance monitoring: protection, performance, and confirmation. Protection monitoring is designed to protect human health and the environment during the construction and operation & maintenance phases of the cleanup action. Performance monitoring confirms that the cleanup action has met cleanup and/or performance standards. Confirmation monitoring confirms the long-term effectiveness of the cleanup action once cleanup standards have been met initially or other performance standards have been attained.

All three alternatives would meet this provision as all require varying levels of all three types of compliance monitoring.

5.4.2 Other Requirements

5.4.2.1 Use of Permanent Solutions to the Maximum Extent Practicable

To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, the procedures outlined in MTCA to consider a disproportionate cost analysis is used. The analysis compares the costs and benefits of the cleanup action alternatives and involves the consideration of several factors. The comparison of costs and benefits may be quantitative, but will often be qualitative and require the use of best professional judgment. Table 7 provides a summary of the relative ranking of each cleanup alternative in the decision process. The relative ranking of each deep contamination alternative for each of the evaluation factors is summarized below.

- Protectiveness

Protectiveness measures the degree to which existing risks are reduced and the time required to reduce risk and attain cleanup standards. On- and off-site risks resulting from implementing the alternative are measured in order to determine the improvement of overall environmental quality.

Alternative 2 would not be protective of groundwater because EDB may remain in soil and continue to impact groundwater adversely. Alternative 3 would be more protective than Alternative 4, because in Alternative 3, the EDB would be destroyed and not merely transferred to another location.

- Permanence

Permanence measures the adequacy of the alternative in destroying the hazardous substance(s), the reduction or elimination of releases or sources of releases, the degree of irreversibility of any treatment process, and the characteristics and quantity of any treatment residuals.

Alternative 3 would be more permanent than Alternative 4, because EDB would be destroyed and not transferred to another location as proposed in Alternative 4. Alternative 2 is not anticipated to be permanent because it does not reduce the toxicity, mobility or volume of EDB in soils within an acceptable restoration time frame. .

- Cost

Cleanup costs are estimated based on specific design assumptions for each alternative. Although the costs are estimates based on design assumptions that might change, the relative costs are used for this evaluation. A detailed description of the costs involved with each alternative can be found in the FS (HDR, 2018). Alternative 2, assuming a 10-monitoring period is estimated to cost \$475,560. Alternative 3, (*ex-situ* soil vapor extraction) is estimated to cost \$461,212 based on a 5-year compliance monitoring period with semi-annual monitoring events. The estimated cost for Alternative 4, (excavation and off-site disposal) is \$579,846 also assuming a 5-year compliance monitoring period with semi-annual monitoring events.

- Long-term Effectiveness

Long-term effectiveness measures the degree of success, the reliability of the alternative during the period that hazardous substances will remain above cleanup levels, the magnitude of residual risk after implementation, and the effectiveness of measures required to manage institutional controls.

Alternatives 3 and 4 would be more effective for the long-term than Alternative 2, as all

shallow soil contamination would be treated or removed from the Site.

- Short-term Risk

Short-term risk measures the risks related to an alternative during construction and implementation, and the effectiveness of measures taken to manage such risks.

Alternatives 2 would have the lowest risk since soils would not be excavated. Alternative 3 would have a lower short-term risk than Alternative 4 since less excavation and contaminated soil transport would occur. Alternatives 3 and 4 would use standard construction techniques and any risks are would be easily mitigated.

Additionally, Alternative 3 is more also more attractive than Alternative 4 because of the lower use of fossil fuels for the *ex-situ* soil treatment Alternative 4 is dependent on heavy trucks for long-distance transportation and disposal Consequently, Alternative 3 would have a lower carbon footprint than Alternative 4.

- Implementability

Implementability considers whether the alternative is technically possible, the availability of necessary off-site facilities, services, and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for operations and monitoring, and integrations with existing facility operations.

Alternatives 2, 3, and 4 are fully implementable at this Site. Alternative 2 ranks slightly lower, as it requires inspection and maintenance until the contamination degrades to a point of meeting CULs.

- Consideration of Public Concerns

few comments from the public were received regarding proposed remedial alternatives presented in the RI/FS report to clean up the Site. Comments received from the public concerned potential migration of EDB contamination to other groundwater production wells. This CAP will undergo public review and comment and Ecology will respond to the public comments. Ecology will consider the comments before finalizing this CAP.

5.4.2.2 Disproportionate Cost Analysis

Costs are disproportionate to the benefits if the incremental costs of an alternative are disproportionate to the incremental benefits of that alternative. In this case, Alternative 3 is considered more permanent since it treats the contamination, but also less expensive than Alternative 4. Therefore, a disproportionate cost analysis is not needed.

5.4.2.3 *Provide a Reasonable Restoration Time Frame*

WAC 173-340-360(4) describes the specific requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame, as required under subsection (2)(b)(ii). The factors used to determine whether a cleanup action provides a reasonable restoration time frame are set forth in WAC 173-340-360(4)(b).

To drive continuous improvement and adaptive management of the active cleanup technologies, Ecology has established an overall restoration time frame (RTF) for the Site of 20 years based on the longevity of EDB in soil and groundwater. This period is consistent with the alternatives presented in the FS and evaluated in this CAP. A 20-year time frame allows adequate time to determine whether the selected cleanup action alternative is proving effective, while allowing time to evaluate an alternate cleanup action, if the primary alternative is not effective. A 20-year RTF is the measure by which the performance of alternatives will be evaluated. It is Ecology's goal that cleanup standards at the Site are attained as quickly as practicable. The RTF starts following completion of construction and start of the compliance monitoring.

It is anticipated that Alternatives 3 and 4 would be able to achieve the soil and shallow groundwater EDB CULs within a time frame of maximum 20 years, whereas Alternative 2 will not.

5.4.3 Cleanup Action Expectations

Specific expectations of cleanup levels are outlined in WAC 173-340-370 and are described in Section 5.3.3. Alternatives would address applicable expectations in the following manner:

Alternative 2:

- Soil - To minimize the potential for migration due to precipitation, a cover or cap would be needed

Alternative 3:

- Soil - Emphasizes a treatment technology
- Soil - Destroys contamination
- Groundwater - Natural attenuation gets benefit of source control with monitoring and lesser risks until CULs achieved

Alternative 4:

- Soil - Removes but does not destroy contamination
- Groundwater - Natural attenuation gets benefit of source control with monitoring and lesser risks until CULs achieved

Soil Contamination:

- Alternative 2 would rely on successful natural attenuation of EDB in soils within the reasonable restoration time frame of 20 years for the Site.

- Alternative 2 would be required to control surface runoff to prevent any impacts to surface water or groundwater.
- In Alternative 3 *ex-situ* vapor extraction treatment will be used to treat EDB vapors that are highly mobile in the environment
- Alternatives 3 and 4 would remove all contaminated materials from the ground surface to 22 feet bgs to concentrations less than cleanup levels, which would eliminate the requirement for long-term management of EDB-contaminated soils.

Groundwater Contamination:

- All three alternatives, Alternative 2, 3 and 4 will rely on natural attenuation of EDB contamination in shallow groundwater after the removal of EDB-contaminated soils in the vadose zone. Compliance monitoring will ensure that natural attenuation is taking place in accordance with the requirements set forth in WAC 173-340-370(7). It is anticipated that compliance groundwater monitoring will be required for the remainder of the RTF of 20 years, with estimated four, five-year reviews evaluating the success of the selected cleanup action for the Site during the .

Indoor Vapor Intrusion:

- All three alternatives, Alternative 2, 3 and 4 will rely on institutional controls to prevent structures from being built within the soil and shallow groundwater EDB contamination footprint. The institutional controls will remain in place as long the soil and shallow groundwater CULs have not been met and site data shows that soil gas EDB concentrations do not pose an unacceptable risk to occupants to such structures.

5.5 DECISION

After evaluation of the three alternatives that meet the cleanup threshold criteria, Alternative 3 is the selected cleanup action at the Site because it is more permanent and less costly.

6.0 SELECTED REMEDIAL ACTION

The selected cleanup action is described below. During the implementation of the CAP if there is a need to deviate from the CAP, any changes to the CAP must be approved by Ecology in writing before the changes are implemented [WAC 173-340-400(6)(d)]. Protection monitoring procedures for the cleanup action implementation will be described in a separate Health and Safety Plan, which will be prepared in accordance with Federal and State occupational health and safety regulations, including those that regulate work on sites where hazardous materials are present.

6.1 CLEANUP ACTION IMPLEMENTATION

Prior to excavation, two wells (MW-5S and MW-5D) inside the planned excavation area will be decommissioned. The PLP will delineate the horizontal and vertical extent of EDB-contaminated soils in more detail through soil borings. The purpose of this contaminant delineation is to define the volume of soils in more detail to be able to design the correct capacity of the *ex-situ* SVE treatment system.

The estimated area to be excavated and treated is approximately 5,000 square feet (sq. ft.) with a maximum depth of approximately 22 feet below ground surface. The areas are divided with approximately 4,500 sq. ft. at the western portion of the Site and 500 sq. ft. around soil boring SB-5. Excavation will not take place in saturated soils below the groundwater table. Estimated total excavation volume is approximately 13,000 cubic yards. The total estimated volume of EDB-contaminated soil greater than 0.27 $\mu\text{g}/\text{kg}$ that will be treated through *ex-situ* vapor extraction is approximately 1,200 cubic yards. Figure 5 shows the anticipated extent of EDB-contaminated soil to be excavated and treated. Excavation activities would occur during the winter months to take advantage of a lower water table, which allows greater access to soil at the soil/groundwater interface and less risk for EDB volatilization. Dust control measure will be in place such as water spraying during excavation to keep dust levels below the limits set in the health and safety plan.

Upon completion of excavation, confirmed clean soil will be returned to the excavation and compacted.

Excavated contaminated soil would be separately stockpiled and stored during the winter months. They would be placed on a one-foot layer of clean soil with plastic sheeting on top. The plastic sheeting will have a network of slotted piping on top. The soil will then be covered with plastic to prevent EDB releases into the atmosphere. The piping will be connected to an *ex-situ* vacuum system to capture the EDB vapors. The extracted vapors will be captured in an appropriate filter and cleaned air will be discharged into the atmosphere. Regular air confirmation sampling of pre-treatment and exhaust air will be conducted to ensure that EDB concentrations are declining and not released into the atmosphere after treatment.

The *ex-situ* SVE would take place during the warmer months (late spring or early summer) when higher temperatures would volatilize EDB more readily. The goal for the SVE soil treatment

would be to treat soils until EDB vapor levels drop to near or below detection limits and soil testing confirms that EDB concentrations are less than 0.27 µg/kg.

Confirmed clean soil that has undergone the SVE treatment may be returned to the excavation or used in other areas of the site.

During the cleanup action implementation the active work area will be fenced with secure chain link fences equipped with windscreen. Access to the Site will be limited to controlled access gates that will be locked after work hours.

Upon completion of the cleanup action, Simplot will prepare a cleanup action report describing the soil excavation, the SVE treatment, any deviations from the plans, and whether the soil cleanup action has fulfilled the soil cleanup action goals set forth in the CAP.

6.2 GROUNDWATER COMPLIANCE MONITORING

Compliance monitoring will involve collection of groundwater samples from the monitoring well network semi-annually until CULs in groundwater in two consecutive monitoring events have been achieved. Sampling will take place in August and January to coincide with maximum and minimum groundwater recharge from the East Low Canal. As described previously, two new monitoring wells will be installed as part of this alternative. The proposed compliance monitoring well locations are shown in Figure 6. These wells would serve as a conditional point of compliance well, along with MW-8S for the horizontally downgradient property boundary. Well MW-5D will serve as a conditional point-of-compliance monitoring well for vertical downgradient groundwater flow. A total of thirteen wells (MW-1, MW-2, MW-3, MW-5D[new], MW-5S[new], MW-6S, MW-7D, MW-7S, MW-8S, MW-9S, MW-10S, MW-11S, and MW-12S) will be monitored as part of the groundwater monitoring program.

A Groundwater Performance Monitoring Plan will be prepared during the development of the engineering design documents to describe in detail the sampling, testing, and data gathering methods, locations, frequency, and other field study procedures that will be used for obtaining and interpreting groundwater sampling data.

6.3 INSTITUTIONAL CONTROLS

Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at the Site. Such measures are required to assure both the continued protection of human health and the environment and the integrity of the cleanup action whenever hazardous substances remain at the Site at concentrations exceeding applicable cleanup levels. Institutional controls can include both physical measures and legal and administrative mechanisms. WAC 173-340-440 provides information on institutional controls, and the conditions under which they may be removed.

Institutional controls will include an environmental covenant prohibiting the extraction of groundwater. The environmental covenant shall be consistent with the State of Washington

Uniform Environmental Covenant Act (UECA; Chapter 64.70 RCW). The environmental covenant can be removed once groundwater has met cleanup levels.

6.4 FINANCIAL ASSURANCES

WAC 173-340-440 states that financial assurance mechanisms shall be required at sites where the selected cleanup action includes engineered and/or institutional controls. Financial assurances are not required at this Site at this time, because institutional controls such as on-site groundwater use restrictions are not part of the overall Site cleanup action after the EDB CUL has been achieved.

6.5 PERIODIC REVIEW

WAC 173-340-420 states that at sites where a cleanup action requires an institutional control, a periodic review shall be completed no less frequently than every five years after the initiation of a cleanup action. Periodic reviews will not be required at this Site upon achieving the groundwater CUL in two consecutive monitoring events. After groundwater cleanup levels have been achieved, periodic reviews will still be required because institutional controls are a part of the remedy. Ecology may require the use of the new improved analytical techniques and may revise cleanup targets accordingly.

The first periodic review will take place no more than five years after the cleanup action construction has been completed. For this site, that will be when soils are treated below cleanup levels.

7.0 REFERENCES CITED

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EDR [Environmental Data Resources], July 21, 2011: the EDR Radius Map Report with GeoCheck; the EDR Aerial Photo Decade Package, Shelton CT

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HDR [HDR Engineering, Inc.], February 2012: *Supplemental Work Plan to Support the Remedial Investigation and Feasibility Study, Boise, Idaho*

HDR [HDR Engineering, Inc.], May 2013: *Phase II Work Plan to Support the Remedial Investigation and Feasibility Study, Boise, Idaho*

HDR [HDR Engineering, Inc.], September 2018. *Final Remedial Action/ Feasibility Study Report, Boise, Idaho*

PGG [Pacific Groundwater Group], April 20, 2007: *City of Warden, Preliminary Investigation of Ethylene Dibromide Contamination. Seattle, Washington*

TABLES

Table 1, Pertinent Site Information

Site Name	Warden City Water Supply Wells 4 and 5
Ecology Facility/sites ID	2802409
Ecology Cleanup Site ID	1618
Agreed Order	8421
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 County Assessor's Parcel Number.: 060697000 County: Grant
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	Karl Schultz, CSP J.R. Simplot Company P.O. Box 27 Boise, Idaho 83707 Karl.schultz@simplot.com 208.780.7368
Site Owner	Same as PLP
RI/FS Preparer	HDR Engineering Michael Murray, Ph.D. 412 East Park Center Boulevard, Suite 100 Boise, Idaho 83706 mike.murray@hdrinc.com 208.387.7033

Table 2, Summary of EDB Sampling Results from City Wells No. 4 and 5 (from HDR, 2018)

City Well #4 ^a		City Well #5	
Sample Month	(µg/L)	Sample Month	(µg/L)
3/89	3.0	3/89	0.02
5/89	0.02	5/89	0.02
12/89	0.8	12/89	0.09
2/90	0.29	2/90	0.33
4/90	0.1	4/90	0.10
6/90	0.02	6/90	0.02
11/90	0.05	11/90	0.08
5/91	0.02	5/91	0.02
10/91	0.02	10/91	0.02
4/92	0.05	4/92	0.02
12/96	0.02	11/96	0.02
6/01	0.02	6/01	0.02
6/03	0.09	6/03	0.09
8/03	0.04	8/03	0.06
11/03	0.46	9/03	0.06
12/03	0.36	11/03	0.09
3/04	1.62	1/04	0.33
10/04	0.02	2/04	0.38
11/04	0.04	3/04	0.40
2/05	0.72	4/04	0.50
6/05	0.06	5/04	0.17
1/07	1.28	10/04	0.05
		11/04	0.06
		1/05	0.15
		2/05	0.15
		4/05	0.15
		5/05	0.06
		6/05	0.04
		7/05	0.05
		8/05	0.05
		10/05	0.05
		11/05	0.03
		10/06	0.01
		11/06	<0.010
		1/07	0.12
		3/07	1.29
		5/07	0.09
		8/07	0.15
		10/07	0.01
		12/07	0.08
		4/11	0.19
			0.15
		6/11	0.11
		7/12	0.086
		9/12	0.099
		9/12	0.83
		8/13	0.10 ^b

* This table represents a compilation of results from several sources and has not been substantiated through review of laboratory reports by HDR.

^b Samples collected by HDR to support pump test (HDR 2013b)

µg/L = micrograms per liter

Table 4, RI Investigation Groundwater EDB Analytical Data (from HDR, 2018)

Well	Jan 12	Apr 12	Jul 12	Oct 12	Jan 13	Jul 13	Oct 13	Dec 17
	EDB (µg/L)							
MW-1	ND ¹	ND	ND	ND	ND	ND	ND	ND
MW-2	ND	ND	ND	ND	ND	ND	ND	ND
MW-3	ND	ND	ND	ND	ND	ND	ND	ND
MW-4	ND	ND	ND	ND	ND	ND	ND	No Well ³
MW-5D	0.27	0.01 ²	ND	ND	ND	ND	0.01 ²	ND
MW-5S	234	18.1	9.1	22.3	14.5	5.7	63	151
MW-6S	10.9	8.7	26.8	15.4	4.2	2.0	ND	0.35
MW-7D	ND	0.01 ²	ND	ND	ND	ND	ND	ND
MW-7S	ND	0.01 ²	ND	ND	ND	ND	ND	ND
MW-8S					ND	ND	ND	ND
MW-9S							Dry	Dry
MW-10S							ND	ND

¹ND = non-detected. Laboratory reporting limit (practical quantitation limit) is 0.01 micrograms per liter (µg/L).

² Laboratory or site cross-contamination suspected given the low detection and that the wells were ND for all other sampling events.

³Well MW-4 was permanently decommissioned in April 2015 with Ecology approval

Table 5, EDB Target Concentrations with Soil and Groundwater CULs (in bold)

	MTCA Method		
	A MTCA Table 720-1 (groundwater) MTCA Table 740-1 (soil)	B Unrestricted Land Use	C Industrial Land Use
	EDB Soil Target (µg/kg)		
Soil Direct Contact, Ingestion and Dermal, based on non-cancer risk	-	720,000	31,500,000
Soil Direct Contact, Ingestion and Dermal, based on cancer risk	-	500	65,600
Protection of Potable Groundwater, Soil CUL	5	0.27¹	
	EDB Groundwater Target (µg/l)		
Groundwater Protection based on non-cancer risk	-	72	158
Groundwater Protection based on cancer risk	0.01	0.0219	0.219
Groundwater Protection, vapor intrusion non-cancer risk	-	277	605
Groundwater Protection, vapor intrusion cancer risk	-	0.28	2.8

¹The Practical Quantitation Limit (PQL) laboratory reporting limit for EDB in soil using US EPA Method 8011 is 0.1 µg/kg (HDR, 2018)

²Federal and State Maximum Contaminant Level (MCL) for EDB is 0.05 µg/l (HDR, 2018)

Method B cancer risk: 1×10^{-6} ; Method C cancer risk: 1×10^{-5}

µg/kg = microgram per kilogram

µg/l = microgram per liter

Table 6. Applicable or Relevant and Appropriate Requirements

Cleanup Action Implementation	
Ch. 18.104 RCW; Ch. 173-160 WAC	Water Well Construction; Minimum Standards for Construction and Maintenance of Water Wells
Ch. 173-162 WAC	Rules & Regulations Governing the Licensing of Well Contractors & Operators
Ch. 70.105D RCW; Ch. 173-340 WAC	Model Toxics Control Act; MTCA Cleanup Regulation
Ch. 43.21C RCW; Ch. 197-11 WAC	State Environmental Policy Act; SEPA Rules
29 CFR 1910	Occupational Safety and Health Act
Ch. 49.17 RCW	Washington Industrial Safety and Health Act
Groundwater and Surface Water	
42 USC 300	Safe Drinking Water Act
33 USC 1251; 40 CFR 131; Ch. 173-201A WAC	Clean Water Act of 1972; Water Quality Standards
Ch. 70.105D RCW; Ch. 173-340 WAC	Model Toxics Control Act; MTCA Cleanup Regulation
40 CFR 141; 40 CFR 143	National Primary Drinking Water Standards; National Secondary Drinking Water Standards
Ch. 246-290 WAC	Department of Health Standards for Public Water Supplies
Ch. 173-154 WAC	Protection of Upper Aquifer Zones
Air	
42 USC 7401; 40 CFR 50	Clean Air Act of 1977; National Ambient Air Quality Standards
Ch. 70.94 RCW; Ch. 43.21A RCW; Ch. 173-400 WAC	Washington Clean Air Act; General Regulations for Air Pollution
Ch. 173-460 WAC Ch. 173-470 WAC	Controls for New Sources of Air Pollution Ambient Air Quality Standards for Particulate Matter
Ch. 70.105D RCW; Ch. 173-340 WAC	Model Toxics Control Act; MTCA Cleanup Regulation

Table 7. Evaluation of Cleanup Action Alternatives

Criteria	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Action	Institutional Controls and Monitored Natural Attenuation	Institutional Controls, Soil Excavation and Treatment, and Monitored Natural Attenuation of Groundwater	Institutional Controls, Soil Excavation, Off-Site Soil Disposal, and Monitored Natural Attenuation of Groundwater
Threshold Requirements				
Protection of human health & environment	no	uncertain	yes	yes
Compliance with cleanup standards	no	uncertain	yes	yes
Compliance with state & federal laws	no	uncertain	yes	yes
Provision for compliance monitoring	no	yes	yes	yes
Other Requirements				
Use of Permanent Solutions (disproportionate cost analysis)	--	overall rank #3	overall rank #1	overall rank #2
Protectiveness	--	3	1	2
Permanent Reduction	--	3	1	2
Cleanup Cost (estimated)	--	2	1	3
Long-term Effectiveness	--	3	1	1
Short-term Risk	--	3	1	2
Implementability	--	3	1	1
Consider Public Concerns	--	yes	yes	yes
Provide Reasonable Time Frame	--	no	yes	yes
Consider Public Comments	--	yes	yes	yes

FIGURES

Cleanup Action Plan, Cleanup Site No. 1618: City of Warden Water Supply Wells No. 4

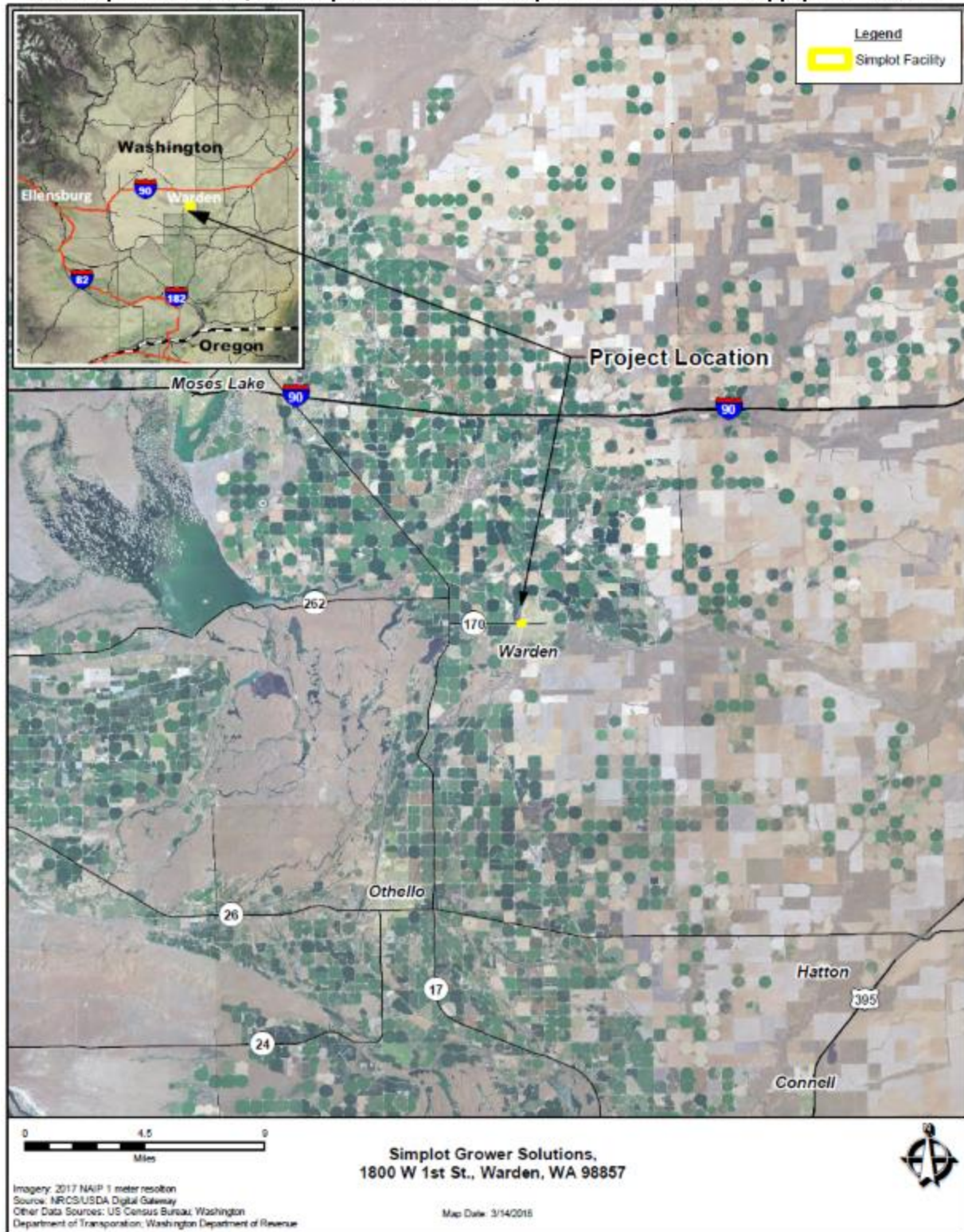


Figure 1, Site Vicinity Map

(from HDR, 2018)

Cleanup Action Plan, Cleanup Site No. 1618: City of Warden Water Supply Wells No. 4 and 5



**Figure 2, Site Layout
(from HDR, 2018)**

Cleanup Action Plan, Cleanup Site No. 1618: City of Warden Water Supply Wells No. 4

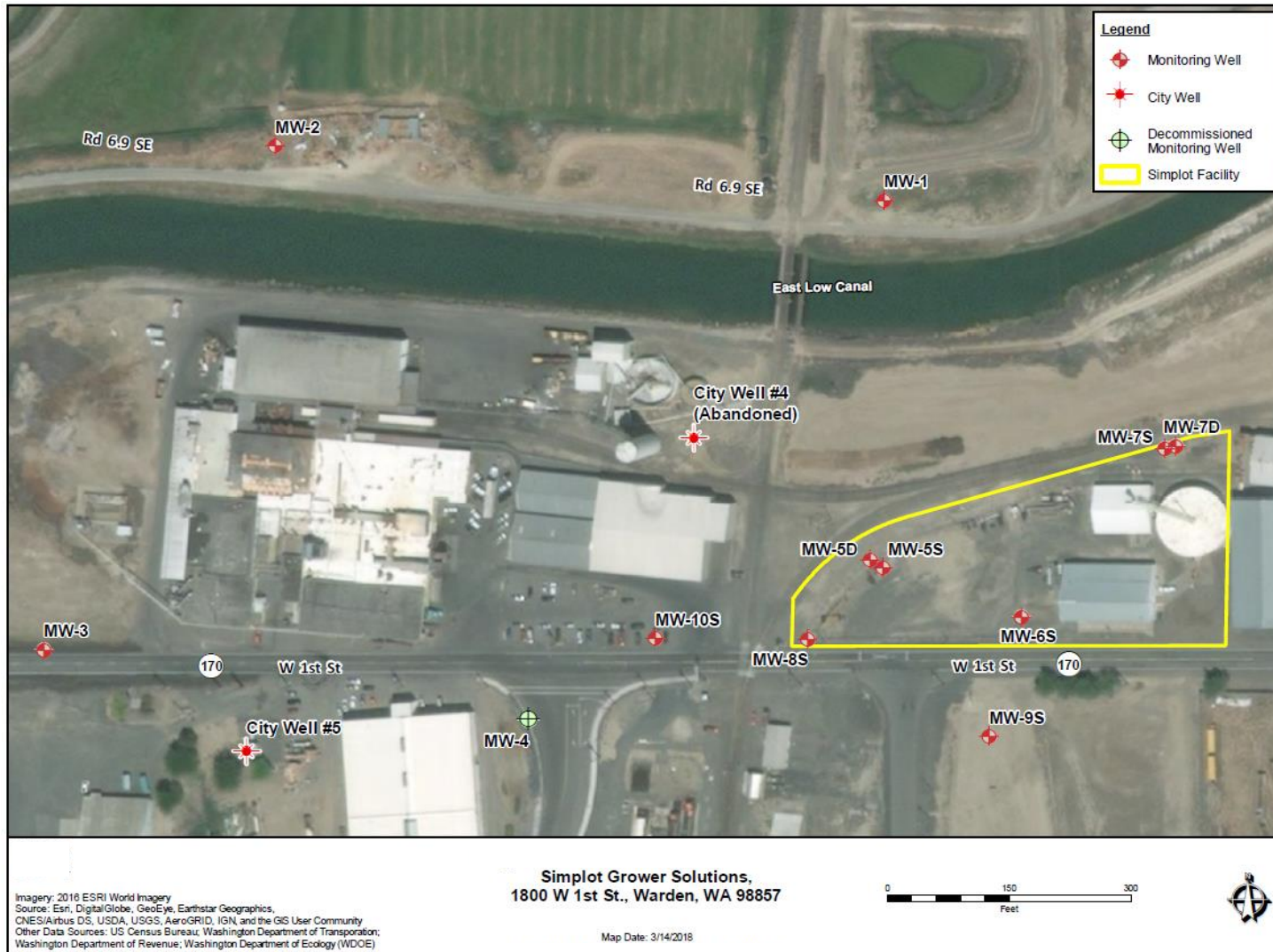


Figure 3, Current Groundwater Monitoring Wells (from HDR, 2018)

Cleanup Action Plan, Cleanup Site No. 1618: City of Warden Water Supply Wells No. 4 and 5

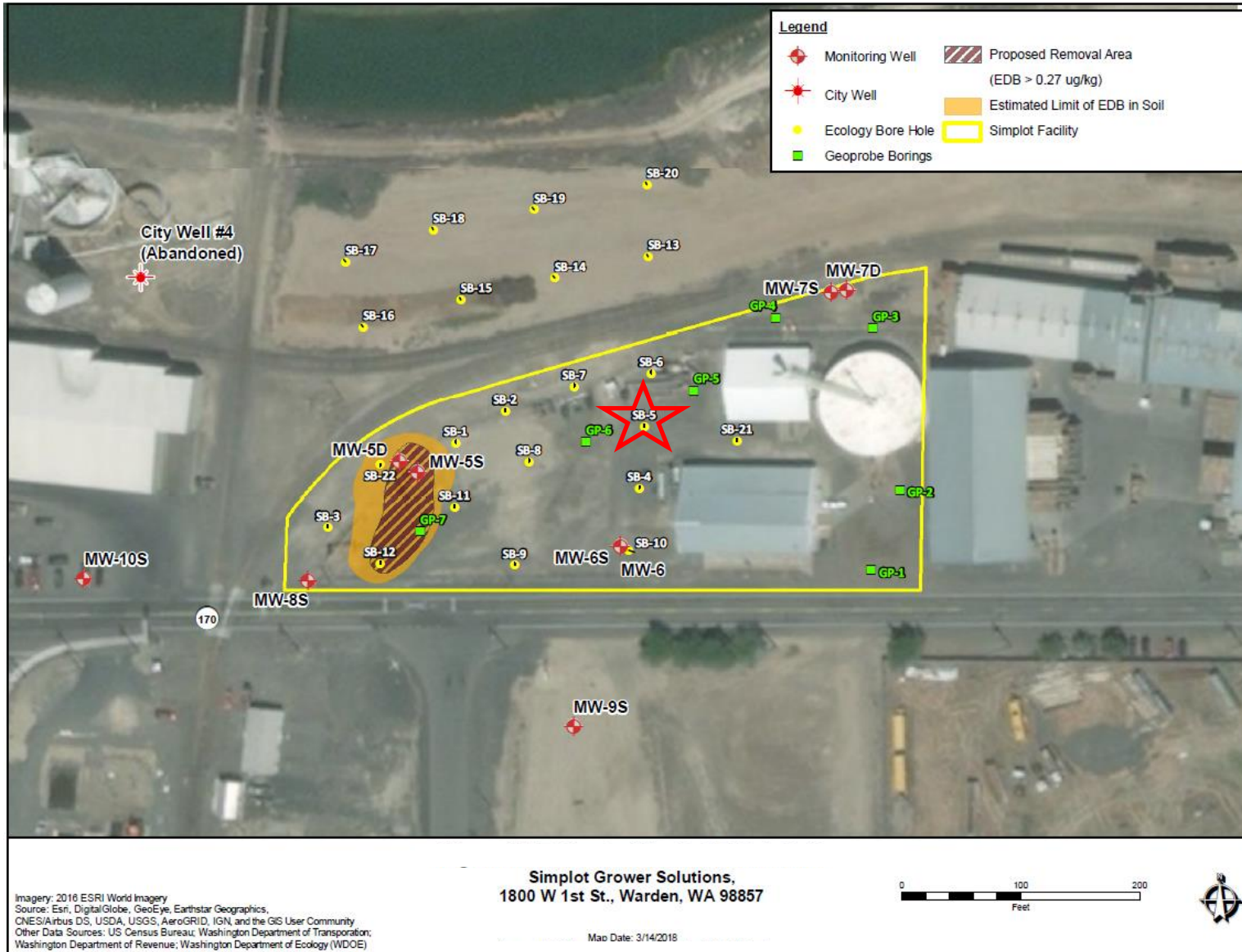
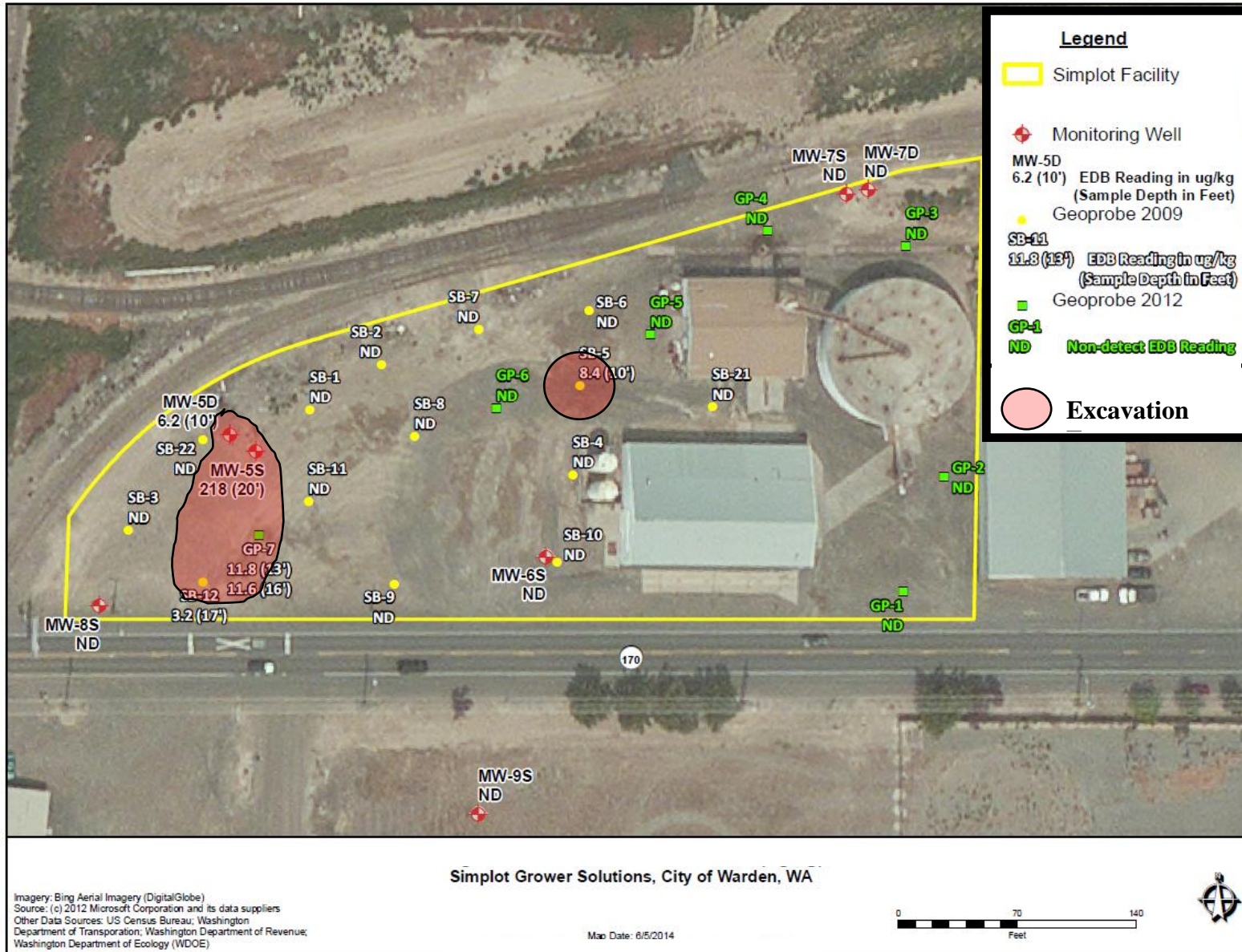


Figure 4, Soil Boring Locations and Estimated Extent of Soil EDB Contamination (from HDR, 2018)

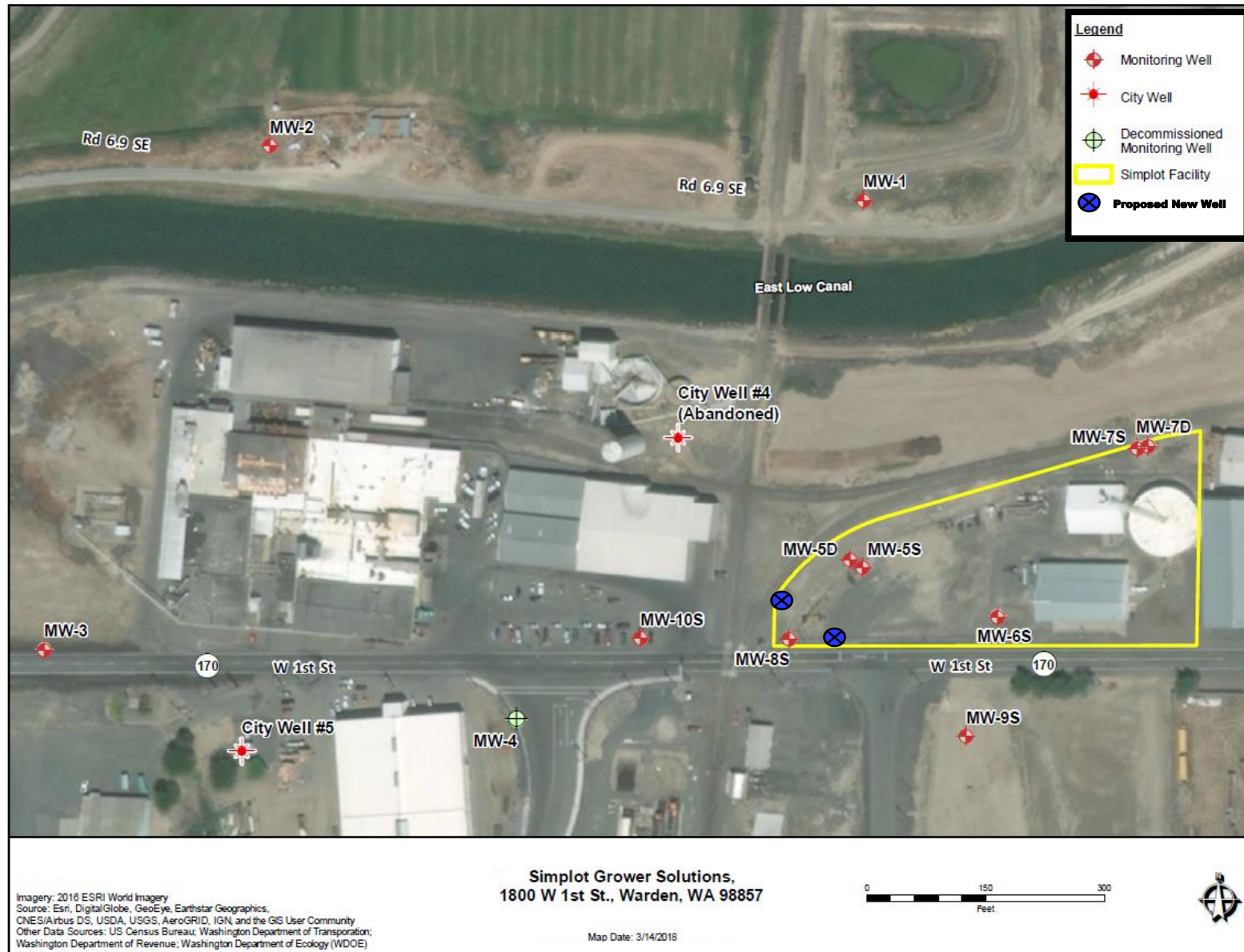
★ 8.4 µg/kg EDB was detected in Boring SB-5 @ 10' below ground surface

Cleanup Action Plan, Cleanup Site No. 1618: City of Warden Water Supply Wells No. 4 and 5



**Figure 5, Anticipated Excavation Extent
(data from HDR, 2018)**

Cleanup Action Plan, Cleanup Site No. 1618: City of Warden Water Supply Wells No. 4 and 5



**Figure 6, Proposed New Groundwater Monitoring Wells
 (data from HDR, 2018)**