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CLEANUP ACTION PLAN

SUDBURY ROAD LANDFILL SITE
WALLA WALLA, WA
CSID 2485, FSID 4446540

Prepared by:
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Eastern Regional Office
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ABBREVIATIONS AND ACRONYMS

ARARs	Applicable or relevant and appropriate requirements
City	City of Walla Walla
CAP	Cleanup action plan
COC	Constituent of concern
CAP	Cleanup action plan
ET	Evapotranspiration
Freon 12	Dichlorodifluoromethane
FS	Feasibility Study
LFG	Landfill gas
µg/L	Micrograms per liter
MSW	Municipal solid waste
MTCA	Washington State Model Toxics Control Act
PCE	Tetrachloroethene
RCW	Revised Code of Washington
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
Site	Sudbury Road Landfill
VOC	Volatile organic compound
WAC	Washington Administrative Code

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1.0 INTRODUCTION

This cleanup action plan describes the proposed cleanup action selected by the Washington State Department of Ecology (Ecology) for the Sudbury Road Landfill Site (Site) (Facility Site #4446540, Cleanup Site #2485), located at 414 Landfill Road, Walla Walla, Washington (Figure 1). Ecology has determined that the proposed cleanup action described here complies with the Model Toxics Control Act (MTCA), Chapter 70.105D RCW, and the MTCA Cleanup Regulation, Chapter 173-340 WAC. This determination is based on the Remedial Investigation Feasibility Study Report (RI/FS), which was completed by the City of Walla Walla, owner of the Site, and approved by Ecology, and other relevant documents in the administrative record. After taking into consideration public comment on the proposed cleanup action, in accordance with WAC 173-340-380(2), Ecology will issue a final cleanup action plan.

This document, in accordance with WAC 173-340-380(1), includes the following:

- A description of the selected cleanup action
- A summary of the rationale for the selection
- A summary of cleanup action alternatives considered
- Site description, background, prior remedial actions, and environmental conditions
- Cleanup standards for each hazardous substance
- An implementation schedule for the selected cleanup action, and a restoration timeframe
- Institutional controls, such as site use restrictions
- Applicable state and federal laws for the selected cleanup action

1.1 DECLARATION

Ecology's selected cleanup action will comply with WAC 173-340-360. This selected remedy is protective of human health and the environment, and is consistent with the preference for permanent solutions to the maximum extent practicable requirement under RCW 70.105D.030(1)(b).

1.2 CLEANUP STANDARDS ARE SITE-SPECIFIC

The MTCA Cleanup Regulation provides a uniform, statewide approach to establishing cleanup standards for a site. However, the two primary components of a particular site's cleanup standards—cleanup levels and points of compliance—are established specific to that site. The cleanup standards specified in this cleanup action plan are specific to the conditions at the Sudbury Road Landfill Site.

1.3 ADMINISTRATIVE RECORD

The documents used to make the decisions discussed in this cleanup action plan (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:

- J-U-B Engineer's, Inc., 2010. *Specifications and Plans, Area 6 Closure, Sudbury Road Landfill*. January.
- Schwyn, 2014. *Remedial Investigation Feasibility Study Report, Sudbury Road Landfill*, Schwyn Environmental Services, LLC. September.

1.4 CLEANUP PROCESS

Cleanup done under the MTCA process for this Site requires preparation of specific documents either by the City or by Ecology. These 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 procedures to encourage public involvement. This document is prepared by Ecology.
- Remedial Investigation (RI) and Feasibility Study (FS) - WAC 173-340-350
  The RI/FS documents the investigations and evaluations of the Site. The RI collects and presents information on the nature and extent of contamination, and the risks posed by the contamination. The FS presents Site cleanup alternatives and proposes a preferred cleanup alternative. The document is prepared by the City, approved by Ecology, and undergoes public comment.
- Cleanup Action Plan (CAP) - 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 PLPs 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 PLPs 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 PLPs 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 PLPs and approved by Ecology.

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION AND SETTING

2.1.1 SITE LOCATION

The Site is located at 414 Landfill Road (formerly Sudbury Road), Walla Walla, Washington 99362, about 4 miles west of the City of Walla Walla and 0.25 mile north of Highway 12 (Figure 1). The landfill covers approximately 125 acres and has seven disposal areas (Areas 1 through 7) (Figure 2 and 4). The landfill is located within the western portion of an 828.86-acre City-owned parcel of land zoned and used for various waste management purposes. The landfill is located in rural southeastern Washington and entirely surrounded by land used for dry-land wheat farming.

2.1.2 LOCAL POPULATIONS

The Washington State Penitentiary and its inmate population are located 1.2 miles east of the Site property boundary. The closest residential populations are located about 2,000 feet south of the landfill.

Groundwater underneath the Site flows from the east to the west-southwest. Four residential properties located in a general downgradient direction maintain their own domestic wells for water supply (Figure 2):

- The Camp well is about 0.75 mile northwest of the landfill
- The Small well is about 0.75 mile west of the landfill.
- The Kinman well is about 1.5 mile west of the landfill.
- Two wells are located on the Schmidt property, which is about 1.5 mile southwest of the landfill.

2.1.3 Site Geology

The Site lies on the northern flank of the Walla Walla Valley. The geology beneath the landfill consists of (from upper to lower) Palouse silt; reworked lacustrine silt and clay of the Touchet beds; interbedded alluvial gravels in a clayey, silty, or sandy matrix, informally termed the "old gravel and clay"; and Columbia River basalt. The unconsolidated to semi-consolidated deposits overlying the Columbia River basalts may be 600 feet or more in thickness.

2.1.4 Hydrogeology

Groundwater beneath the Site is 30 to 87 feet below ground surface (bgs). Groundwater flow direction is to the west-southwest, with an approximate horizontal gradient of 0.004 feet per foot beneath the landfill. The calculated groundwater velocity is about 190 feet/year. Groundwater elevations in the vicinity of the landfill have been declining, and since 1997, the water level in one well has declined as much as 10 feet.

A second, deeper aquifer is present in the underlying Columbia River basalts. Based on information in driller's water well reports within the Site vicinity, the aquifer is 150 to 200 feet bgs (EMCON 1995).

2.2 Landfill and Groundwater Monitoring History

The Sudbury Road Landfill currently operates under Chapter 173-351 WAC, Criteria for Municipal Solid Waste Landfills (WAC 173-351), and a solid waste handling permit issued by the Walla Walla County Health Department. The initial permit for the landfill was issued on June 27, 1977, and news publications announced that the “New City Landfill on Sudbury Road” was opened to the public on July 10, 1978 (*Walla Walla Union Bulletin* 1978). Municipal solid waste (MSW), asbestos waste, and medical waste have been placed on the landfill property since that time.

MSW has been placed in five separate areas, commonly referred to as Areas 1, 2, 5, 6, and 7. Areas 1, 2, 5 and 6 are unlined and contain MSW. Area 7 is lined and actively receiving MSW. Areas 3 and 4 are unlined and contain medical waste and asbestos waste, respectively. Areas 3 and 4 were closed in 2004 and in 2006, a composting facility was constructed over the former asbestos and medical waste areas. The approximate location of these areas is shown on Figure 2 and 4.

As part of their solid waste handling permit requirements, the City has monitored groundwater on a quarterly schedule since July 1978. In July 2001, the City installed monitoring well MW-15, a downgradient well adjacent to Area 5. Tests showed the presence of volatile organic compounds (VOCs) in groundwater including trichloroethene (TCE), tetrachloroethene (PCE), trichlorofluoromethane (Freon 11), dichlorodifluoromethane (Freon 12), vinyl chloride, chloroethane, 1,1-dichloroethane, and cis-1,2-dichloroethane, and other constituents including calcium, sodium, bicarbonate/alkalinity, chloride, and total dissolved solids. These constituents were generally at higher levels in MW-15 than other Site wells and surrounding groundwater. This prompted further investigation.

2.3 SUMMARY OF INVESTIGATIONS AND CLEANUP ACTIONS

2.3.1 ASSESSMENT MONITORING AND DOMESTIC WELL SAMPLING

In September 2002, the City began assessment monitoring in accordance with WAC 173-351-440. Assessment monitoring increases the number of constituents tested to find out if additional constituents need to be added to the quarterly groundwater monitoring program. The tests resulted in one additional constituent found to be present at concentrations greater than background concentrations – Freon 12 – and it was subsequently added to the routine monitoring program.

Since 2002, the City has periodically tested water from four private wells to the west-southwest of the landfill, in the direction of groundwater flow. The Washington Department of Health looked at water quality from three of the private wells in 2012 (WDOH 2012). It found one chemical in two of the wells that warranted additional analysis – PCE. The Washington Department of Health concluded that the level of PCE was below federal and state drinking water standards and, therefore, not at levels expected to harm people's health through drinking, showering, bathing, and cooking with this water. The potential source of PCE in these wells is unknown. There may be sources unrelated to the landfill contributing PCE to the two wells.

2.3.2 INDEPENDENT REMEDIAL INVESTIGATION

The City initiated a remedial investigation (RI) in 2004 to characterize MW-15 contamination. This was undertaken without Ecology oversight. The City prepared a work plan to guide the RI process and started the work in 2005. The RI was stalled in 2006 before the City could complete all of the tasks due to factors such as insufficient funds and off-Site access.

2.3.3 AGREED ORDER

In January 2010, Ecology submitted an Early Notice Letter to the City. This notice indicated that Ecology was aware that a release of hazardous substances had occurred and that further remedial actions were needed. Ecology and the City entered into Agreed Order No. 8456, which became effective May 26, 2011. The Agreed Order required the City to conduct a RI/FS to determine the nature and extent of contamination in groundwater from the Site.

2.3.4 INTERIM ACTIONS

The City initiated interim actions at the Site in 2010 consistent with a Revised Interim Action Plan (Schwyn 2010). The interim actions included:

- Area 6 closure design and construction; and
- Improvements to stormwater controls along the north side of Area 5.

Area 6 closure consisted of placement of an evapotranspiration cover, installation of a landfill gas collection and control system, and a stormwater collection and conveyance system. Improvements to stormwater controls north of Area 5 included filling depressions in the stormwater channel and grading to prevent future ponding and direct stormwater flow to the west, installation of a sedimentation basin, installation of a culvert under the western perimeter roadway, and erosion control mats in the stormwater channel.

2.3.5 REMEDIAL INVESTIGATION

In 2012 and 2013, the City conducted a remedial investigation in accordance with the Agreed Order. The City installed several new groundwater and landfill gas monitoring wells, sampled well water from residents to the west/southwest of the landfill, sampled soils beneath buried waste, inspected stormwater controls and cover over landfill areas, tested landfill gas composition and production, and checked existing gas control systems at

the Site. The methods and findings of the remedial investigation were presented in the RI/FS Report (Schwyn 2014). The following sections are based on the findings of the RI/FS.

3.0 SUSPECTED SOURCES OF HAZARDOUS SUBSTANCES

Most waste disposed at the Site is municipal solid waste (MSW) from the City, as well as Walla Walla and Columbia Counties, which are predominantly rural counties with an agricultural economic base and little manufacturing or heavy industry. The City has also provided distinct areas for disposal of asbestos and medical wastes. Based on the RI data, the suspected source of hazardous substances is MSW from Areas 1, 2, and 5. Volatile organic compounds (VOCs) were detected in soil samples beneath the MSW in these areas, which indicates downward leachate migration or landfill gas (LFG) migration, or a combination of both. These areas are unlined, have no leachate collection system, and no gas control system with the exception of one passive gas vent in Area 5.

3.1 LANDFILL GAS (LFG)

During the RI, LFG was sampled from 10 gas wells. Results indicate the presence of VOCs in LFG at some level in all samples. Using mathematical calculations, the City determined that some concentrations of VOCs in LFG were high enough to potentially impact groundwater. Without controls (e.g. liner under MSW, gas extraction system, etc.), LFG may transfer contaminants to underlying groundwater. Areas 1, 2, and 5 are unlined and do not have LFG control systems in place. They are the suspected areas contributing to contaminants to groundwater.

The City installed an active LFG collection system in Area 6 in 2010 that extracts LFG and combusts the LFG at a flare station. The system was assessed during the remedial investigation to see if Area 6 was preventing LFG movement beyond its boundary. The City assessed the radius of influence from 11 gas extraction wells in Area 6 , found lower methane concentrations at wells near the Area 6 boundary than wells more centered in Area 6, and found no methane at a perimeter gas well outside Area 6. Based on these results, the system appears to be controlling LFG from this area. LFG from Area 6 may have contributed LFG contaminants prior to installation of the gas system, but it is not a suspected source that continues to contribute.

3.2 LEACHATE

Leachate could be a source of hazardous substances in groundwater. It could be produced and reach groundwater as a result of insufficient cover over buried MSW, allowing precipitation and stormwater to infiltrate through the MSW. Thin landfill cover soils were observed over most of Area 2 and portions of Area 5, creating conditions for infiltration of water into MSW and subsequent production of leachate.

Leachate could also be produced as a result of poorly-functioning or lack of stormwater controls, allowing stormwater to infiltrate into or near MSW. There are three areas of concern at the Site:

1. An unlined stormwater conveyance channel that extends along the north side of Area 5 approximately 30 to 40 feet from where MSW is buried.
2. Stormwater run-on to the southwestern portion of Area 5.
3. Poor grading of Area 5. Two linear road cuts on the north slope of Area 5, and erosion channels and boggy areas on the west side of Area 5 impede stormwater flow away from MSW.

The City installed an engineered cover system over Area 6 in 2010 designed to convey stormwater away from Area 6 and prevent precipitation from infiltrating through the cover into MSW. For this reason, leachate

production from Area 6 is minimized and not suspected to be an ongoing contributor of contaminants to groundwater.

3.3 MUNICIPAL SOLID WASTE IN GROUNDWATER

A relatively small amount of MSW was disposed at depths below the groundwater level in the northern part of Area 5 when landfilling began in Area 5 around 1978. The City found MSW below the water table in one soil boring; however, several borings along the northern part of Area 5 had wet soils near the base of MSW. Results of soil sampling beneath MSW along the northern part of Area 5 and groundwater sampling from three wells along the northern part of Area 5 show that VOCs do not increase as you move downgradient of the area where MSW is in groundwater. Given these test results and a declining elevation of the regional groundwater table that will provide greater separation between the MSW and groundwater, the limited volume of MSW in groundwater does not appear to be a significant source of contaminants to groundwater.

4.0 CLEANUP STANDARDS

4.1 OVERVIEW

MTCA requires the establishment of site-specific cleanup standards. The two primary components of cleanup standards are cleanup levels and points of compliance. Cleanup levels are the concentrations at which a substance does not pose an unacceptable threat to human health or the environment. Points of compliance represent the locations on the Site where cleanup levels must be met. Following establishment of cleanup levels, media having concentrations above cleanup levels must be mitigated.

MTCA provides three options for establishing cleanup levels – Methods A, B, and C. Method A provides cleanup levels for routine cleanup actions at sites with relatively few hazardous substances. Methods B and C concentrations are calculated from applicable or relevant and appropriate requirements (ARARs) and from using formulas provided in WAC 173-340-720 through WAC 173-340-760. Method B is the standard method for establishing cleanup levels and is applicable to any site. Method C is a conditional method for use at sites subject to limited uses.

Groundwater is the contaminated medium at the Site with PCE and vinyl chloride above cleanup levels. Other VOCs have been detected in groundwater, but at concentrations below MTCA screening levels. Due to the presence of domestic wells downgradient of the Site, cleanup levels will be based on the highest beneficial use being drinking water and other domestic water uses. Method B standards will be used to establish cleanup levels.

4.2 SITE CLEANUP LEVELS

Indicator hazardous substances as defined by WAC 173-340-200 are a subset of hazardous substances present at a site selected under WAC 173-340-708 for monitoring and analysis during any phase of remedial action for the purpose of characterizing a site or establishing cleanup levels. The criteria found in WAC 173-340-708(2) are used to screen the list of hazardous substances present at a site. Following the selection of indicator hazardous substances, cleanup levels are developed for the indicator hazardous substances.

Many hazardous substances have been tested for and detected in groundwater at the Site, but only PCE and vinyl chloride have exceeded screening criteria. For this reason, PCE and vinyl chloride are the Site indicator hazardous substances in groundwater. The highest concentrations are detected in monitoring well MW-15, with vinyl chloride detected in MW-15 only.

Method B cleanup levels are based on the following:

- The cleanup level for PCE is 5 µg/L based on the state and federal drinking water maximum contaminant level.
- The cleanup level for vinyl chloride is calculated to be 0.029 µg/L. This is based on overall site risk from the presence of both indicator hazardous substances and is protective of human health. A concentration is protective of human health if the hazard index does not exceed 1 and the total excess cancer risk does not exceed 1 in 100,000 (1×10^{-5}):

Indicator Hazardous Substance	Cleanup Level (µg/L)	Associated Risk Values	
		Excess Cancer Risk	Hazard Quotient
Tetrachloroethene (PCE)	5.0	2.3×10^{-7}	0.1
Vinyl chloride	0.29	9.9×10^{-6}	0.01
	Total Risk	1.0×10^{-5}	0.11

µg/L = micrograms per liter

4.3 Point of Compliance

Under MTCA, the standard groundwater point of compliance is throughout a site from the uppermost level of the saturated zone extending vertically to the lowest depth which could potentially be affected by the site (WAC 173-340-720(8)(b)). Where hazardous substances remain on-site, as is the case at this Site where MSW will remain in place, a conditional point of compliance is established. The conditional point of compliance must be as close as practicable to the source of hazardous substances, and should not exceed the property boundary.

For this Site, the downgradient property boundary (western boundary) coincides with the western edge of MSW in Area 5 and the location of well MW-15. This is the only well with groundwater that has exceeded cleanup levels and it is an on-site well. Therefore, a conditional point of compliance is set at the western property boundary.

4.4 Applicable or Relevant and Appropriate Requirements

Cleanup actions must comply with applicable state and federal laws. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements Ecology determines, based on consideration of the criteria in WAC 173-340-710(4), are relevant and appropriate requirements. Collectively, these requirements are referred to as ARARs. The ARARs for this project are listed below.

- MTCA Cleanup Regulation (Chapter 173-340 WAC)
- Minimum Functional Standards for Solid Waste Handling (Chapter 173-304, WAC)
- Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC)
- Solid Waste Handling Standards (Chapter 173-350 WAC)
- Dangerous Waste Regulations (Chapter 173-303 WAC)
- State Environmental Policy Act (SEPA) Rules (Chapter 197-11 WAC)
- Safe Drinking Water Act, Primary Drinking Water Regulations [Code of Federal Regulations Title 40, Part 141 (40 CFR 141)]
- State Water Code and Water Rights (Chapters 173-150 and 173-154 WAC)
- Underground Injection Control Program (Chapter 173-218 WAC)
- State Water Pollution Control Act (Chapter 90.48 RCW)
- Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC)
- Washington Clean Air Act (Chapter 70.94 WAC)
- General Regulations for Air Pollution Sources (Chapter 173-400 WAC)

- Operating Permit Regulation (Chapter 173-401 WAC)
- Occupational Safety and Health Act (29 CFR 1910.120)
- Washington Industrial Safety and Health Act (Chapter 49.17 RCW)
- Accreditation of Environmental Laboratories (Chapter 173-50 WAC)
- Uniform Environmental Covenants Act (Chapter 64.70 RCW)

5.0 CLEANUP ACTION SELECTION

5.1 CLEANUP ACTION ALTERNATIVES

Ecology considered several cleanup action alternatives. First, a large number of alternatives and technologies potentially applicable to the Site were identified in a Remedial Action Focusing Study (Schwyn 2013a). These alternatives were then screened against the criteria in WAC 173-340-350(8)(b) and WAC 173-340-360(2)(a)(b), resulting in a smaller set of alternatives and technologies for detailed evaluation. Detailed assessment of each alternative is in the RI/FS.

Treatment of groundwater was considered but rejected as an alternative for the site. MW-15, an on-Site well, is the only well with contaminants exceeding cleanup standards. Off-Site wells downgradient of MW-15 contain breakdown products that indicate natural attenuation is occurring. Time-series plots of VOC concentrations in MW-15 since 2001 show decreasing trends, with the exception of breakdown products that also indicate natural attenuation is occurring. Given the slow movement of groundwater (193 feet per year), lack of immediate downgradient receptors, concentrations of contaminants in off-Site wells, and indications of natural attenuation, treatment of groundwater was ruled out as an alternative.

5.1.1 LANDFILL GAS FROM AREAS 1, 2, AND 5

Results of the RI showed that LFG from Areas 1, 2, and 5 could be contributing contaminants to groundwater. Areas 1, 2, and 5 are unlined areas with no gas control systems, other than one passive vent in Area 5. Cleanup actions explored to address this include:

Alternative 1: Build a trench system into waste in each area and actively pull gas out and vent it to air.
Alternative 2: Install multiple wells through the waste in each area and allow passive venting of gas to the air.
Alternative 3: Install multiple wells through the waste in each area and actively pull gas out and through the Area 6 gas system for destruction.

5.1.2 AREAS 2 AND 5 COVER SYSTEMS

Results of the RI showed the soil cover over Area 2 and part of Area 5 was in poor condition and could allow precipitation to infiltrate into the MSW. This may lead to production of leachate and with these areas having no leachate collection system, leachate could carry contaminants to groundwater. Cleanup actions explored to address this include:

Alternative 1: Install a geomembrane cover system over Areas 2 and 5 to prevent precipitation from infiltrating into the MSW.
Alternative 2: Increase the thickness of soil over Areas 2 and 5 to serve as an “evapotranspiration (ET) cover” to prevent precipitation from infiltrating into the MSW.
Alternative 3: Re-grade Areas 2 and 5 to promote stormwater movement off of each area and place an erosion control berm on Area 5 to prevent stormwater from eroding cover soil.

5.1.3 AREA 5 NORTHERN STORMWATER CONTROL

Results of the RI showed that a stormwater channel along the north side of Area 5 may not be effectively moving stormwater away from the MSW in Area 5. This may lead to leachate production and with Area 5 not having a leachate collection system, leachate could transport contaminants to groundwater. Cleanup actions explored to address this include:

Alternative 1: Install a cast-in-place concrete channel along the north side of Area 5 to convey stormwater away from the MSW to a culvert on the northwest Site boundary and off-Site. A geomembrane liner would be placed under the concrete to provide secondary protection. The channel gradient would be such that the channel is "self-cleaning" (storm events would carry sediment and debris that could impede flow out of the channel with stormwater), but built wide enough to allow the City's equipment to clean the channel if needed.

Alternative 2: Install a precast concrete channel along the north side of Area 5 to convey stormwater away from the MSW to a culvert on the northwest Site boundary and off-Site. A geomembrane liner would be placed under the concrete to provide secondary protection. The channel gradient would be such that the channel is "self-cleaning" (storm events would carry sediment and debris that could impede flow out of the channel with stormwater).

Alternative 3: Install a cable-block channel along the north side of Area 5 to convey stormwater away from the MSW to a culvert on the northwest Site boundary and off-Site. A geomembrane liner would be placed under the concrete to provide secondary protection. The channel would be built wide enough to allow the City's equipment to clean the channel.

5.1.4 AREA 5 SOUTHERN STORMWATER CONTROL

The Site's compost facility and an access road to it are south of Area 5. Land north and east of the asphalt compost pad, including the access road, is graded to carry stormwater to a culvert. This culvert directs stormwater flow onto the southwestern portion of Area 5, which may lead to production of leachate. With Area 5 having no leachate collection system, leachate could carry contaminants to groundwater. Cleanup actions explored to address this include:

Alternative 1: Build a soil berm to prevent flow onto Area 5. This would also serve as part of the proposed cover for Area 5 discussed in section 5.1.2. Remove the existing culvert and regrade the problem areas to direct stormwater onto the asphalt compost pad and into the compost lagoon, which has capacity for the additional stormwater. A new culvert would be installed under the re-graded access road to direct stormwater toward the compost pad.

Alternative 2: Remove the existing culvert, replace it with a storage basin and sediment sump, and install piping from the basin to carry stormwater directly to the compost lagoon, which has capacity for the additional stormwater. The piping would connect through the geomembrane liner of the lagoon.

5.1.5 INSTITUTIONAL CONTROLS AND MONITORING

All alternatives would include:

- Placement of an environmental covenant that conforms to the Uniform Environmental Covenants Act (Chapter 64.70 RCW) on the property to prevent future land uses that may damage systems put into place.
- Monitoring and maintenance of groundwater, gas, landfill cover, and stormwater control systems.
- Establishment of financial assurance to ensure there are adequate funds to complete construction, maintenance, and monitoring required for the cleanup action.

5.2 REGULATORY REQUIREMENTS

The MTCA Cleanup Regulation sets forth the 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. This section discusses how the selected cleanup action meets these requirements.

5.2.1 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 4.4); and
- Provide for compliance monitoring.

5.2.2 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.

5.2.3 CLEANUP ACTION EXPECTATIONS

WAC 173-340-370 sets forth expectations for cleanup action alternatives and lists the types of cleanup actions typical of the remedy selection process. Those most pertinent at this Site include:

- 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.
- Natural attenuation of hazardous substances may be appropriate at sites under certain specified conditions (see WAC 173-340-370(7)).

5.3 EVALUATION OF CLEANUP ACTION ALTERNATIVES

The requirements and criteria outlined in Section 5.4 are used to conduct a comparative evaluation of cleanup alternatives and select a cleanup action from those alternatives.

5.3.1 THRESHOLD REQUIREMENTS

5.3.1.1 PROTECT HUMAN HEALTH AND THE ENVIRONMENT

Landfill Gas from Areas 1, 2, and 5: Alternative 3 will reduce the risk posed from LFG to groundwater by active LFG extraction and destruction of VOCs in the LFG, thereby minimizing the cross-media-contaminant pathway while also preventing discharges to air. Alternative 1 and 2 would vent LFG to atmosphere and the concentrations of toxic air pollutants would likely exceed air quality standards, including ambient source impact levels and small quantity emission rate loading limits. Alternative 1 would not be as effective as Alternative 3 as it would remove LFG from only a small portion of each area. Alternative 2 could remove LFG from larger portions of each area, but it would not actively extract LFG. Neither Alternative 1 or 2 would destroy LFG through the Site's existing flare system.

Areas 2 and 5 Cover Systems: Alternative 2 (ET soil cover) will prevent direct contact with solid waste by people, plants, and terrestrial receptors. In combination with Alternative 3, the cover and stormwater and erosion controls will decrease the amount of generated leachate by limiting infiltration of precipitation and stormwater into the MSW, thereby reducing the risk posed from MSW leaching contaminants to groundwater. Alternative 1 (geomembrane cover) would be as protective as Alternative 2, however geomembrane covers have a finite lifespan. Ample soils exist at the Site that are the same as those used in the construction of the ET cover on Area 6. That cover was designed in accordance with WAC 173-351, reviewed by Ecology, and permitted by the solid waste handling permit authority. Engineering plans showed it would be perform better than a geomembrane cover, allowing less percolation through the cover into MSW, making Alternative 2 more desirable.

Area 5 Northern Stormwater Control: Alternative 1 (cast-in-place concrete) will ensure stormwater is conveyed away from MSW and is designed to be self-cleaning, though will be built to handle the City's equipment should mechanical cleaning be needed. Alternative 2 (precast concrete panels) could not likely be built to the width of cleaning equipment, so easy mechanical cleanout if needed would be unlikely. Alternative 3 (cable-blocks) is not self-cleaning of sediment and debris and ridges on the blocks would make mechanical cleanout difficult.

Area 5 Southern Stormwater Control: Both alternatives will ensure stormwater is conveyed away from MSW thereby reducing the risk posed from MSW leaching contaminants to groundwater. While Alternative 2 is less expensive, it requires ongoing maintenance to remove sediments from the sediment sump. Alternative 1 is desirable because there are ample soils at the Site to accomplish the work, it will provide part of the cover system for Area 5, and ongoing maintenance will not be needed.

Institutional Controls and Monitoring: The monitoring and maintenance requirements combined with the environmental covenant and financial assurance will ensure that the cover systems, stormwater controls, and LFG system are maintained over time.

5.3.1.2 COMPLY WITH CLEANUP STANDARDS

With the exception of groundwater at well MW-15, the indicator hazardous substances in groundwater meet cleanup levels discussed in section 4.2. Generation of contaminated groundwater at MW-15 will be substantially reduced with the LFG control system, landfill cover improvements, and stormwater control alternatives chosen. Since MSW will be left in place, institutional controls and monitoring will be part of the cleanup action to ensure groundwater conditions are improving over time and indicator hazardous substances are not migrating past the conditional point of compliance.

5.3.1.3 Comply with state and federal laws

All alternatives would be performed in compliance with ARARs listed in section 4.4. Local laws, which can be more stringent, will govern actions when they are applicable and will be established during the design phase of the project.

5.3.1.4 Compliance monitoring

Compliance monitoring is required for cleanup actions. There are three types of compliance monitoring: protection, performance, and confirmational. Protection monitoring is designed to protect human health and the environment during the construction, operation, and maintenance phases of the cleanup action. Performance monitoring confirms the cleanup action has met cleanup and/or performance standards. Confirmational monitoring confirms the long-term effectiveness of the cleanup action once cleanup standards have been met or other performance standards have been attained. All alternatives would require varying levels of all three types of compliance monitoring.

5.3.2 Other Requirements

5.3.2.1 Use permanent solutions to the maximum extent practicable

A permanent solution is one in which cleanup standards can be met without further action being required. A practicable permanent solution was not identified for the Site as it would involve removal of MSW. The selected cleanup action is permanent to the maximum extent practicable for closed solid waste landfills. WAC 173-340-370(3) allows engineering controls, such as containment, for sites or portions of sites that contain large volumes of materials with relatively low levels of hazardous substances. The landfill cap will prevent direct contact by potential receptors and along with stormwater controls will reduce production of leachate. LFG production will diminish over time, but LFG will be removed and destroyed while quantities that pose a risk to groundwater are produced. With these controls in place, the source of constituents of concern to groundwater is substantially reduced. Monitoring and maintenance requirements, along with an environmental covenant, will ensure that the containment remedy will remain protective over time.

5.3.2.2 Provide for a reasonable restoration timeframe

The selected cleanup action will be complete within one to two years after design plans are approved. It will provide source control measures by reducing the production of leachate and controlling LFG impacts to groundwater. A reduction in indicator hazardous substance concentrations in groundwater is expected within several months of work completion as leachate production diminishes, LFG is removed, and natural attenuation takes place. Based on the speed in which existing contaminated groundwater underlying Area 5 will move past the conditional point of compliance, indicator hazardous substance concentrations in groundwater are expected to meet cleanup levels within 6-7 years, if not sooner. Ecology considers this a reasonable restoration timeframe.

5.3.2.3 Consider public concerns

A 30-day public review and comment period will be held to allow the public and parties affected by the cleanup action an opportunity to provide comment on this cleanup action plan. Public comments and concerns will be addressed in a responsiveness summary and incorporated as appropriate in the final cleanup action plan.

6.0 DESCRIPTION OF THE SELECTED CLEANUP ACTION

The selected remedy for the Site consists of:

- To control LFG from Areas 1, 2 and 5, Alternative 3 was chosen;

- To improve Area 2 and 5 cover systems, Alternatives 2 and 3 were chosen;
- To improve Area 5 northern stormwater controls, Alternative 1 was chosen;
- To improve Area 5 southern stormwater controls, Alternative 1 was chosen;
- An environmental covenant will be placed on the property to prevent future land uses that may damage systems put into place; and
- Monitoring and maintenance of groundwater, gas, landfill cover, and stormwater control systems will be required.

The general details for the selected cleanup action are presented below. Additional details will be provided in an Engineering Design Report, Operation and Maintenance Plan, Compliance Monitoring Plan, and other plans which must be prepared and approved prior to implementing the selected cleanup action.

6.1 LANDFILL GAS CONTROLS FOR AREAS 1, 2, AND 5

The design for the Area 6 LFG extraction and treatment system, installed in 2010, indicated extraction well spacing intervals of approximately 150 feet would effectively remove LFG. This system was evaluated as part of the RI, as described in section 3.1, and found to be controlling LFG effectively. For this reason, controls for Areas 1, 2, and 5 will be similarly designed.

The current LFG extraction and treatment system for Area 6 will be expanded to include Areas 1, 2, and 5. The existing system is operating at approximately 45 percent capacity, leaving adequate capacity for the estimated additional LFG from Areas 1, 2, and 5. Two extraction wells will be installed in Area 1, one extraction well will be installed in Area 2, and seven extraction wells will be installed in Area 5. The extraction wells will be linked by a header system to the existing flare station for LFG destruction.

At Area 1, one extraction well will be located near GW-11 and a second extraction well will be installed approximately 140 feet northeast of GW-11. Considering the small size of Area 2, one extraction well that is centrally located in the MSW should effectively control LFG. The locations of the seven Area 5 extraction wells will be spaced with a radius of 150 feet. The extraction wells will be screened throughout the depth of MSW in each area. Refer to Figure 4 for the locations of the proposed landfill gas extraction wells.

During the extraction well installation, the existing Area 5 passive gas vent will be decommissioned to prevent interference with the new system. Vent decommissioning will be accomplished by filling the vent from bottom to top with concrete.

6.2 LANDFILL COVER SYSTEM FOR AREAS 2 AND 5

An ET cover will be constructed over Area 2 and Area 5. An ET cover was the final cover selection for the Area 6 closure in 2010; therefore, several key aspects of the design have already been completed. Engineering plans showed that that ET cover design would perform better than a geomembrane cover, allowing less percolation through the cover into MSW. As described in a January 2010 memorandum prepared by HWA (provided in RI/FS Report Appendix H), a 4.8-foot-thick layer of native soils compacted in 24-inch lifts at 85 percent of maximum compaction was the design for the Area 6 cover. The top foot of the cover incorporated biosolids and compost to create a medium in which dryland vegetation was established to control erosion. The same design will be used for Areas 2 and 5.

To meet the requirements of the ET cover functionality and address overall site drainage for Areas 2 and 5, including potential infiltration via the road cuts on the north side of Area 5, a grading design will be included in the Engineering Design Report. It will address the suitability of the existing soil cover, additional cover needs,

improvements to grading, required compaction (or loosening and scarification), the addition of an erosion control berm on Area 5, and installation methodology.

An erosion control berm will be constructed to facilitate the movement of Area 5 surface drainage, address the rutting and soil erosion concerns on the southwest and west sides of Area 5, and impede run-on. The erosion control berm will consist of a V-shaped channel lined with an erosion control mat as shown on Figure 3. The erosion control berm will extend along the entire southern boundary and west side of Area 5 and will be sloped to convey stormwater to the north drainage channel described in section 6.3. The total length of the berm will be about 1,500 feet, and it will have a maximum 4 percent slope.

6.3 AREA 5 NORTHERN STORMWATER CONTROL

A cast-in-place concrete channel will be constructed along the north side of Area 5. A geomembrane will provide secondary protection underneath the concrete channel. The channel will have a slope of 0.7% to the west, connecting to an existing culvert that carries stormwater off-Site. The slope will promote natural cleanout of sediment from the channel, particularly during storm events. The general design is shown on Figure 3.

In case mechanical means are needed to remove sediment and other debris from the channel, the cross-sectional shape of the channel will be rectangular and sized to allow a compact rubber-tired skid steer to be driven in it. The design will include reinforced concrete and a pea gravel base to provide the structural support needed for the skid steer.

The channel will be designed to accommodate runoff from the north side of Area 5. The design will include a strip of geomembrane attached to the top of the concrete channel and covered with an erosion control mat to prevent undermining and rutting as this stormwater enters the channel.

6.4 AREA 5 SOUTHERN STORMWATER CONTROL

An elevated soil berm will be constructed generally north of the compost facility to prohibit stormwater generated south of Area 5 from flowing north onto Area 5. Re-grading of surface soils in the valley east of the compost facility will direct stormwater away from Area 5. The existing culvert will be removed and replaced with a new culvert that will direct stormwater onto the compost pad, and ultimately into the compost facility lagoon. Reconstruction of approximately 200 linear feet of the existing compost access road is needed in order to raise the grade of the road and prevent stormwater from flowing onto Area 5. The general configuration is shown on Figure 3.

The additional stormwater from a 25-year, 24-hour rainfall event diverted into the compost facility lagoon is calculated to cause a 2.8-inch rise in the water level within the lagoon, which the lagoon has capacity to handle. The ability to pump water from the lagoon and use it in the compost process or move excess water to landfill leachate lagoons mitigates any effect an anomalous storm event could have on capacity.

6.5 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. WAC 173-340-440 provides information on institutional controls.

6.5.1 Environmental Covenant

An environmental covenant consistent with the Uniform Environmental Covenant Act (Chapter 64.70 RCW) will be required for this property to prohibit activities that:

- Threaten the integrity of the cover, waste containment, stormwater control, gas, leachate, public access control, and environmental monitoring systems;
- May interfere with the operation and maintenance, monitoring, or other measures necessary to ensure the integrity of the landfill and continued protection of human health and the environment; and
- May result in the release of solid waste constituents or otherwise exacerbate exposures.

6.5.2 Financial Assurance

WAC 173-340-440 states that financial assurance mechanisms shall, as appropriate, be required at sites where the selected cleanup action includes engineered and/or institutional controls. Financial assurances will be required at the Site.

6.6 Monitoring

Compliance monitoring will be conducted in accordance with WAC 173-340-410. The following subsections generally describe monitoring requirements:

6.6.1 Groundwater

The goal of groundwater monitoring is to confirm that the cleanup action is working to reduce PCE and vinyl chloride concentrations in groundwater at the conditional point of compliance. On-Site and downgradient off-Site groundwater will be monitored for VOCs. The contaminant concentrations in downgradient off-Site groundwater currently meet the cleanup levels; therefore, the groundwater will be monitored to ensure that conditions remain stable or improve over time. Performance monitoring will be conducted to monitor changes in groundwater quality after implementation of the cleanup actions. Once cleanup standards are met, confirmational monitoring will begin.

Monitoring will include quarterly collection and analysis of groundwater from Site monitoring wells MW-11, MW-12b, MW-14b, and MW-15, and from downgradient off-Site monitoring wells MW-19 and MW-20. All samples will be analyzed for VOCs, specifically PCE and vinyl chloride. Monitoring will occur for a minimum period of 5 years after completing construction described in Sections 6.1-6.4 and for at least 2 years after achieving groundwater cleanup levels. Monitoring may be altered should conditions warrant it.

Monitoring wells MW-11, MW-12b, MW-14b, and MW-15 are currently sampled quarterly in accordance with the Site's landfill permit and this will continue. Details of this monitoring are in the Revised Compliance Monitoring Plan (Schwyn 2013b).

6.6.2 Landfill Gas

LFG systems typically require two types of monitoring. To optimize the system at startup, operational monitoring will be required. Performance monitoring will be required after startup to ensure that the system continues to operate effectively.

Performance monitoring will be conducted in Area 1 (GW-11) and Area 5 (GW-5 and GW-6), and at the landfill perimeter using existing gas monitoring wells (GW-7S, GW-7D, GW-8, GW-9, GW-10, and GW-12). Effective system performance will be based on not exceeding the methane lower explosive limit at the landfill perimeter (five percent by volume), as well as a reduction in VOC concentrations in downgradient groundwater. LFG

monitoring will occur for a minimum period of 5 years after completing construction described in Sections 6.1-6.4 and for at least 2 years after achieving groundwater cleanup levels. Monitoring may be altered should conditions warrant it.

6.6.3 Landfill Cover

Annual landfill cover inspection, maintenance, and repair procedures will be conducted to preserve the intended function of the ET covers. The following cover conditions will be observed and documented:

- Appearance and condition of vegetation;
- Vegetation stress or death due to LFG;
- Deposition of eroded soil at the toe of steep slopes;
- Soil erosion;
- Rills or cracks in the cover;
- Changes in the surface slope and settlement of waste;
- Intrusion by humans or animals;
- Holes of any kind that allow surface runoff to enter the MSW directly;
- Wildlife trails created on the cover; and
- Damage by vehicles or maintenance machines.

Maintenance and repairs will be done as needed to maintain the integrity of the cover system.

6.6.4 Stormwater Controls

Annual inspection of stormwater controls will be conducted. Inspections will document erosion, settlement, ponded stormwater, blockage of flow, or other issues that compromise the prevention of infiltration into soil or the municipal solid waste. Maintenance and repairs will be done as needed to maintain the integrity of the stormwater control system.

6.8 Periodic Review

As long as groundwater cleanup levels have not been achieved, 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. Additionally, periodic reviews are required at sites that rely on institutional controls as part of the cleanup action; therefore a periodic review will be required at this Site.

6.9 Implementation Schedule

The schedule for implementing the cleanup actions has not been fully determined. There will be a 30-day public comment period, after which comments will be considered before finalizing a CAP. Construction of the remedy is expected to be completed during 2016.

7.0 REFERENCES

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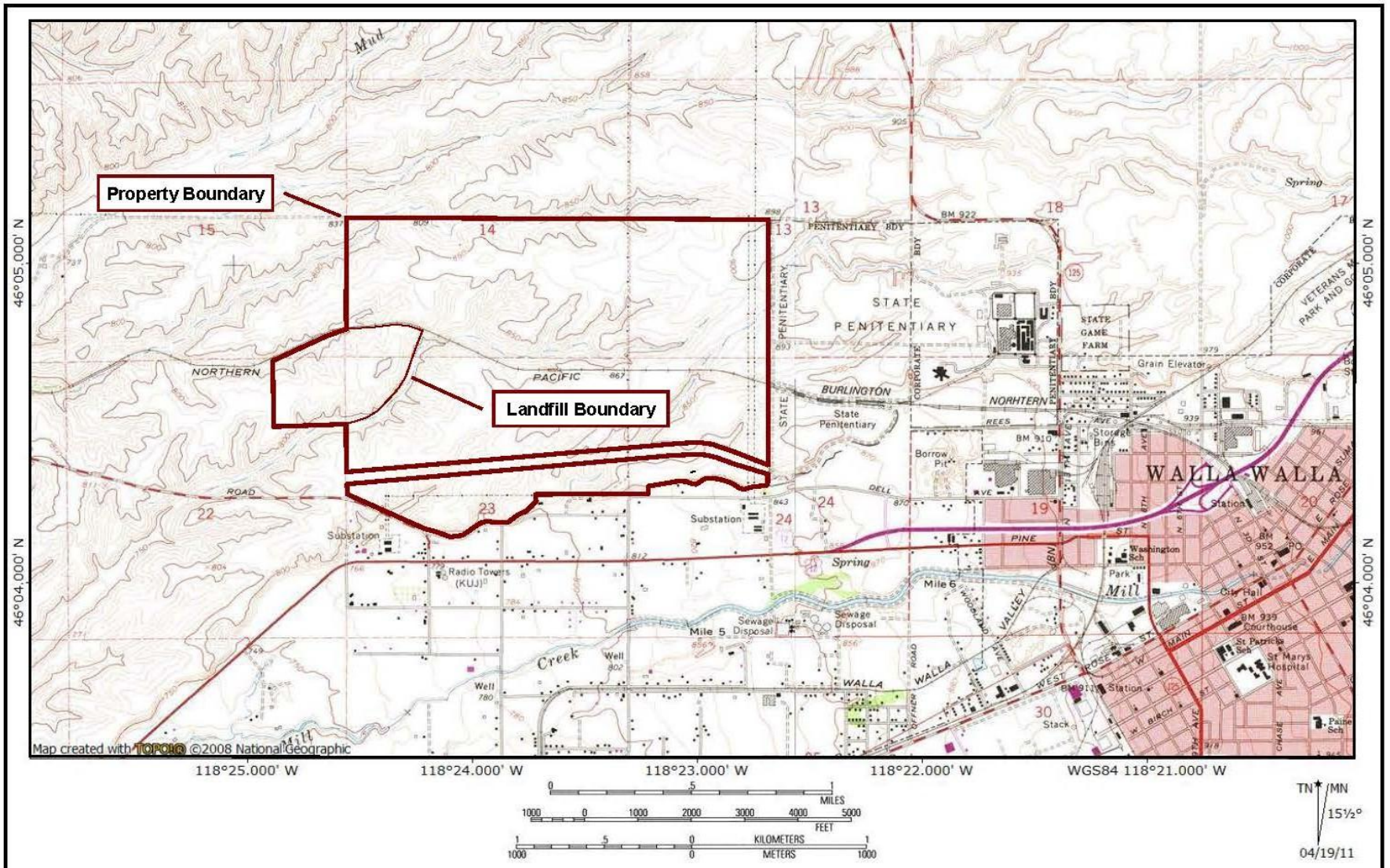
FIGURES



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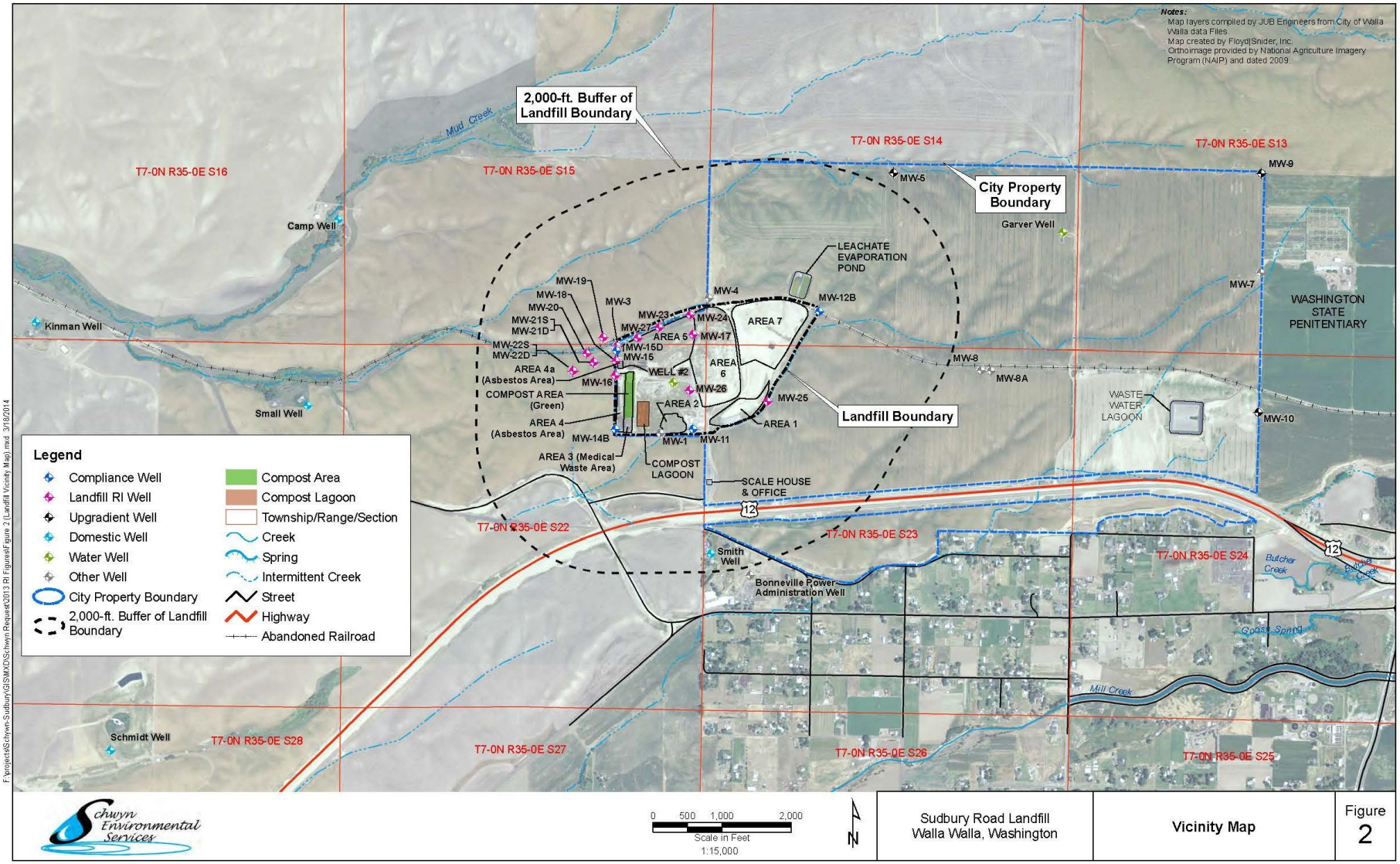
Sudbury Road Landfill Walla Walla, Washington	**Site Location**	Figure 1



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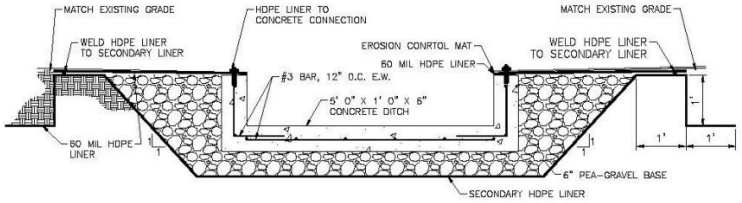
Sudbury Road Landfill
Walla Walla, Washington

Vicinity Map

Figure 2

North Drainage Ditch Alternative

Plate 1: Alternative 1 - Cast–In–Place Concrete Channel



Area 5 Erosion Control Berm

Plate 2: Erosion Control Berm–Typical Section

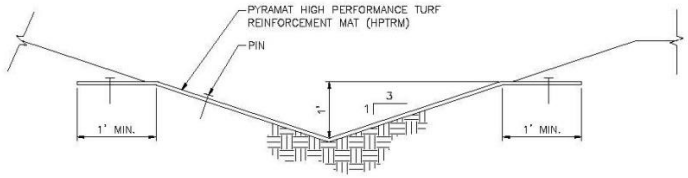
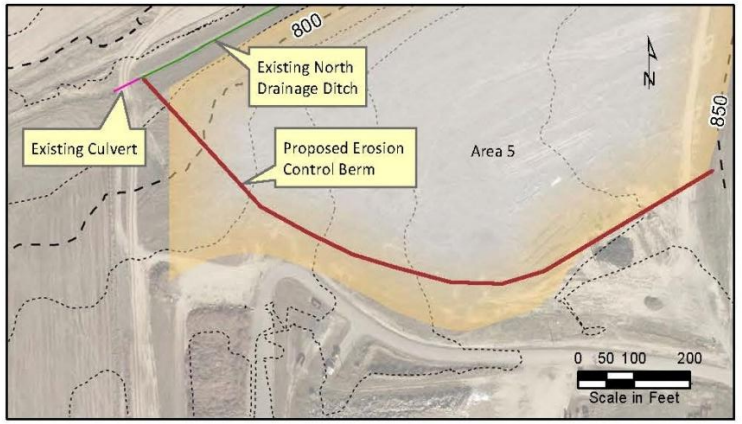
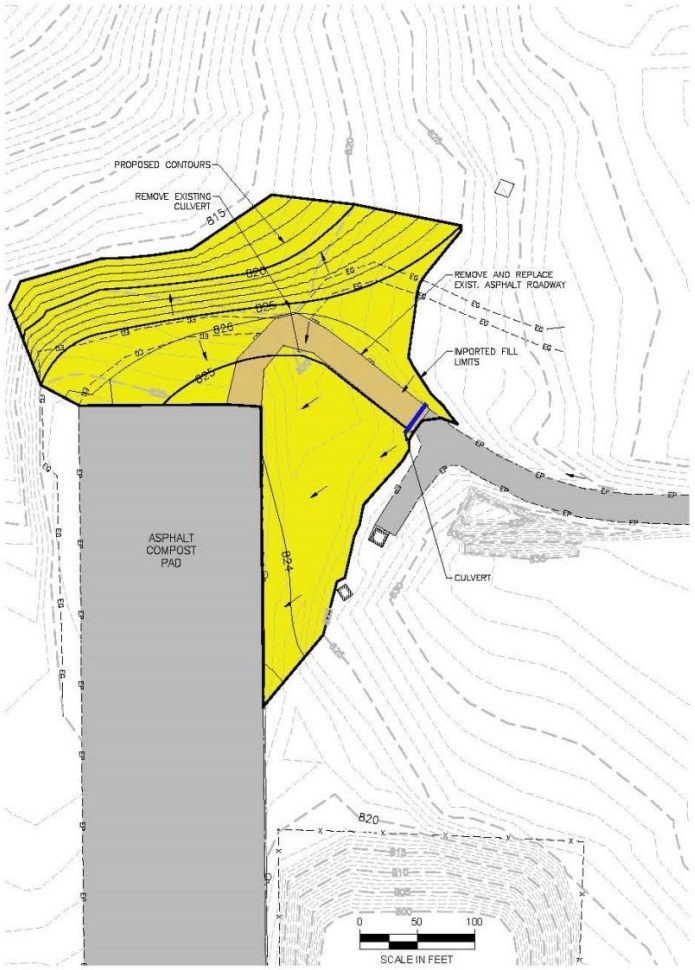


Plate 3: Area 5 Erosion Control Berm–Plan View



Area 5: Stormwater Run-On

Plate 4 – Area 5 Run-On Alternative 1



I:\GIS\Projects\Schuyn-Sudbury\SV\GIF\Figure 4 (Stormwater Control Selected Alternative Plates 1-4).jpg 7/23/2014

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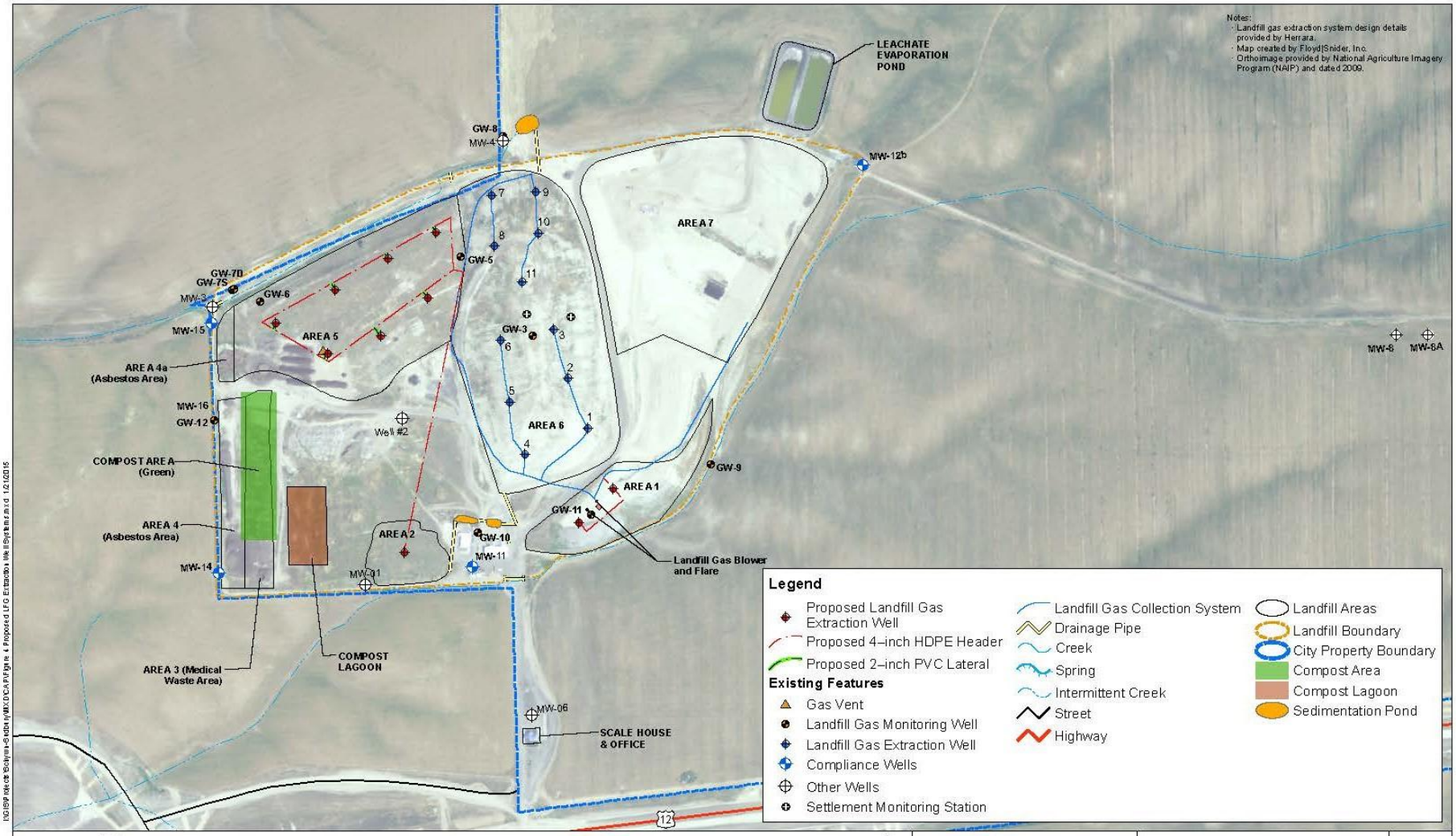
Notes:
- Design elements provided by J-U-B Engineers, Inc.
- Map created by Floyd|Snider, Inc.
- Orthoimage provided by National Agriculture Imagery Program (NAIP) and dated 2009.

Sudbury Road Landfill
Walla Walla, Washington

Stormwater Control Selected Alternative Plates 1–4

Figure 3



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Scale in Feet
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Sudbury Road Landfill
Walla Walla, Washington

Proposed Landfill Gas Extraction Well Systems Areas 1, 2, and 5

Figure 4