PERIODIC REVIEW

Olympic View Sanitary Landfill
Facility Site ID#: 79649975

10015 SW Barney White Road
Port Orchard, WA

Northwest Region Office

Waste 2 Resources Program

January 2017

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1.0 INTRODUCTION

This document is a review by the Washington State Department of Ecology (Ecology) of cleanup Site conditions and monitoring data to ensure that human health and the environment are being protected at the Olympic View Sanitary Landfill (OVSL) Site (Site). Cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

Cleanup activities at this Site are being completed under Agreed Order No. DE 8462. The concentrations of metals and volatile organic compounds (VOCs) in groundwater at the Site exceed MTCA cleanup levels. The MTCA cleanup levels for groundwater are established under WAC 173-340-720. It was determined that institutional controls in the form of a restrictive covenant (Covenant) were required at the Site due to the continued presence of the contaminant source, a municipal solid waste landfill, and contaminated groundwater.

WAC 173-340-420 (2) requires that Ecology conduct a periodic review of a Site at least every five years whenever the department conducts a cleanup action, whenever the department approves a cleanup action under an order, agreed order or consent decree, or, as resources permit, whenever the department issues a no further action opinion, and one of the following conditions exists at the Site:

(a) Institutional controls or financial assurance are required as part of the cleanup;

(b) The cleanup level is based on a practical quantitation limit; or

(c) Where, in the department's judgment, modifications to the default equations or assumptions using Site-specific information would significantly increase the concentration of hazardous substances remaining at the Site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors the department shall consider include [WAC 173-340-420(4)]:

(a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the Site;

(b) New scientific information for individual hazardous substances of mixtures present at the Site;

(c) New applicable state and federal laws for hazardous substances present at the Site;

(d) Current and projected Site use;

(e) Availability and practicability of higher preference technologies; and

(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

The Department shall publish a notice of all periodic reviews in the Site Register and provide an opportunity for public comment.

Agreed Order No. DE 8462 between Waste Management of Washington (WM WA) and Ecology requires WM WA to submit a report to Ecology at least every 5 years that documents whether human health and the environment are being protected based upon the factors set forth in WAC 173-340-420(4). WM WA initially submitted the report, "Five Year Review Evaluation" on March 4, 2016. The report was revised in response to comments from Ecology and resubmitted September 22, 2016 (EMSI, 2016).

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site Description and History

The OVSL Site is located at 10015 SW Barney White Road, Port Orchard, Washington in the Olympic View Industrial Park Complex. (Appendix 7.1) The landfill was used for disposal of solid wastes from 1963 to 2002. The Site, including the landfill, is located in the northeast quarter of Section 10, Township 23 North, Range 1 West. The Site consists of 436 acres of which 65 acres were used as a solid waste landfill. The landfill consists of three adjoining areas (Appendix 7.2):

- The Old Barney White Landfill (OBWL) consists of approximately 20 acres and lies in the southwestern portion of the facility.
- The Phase I Landfill area, located adjacent to the east side of OBWL, consists of:
    - Phase I Stage A has a bottom liner, but was not constructed to meet bottom liner requirements of chapter 173-304 WAC, the Minimum Function Standards for Solid Waste Handling, because the area was already constructed and filled before these requirements were established.
    - Phase I Stage B and Phase I Stage C were designed and constructed with a bottom liner system that met the requirements of WAC 173-304-460.
- The Phase II Landfill area, located adjacent to the north side of Phase I, includes a bottom liner system designed and constructed to meet the requirements of Chapter 173-351 WAC, Criteria for Municipal Solid Waste Landfills.

Concurrent with the closure of the disposal areas at the Site in 2002, Waste Management constructed a solid waste transfer station near the Landfill to allow for continued service for south Kitsap County residents. Current land uses around the Site are industrial activities to the north and east including the waste transfer station, recreational uses to the south, and residential uses to the west.

Existing source control and containment systems include:

- Geomembrane cap over the Phase I and II Landfill cells and OBWL to reduce precipitation infiltration and resulting leachate generation

- Stormwater runoff diversion and control structures to reduce precipitation infiltration and leachate generation
- Geomembrane liner beneath Phases I and II to contain leachate
- Leachate collection system from the Phase I and II Landfill cells
- OBWL toe drain leachate collection system
- Leachate treatment and disposal system
- Landfill gas extraction and treatment system for Phase I, Phase II, and OBWL.

The OVSL Site is located on a hillside that slopes westward along the flank of the Southern Upland to the Union River Valley. The highest elevation on the Site is approximately 300 feet above Mean Sea Level (MSL), near the eastern boundary. Ground surface elevation in the Union River Valley adjacent to the west of the Site is about 140 feet MSL. (Parametrix, 2007)

Surface water generally flows from the upland areas east of the Site towards the Union River to the west. The Site boundary is about 300 feet from the Union River at the closest point. The East Fork of the Union River passes close to or through a corner of the site to the northwest. Tributary No. 512 to the Union River is located near the southern Site boundary and extends from the southeast corner of the Site about 4,000 feet towards the southwest corner of the Site. Wetlands located on the western portion of the Site receive surface water runoff and discharge from seeps and springs. (Parametrix, 2007)

The subsurface at the Site is dominated by poorly graded to well graded sands and gravels associated with coarse-grained Vashon recessional and advance outwash deposits and intervening lenses of silty sands, silts and clays associated with Vashon recessional lacustrine deposits. The outwash deposits and the interbedded recessional lacustrine deposits overlay thick deposits of silts and clays associated with the Vashon advance lacustrine deposits.

Groundwater is present in all of the units beneath the Site, with the primary groundwater system composed of the Vashon recessional and advance outwash deposits. These two units have been interpreted to act as one continuous unconfined aquifer extending from the water table to the underlying fine-grained deposits of the Vashon advance lacustrine deposits. The groundwater flow direction of the regional aquifer is generally to the west or west northwest, extending from the highland areas along the eastern and southeastern portions of the Site to the wetlands and Union River valley to the west and west-northwest of the Site.

The regional aquifer is a water supply source for multiple residences in the vicinity of the OVSL. A water well inventory was completed as part of the Remedial Investigation and served as the basis for development and implementation of a water supply well sampling program. Evaluation of the water quality data from these sampling events indicated that none of these wells have been impacted by the Landfill.

2.2 Site Investigations and Sample Results

Groundwater downgradient of the landfill contains VOCs, trace metals, and general water quality parameters at concentrations above state standards or risk-based levels. The extent of groundwater contamination is primarily coincident with areas located immediately downgradient of the landfill within the property boundary.

As part of the remedial investigation (RI), private wells in the area surrounding the landfill property were identified and many were sampled. Results of the sampling provide strong evidence that no domestic wells are impacted by the site (Parametrix, 2007).

Components of landfill gas such as methane and carbon dioxide have historically been detected in monitoring probes located outside of the landfill waste cells, but methane gas has not been detected beyond the facility property boundary. None of the probes currently monitored have levels of landfill gas components in excess of the regulatory standard of 5% methane by volume at the property boundary. In 2015, methane was detected one time: in the first quarter sampling (March) of GP-15, 0.2% methane by volume was detected. GP-15 is adjacent to the landfill and not at the property boundary. Carbon dioxide and oxygen levels are also measured in the gas monitoring probes. Elevated levels of carbon dioxide and depressed oxygen levels, indicators of landfill gas, have been measured in Site monitoring probes, particularly GP-7 and GP-8 to the west of OBWL and GP-14 and GP-15 to the northwest and west of the Phase II landfill area, respectively. (SCS, 2016)

Contaminants were not detected in surface water samples obtained from the facility. The chemical concentrations and water quality of the surface waters receiving runoff or groundwater discharge from the landfill area are very similar to those observed in background (non-receiving) waters (Parametrix, 2007).

As part of the remedial investigation and feasibility study (RI/FS), assessments were conducted of potential impacts to human health and the environment in the vicinity of the landfill. The Human Health Risk Assessment (HHRA) (AMEC/Geomatrix, 2008) indicates that potential risks to off-site recreational users and off-site residents were either within or below the risk range considered acceptable by the United States Environmental Protection Agency (EPA). The primary risk-driving exposure pathway and chemical is ingestion of arsenic in groundwater; however, the levels of arsenic in the deeper groundwater were either at or below the drinking water standard and thus the potential health risks associated with arsenic in the groundwater would be equivalent to a municipal drinking water supply containing an allowable level of arsenic. In addition, the concentrations of arsenic measured in the on-site monitoring wells were generally lower than the concentrations measured in the off-site domestic wells. This suggests that the potential health risks associated with arsenic in groundwater beneath and downgradient of the site are equal to or less than risks from natural occurrences of arsenic in nearby domestic wells.

The Ecological Risk Assessment (ERA) (Arcadis BBL, 2009) identified potential source areas of hazardous substances, indicator hazardous substances, potential exposure pathways, and ecological receptors, and evaluated the potential exposures. The results indicated that the site-related chemicals

in the shallow emergent groundwater pose a negligible risk of adverse effects to ecological receptors in the aquatic and terrestrial habitat downgradient of the site. No complete exposure pathways to potentially contaminated subsurface soil were identified. The ERA satisfies the requirements of WAC 173-340-7490 through 7494 for terrestrial ecological evaluations.

2.3 Cleanup Actions

The cleanup action selected for the OVSL Site was Alternative 2, Landfill Gas Collection System Upgrades, described in the feasibility study (FS) (EMSI, 2010). The cleanup action includes:

- Continued performance of landfill post-closure care activities
- Increased inspection, repair, and operational improvements to leachate, gas, and stormwater management systems
- Installation of additional landfill gas collection wells
- Monitored natural attenuation
- Continued implementation of the Environmental Monitoring Plan
- Institutional controls

2.3.1 Post-closure Care Activities

Post-closure care includes continued operation and maintenance of the existing landfill source control and containment systems and environmental monitoring programs carried out in compliance with requirements of state and local regulations for landfill post-closure (Chapter 173-351 WAC and Kitsap Public Health District (KPHD) Ordinance 2004-2). Specific post-closure activities and requirements are detailed in the OVSL Post Closure Operations & Maintenance Plan (EMSI, 2012) and Solid Waste Landfill Post Closure Permit for the Olympic View Sanitary Landfill (KPHD, 2010). The ongoing operations, maintenance, and monitoring activities include:

- Inspection and maintenance of the landfill cover
- Control of weeds and intrusive vegetation to eliminate the potential for root penetration into and resultant damage to the cover
- Inspection and maintenance of stormwater runoff and control structures
- Extraction and collection of leachate from the collection system associated with the Phase I and II Landfills and from the OBWL toe drain system
- Storage and treatment of collected leachate in the double-lined leachate collection pond
- Disposal of leachate through a publicly-owned treatment works pursuant to the terms of State Waste Discharge Permit No. 7271

- Inspection, maintenance, and repair of the leachate collection system pumps, piping, transfer and truck load-out pumps and the leachate pond liner and cover
- Inspection, operation and maintenance of the landfill gas vacuum blowers, landfill gas extraction wells, and lateral and header piping to extract and collect landfill gas from the Phase I and II cells and from OBWL
- Destruction of the landfill gas in the landfill gas flare pursuant to the conditions of Order of Approval No. 6954, issued by Puget Sound Clean Air Agency
- Operation of the landfill gas condensate traps to collect condensate and disposal of the condensate in conjunction with leachate disposal
- Inspection and maintenance of the perimeter fencing to limit trespass potential
- Inspection and maintenance of existing berms and, if necessary, construction of additional berms across roads or trails to limit trespass potential
- Inspection, repair and maintenance of the environmental monitoring points and systems.

Under the state and local solid waste regulations, WM WA is required to conduct post-closure care until KPHD determines that the landfill has become functionally stable as defined in WAC 173-351-500(2). WM WA is required to maintain financial assurance adequate to cover the cost of post-closure care activities for the post-closure care period. WAC 173-351-600.

2.3.2 Improvements to Leachate, Gas, and Stormwater Management Systems

The cleanup action included the following improvements/enhancements and repairs to reduce potential leachate generation, increase leachate capture, optimize gas collection, and further reduce the potential for migration of landfill gas from the landfill.

- Repair/modification of the landfill cover system along the landfill toe to reduce potential for stormwater infiltration and resultant leachate generation and to reduce potential for atmospheric air intrusion and resultant increased oxygen levels and loss of vacuum applied by the landfill gas system
- Inspection and repair of penetrations to cover system to reduce potential for atmospheric air intrusion and resultant increased oxygen levels and loss of vacuum applied by the landfill gas system
- Repair/replacement of landfill gas extraction wells containing blockages that restrict gas extraction and flow
- Repair/replacement of landfill gas extraction system conveyance piping as needed to eliminate blockages that restrict gas extraction and flow
- Repair/replacement of condensate collection equipment as needed to reduce condensate accumulation in the piping that causes blockages, thereby restricting gas extraction and flow

- Maintenance/repair of landfill gas system vacuum blowers to optimize gas extraction and flow
- A program of optimization of the landfill gas collection system (well field balancing) to ensure that all portions of the landfill are subject to vacuum thereby minimizing the potential for gas migration from the landfill
- Increased inspection, maintenance and adjustment of the leachate collection system pumps to ensure optimum performance of the leachate extraction system
- Repair and improvement of the perimeter stormwater drainage diversion and control system to minimize the potential for stormwater infiltration into the landfill and resultant leachate generation
- Installation of a floating cover to eliminate rainwater accumulation in the leachate pond to reduce the amount of leachate requiring treatment or disposal
- Permitting of alternate leachate disposal facilities to ensure sufficient capacity for leachate collection and disposal

The focus of these improvements is to reduce potential leachate generation, increase leachate capture, optimize gas collection, and prevent migration of landfill gas from the landfill.

2.3.3 Additional Landfill Gas Extraction Wells

The cleanup action required that additional landfill gas extraction wells be installed, primarily within OBWL, to reduce the amount of gas that may be contributing to groundwater contamination beneath and subsequently downgradient of OBWL and to reduce the potential for lateral gas migration. In 2011, six additional landfill gas extraction wells were installed in OBWL and connected to the landfill gas collection system. Evaluation of the assumed radius of influence for the landfill gas extraction wells indicated that the additional six landfill gas extraction wells combined with the existing 14 wells in OBWL provided adequate coverage (SCS, 2011).

2.3.4 Natural Attenuation

In addition to the source control measures described above, the selected cleanup alternative relies upon natural attenuation processes to achieve Site cleanup levels. Over time, natural attenuation reduces the concentrations of chemicals introduced into the environment using natural biological and chemical processes. Natural attenuation is monitored as described in the next subsection.

2.3.5 Environmental Monitoring Program

WM WA is currently conducting environmental monitoring in accordance with the Environmental Monitoring Plan (EMP) (EMSI, 2009). Key components of the EMP include groundwater monitoring locations, water quality parameters to be tested, and monitoring frequency. The EMP includes a Sampling and Analysis Plan (SAP) as an appendix that meets the requirements specified in WAC 173-340-820 and -830 (SCS, 2009). The SAP was updated in 2013 to comply with the 2012 revisions to chapter 173-351 WAC requiring analysis of total metals (SCS, 2013a).

2.3.6 Institutional Controls

Institutional controls in place due to the site's status as a closed municipal solid waste landfill include:

- Signage to identify the presence of the landfill
- Access restrictions – locked gates, berms
- Restricted use of the landfill surface
- Deed notification regarding the presence of the landfill
- Financial assurance for post-closure operation and maintenance costs
- Existing regulatory prohibitions on installing water supply wells within 1,000 feet of the waste management unit boundaries of a solid waste landfill.

2.4 Cleanup Levels

Ecology approved the use of a groundwater conditional point of compliance at the OVSL Site pursuant to WAC 173-340-720(8)(c). The conditional point of compliance is established at 150 meters (492 feet) downgradient of the edge of the landfill. As shown in Appendix 7.3, the conditional point of compliance is monitored at monitoring wells MW-15R, MW-34A, MW-34C, MW-39, MW-42, and MW-43.

Ecology used standard Method B to establish groundwater cleanup levels for the ten indicator hazardous substances (IHS) identified in the OVSL RI and FS reports: arsenic, iron, manganese, 1,4-dichlorobenzene, 1,1-dichloroethane, cis-1,2-dichloroethene, ethyl ether, trichloroethene, vinyl chloride, and ammonia (Parametrix, 2007; EMSI, 2010). The Site groundwater cleanup levels are shown in the following table:

Site Groundwater Cleanup Levels	
Indicator Hazardous Substance	**Cleanup Level**
Arsenic	0.000462 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
1,4-Dichlorobenzene	2 µg/l
1,1-Dichloroethane	50 µg/l
cis-1,2-Dichloroethene	35 µg/l
Ethyl ether	50 µg/l
Trichloroethene	1 µg/l
Vinyl Chloride	0.2 µg/l
Ammonia	0.19 mg/l

2.5 Restrictive Covenant

Institutional controls were implemented at the Site in the form of a restrictive covenant to prevent damage to the landfill cover and exposure of potential receptors to groundwater. A Covenant was recorded for the Site in 2011 and is available as Appendix 7.4. The conditions of the covenant are:

> Waste Management of Washington Inc. makes the following declaration as to limitations, restrictions, and uses of which the property may be put and specifies that such declarations shall constitute covenants to run with the land, as provided by law and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in Property (hereafter "Owner").
>
> Section 1.
>
> 1. No groundwater may be taken from the Property for drinking, cooking, or personal washing. The use of groundwater for other purposes must be approved in writing by Ecology.
> 2. Any activity on the property that may result in the release of exposure the environment of the waste contained in the landfill, or create a new exposure pathway, is prohibited. Some examples of activities that are prohibited in the capped area include: drilling, digging, placement of any objects or use of any equipment which deform or stress the surface beyond its load bearing capability, piercing the surface with a rod, spike or similar item, bulldozing or earthwork, unless such activities are conducted in accordance with landfill Operations and Maintenance Plan approved by Ecology or prior written approval of the activity has been obtained by Ecology.
>
> Section 2.
>
> Any activity on the Property that may interfere with the integrity of the Remedial Action and continued protection if human health and the environment are prohibited.
>
> Section 3.
>
> Any activity on the Property that may result in the release or exposure to the environment of a hazardous substance that remains on the Property as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval by Ecology.
>
> Section 4.
>
> The Owner of the Property must give thirty (30) day advance written notice to Ecology of the Owners intent to convey any interest in the Property. No conveyance of the title, easement, lease or any interest in the Property shall be consummated by the Owner without adequate and complete provision to continue monitoring, operation, and maintenance of the Remedial Action.

Section 5.

The Owner must restrict leases to uses and activities consistent with the Covenant and notify all leases of the restriction on the use of the Property.

Section 6.

The Owner must notify and obtain approval from Ecology prior to any use of the Property that is inconsistent with the terms of this Covenant. Ecology may approve any inconsistent use only after public notice and comment.

Section 7.

The Owner shall allow authorized representative of Ecology to enter the Property at reasonable times for the purpose of evaluating the Remedial Action; to take samples, to inspect remedial actions conducted at the property, to determine compliance with this Covenant, and to inspect records that are related to the Remedial Action.

Section 8.

The Owner of the Property reserves the right under WAC 173-340-440 to record an instrument that provides that this Covenant shall no longer limit use of the Property or be of any further force or effect. However, such and instrument may be recorded on if Ecology, after public notice and opportunity for comment, concurs.

3.0 PERIODIC REVIEW

3.1 Effectiveness of Completed Cleanup Actions

The Restrictive Covenant for the Site was recorded and is in place. This Covenant prohibits activities that could result in the release of contaminants at the Site without Ecology's approval, and prohibits any use of the property that is inconsistent with the Covenant. This Restrictive Covenant serves to ensure the long term integrity of the remedy.

Based upon the Site visit conducted on June 21, 2016, the landfill cover at the Site continues to eliminate exposure to waste. The site inspection checklist is provided in Appendix 7.5. The cover appears in satisfactory condition. Routine inspections are conducted by WM WA and KPHD. The cover grass is adequately mowed and maintained to remove or prevent establishment of vegetation with roots that might extend into the cover system. The Site is operating under a solid waste management permit for a closed landfill, issued by KPHD (KPHD, 2010). A photo log is available as Appendix 7.6.

The landfill's leachate and landfill gas collection systems continue to be operated and maintained to control releases from the landfill to the environment. Groundwater and landfill gas continue to be monitored in accordance with the approved EMP. Reports are submitted to Ecology and KPHD and data are entered into Ecology's Environmental Information Management (EIM) system. Groundwater monitoring and data evaluation provide a means of evaluating the effectiveness of the cleanup actions in reducing groundwater contamination.

3.1.1 Background Groundwater Quality

In accordance with the approved EMP for the Site, upgradient groundwater quality data are re-evaluated on a yearly basis through re-calculation of the upper prediction limit at a 99% confidence level based on incorporating the prior year's monitoring results into the historical data set from the upgradient monitoring wells. Background levels for organic IHS are presumed to be zero. If the background level for a parameter is greater than the cleanup level, the background level becomes the cleanup level. The re-calculated levels for arsenic, iron, manganese, and ammonia, based on the data set of January 2005 to December 2015, are shown below:

Updated Background Levels (mg/l)		
IHS	**2009 Background**	**2015 Background**
Arsenic	0.000462	0.0005
Iron	0.23	0.31
Manganese	0.031	0.062
Ammonia	0.19	0.3

3.1.2 Groundwater Monitoring Results

Groundwater monitoring at the site includes four types of monitoring wells: background, performance, compliance and downgradient. Groundwater monitoring data are compared to the Site groundwater cleanup levels established in the Cleanup Action Plan (CAP) (Ecology, 2010) for six organic compounds (1,1-dichloroethane, 1,4-dichlorobenzene, cis-1,2-dichloroethene, ethyl ether, trichloroethene, and vinyl chloride), three trace metals (arsenic, iron and manganese), and one inorganic constituent (ammonia), as listed previously in Section 2.4 of this document. Temporal trends in groundwater quality parameters are also evaluated annually. Results of the landfill gas and groundwater monitoring are presented in quarterly monitoring reports and evaluated in detail in annual monitoring reports that were provided to Ecology for the period covered by this 5-year review (2011 through 2015). The latest annual monitoring report submitted to Ecology documented 2015 data (SCS, 2016).

Review of the results of the 2015 statistical evaluation of the groundwater results [using the 95% upper confidence limit (UCL), as specified in the EMP] against the Site groundwater cleanup levels indicates that groundwater quality in the six compliance monitoring wells meets the cleanup levels for the six organic compounds for which Site groundwater cleanup levels were established (Appendix 7.7). Four of the compliance monitoring wells (MW-34C, MW-39, MW-42 and MW-43) still contain arsenic, iron, and/or manganese concentrations that exceed the cleanup levels and two compliance monitoring wells (MW-39 and MW-42) contain ammonia at concentrations greater than its cleanup level.

In addition to the six compliance monitoring wells, the EMP for the Site (EMSI, 2009) also requires groundwater monitoring be conducted for five downgradient groundwater monitoring wells. Review of the data obtained from the five downgradient monitoring wells indicates that, with the exception of vinyl chloride in well MW-32, groundwater quality in the downgradient monitoring

wells meets the Site cleanup levels for the six organic compounds (Appendix 7.7). Arsenic, iron, manganese and/or ammonia concentrations in the downgradient monitoring wells exceed the Site cleanup levels (Appendix 7.7), similar to conditions observed in the compliance monitoring wells.

Comparisons of the groundwater monitoring results to the cleanup levels have been performed for each of the prior four years (2011 through 2014) and were presented in annual monitoring reports. These evaluations indicate that, with the exception of arsenic, iron, manganese and ammonia in some of the wells and vinyl chloride in well MW-32, the Site groundwater cleanup levels for the other parameters were achieved and have continued to be met since 2012 (Appendix 7.8).

VOC concentrations in groundwater continue to diminish at the Site, with only one VOC daughter product remaining above a cleanup level in one monitoring well (vinyl chloride in well MW-32). These improving conditions are anticipated to continue. However, there is some uncertainty with regard to achieving the Site groundwater cleanup levels for arsenic, iron, manganese, and ammonia, given the natural geochemical environment present at the Site.

3.1.3 Trend Analysis

In addition to evaluation of the concentrations of the ten constituents for which Site groundwater cleanup levels have been established, temporal trends in groundwater quality were also evaluated as part of the assessment of the effectiveness of the OVSL engineering controls. Overall, very few upward trends in water quality have occurred over the last five years; however, notable downward trends were observed for arsenic in performance monitoring wells MW-23A and MW-24 and in downgradient monitoring well MW-36A, and for a variety of inorganic constituents in several wells, most notably compliance monitoring wells MW-15R and MW-34C and performance monitoring well MW-2B1 (Appendix 7.9). The only increasing trends that were identified were for temperature in several wells, ammonia in performance monitoring well MW-19C, and specific conductivity in downgradient well MW-33C.

Because some of the changes to the engineering controls and the operation of these controls were initially made in 2005, the evaluation of temporal trends was also performed for the period from 2005 through 2015 (Appendix 7.10). Review of this table indicates that a significantly greater number of downward trends can be identified over the last ten years as compared to the those observed for the prior five years, suggesting that some of the actions taken at OVSL prior to the date of the CAP had already resulted in improvements in groundwater quality.

The overall inorganic chemistry observed in groundwater monitoring wells at the site continues to show statistically significant decreasing trends in numerous parameters. In terms of the general inorganic chemistry, many decreasing trends are apparent for parameters including specific conductivity, bicarbonate, chloride, calcium, magnesium, and sodium. In particular, the long-term decreasing trends for bicarbonate, as well as calcium and magnesium, suggest that the likely landfill gas impacts to groundwater that occurred historically are being managed effectively.

3.1.4 Summary of CAP Effectiveness

Review of the past five years of groundwater monitoring data indicates that impacts to groundwater continue to decline. In the current 2015 annual reporting period, there was only one VOC exceedance of a cleanup level in a compliance or downgradient well (vinyl chloride in MW-32). The results from 2015 are consistent with the prior four years of monitoring, with vinyl chloride in MW-32 being the only organic constituent showing an exceedance of a cleanup level. By contrast, four wells had vinyl chloride exceedances in 2011 (MW-15R, MW-32, MW-34C, and MW-42). Additionally, there has been no exceedance of the trichloroethene cleanup level in any compliance or downgradient well since 2009.

The occurrence of only a single chlorinated VOC daughter product (i.e., vinyl chloride) above a cleanup criteria in groundwater at the site, as well as the decreasing concentrations of this parameter indicates that: (1) mitigation controls at the site (landfill capping, leachate minimization, LFG extraction, etc.) have been effective; and (2) reductive dechlorination is an active natural attenuation process in the groundwater system beneath the site. This conclusion is supported by overall decreasing trends for several general inorganic water quality parameters.

The nature and extent of vinyl chloride in groundwater should continue to diminish as a result of the mitigation measures in place, as well as the continued natural attenuation processes in the groundwater system. Similarly, numerous decreasing trends are apparent in the concentrations of inorganic parameters detected in groundwater. These downward trends are also anticipated to continue. However, there is some uncertainty with regard to ultimately achieving the Site groundwater cleanup levels for arsenic, iron, manganese and ammonia at all groundwater compliance monitoring locations, given the natural geochemical environment associated with wetlands located between the landfill and the Union River.

3.2 New Scientific Information for Individual Hazardous Substances for Mixtures Present at the Site

New toxicity values led to changes in the MTCA Method B groundwater cleanup level for the following Site IHS:

Updated MTCA Method B Groundwater Cleanup Levels			
IHS	**C or NC**	**Former Value (µg/l)**	**New Value (1) (µg/l)**
Iron	NC	NE	11.2
1,4-Dichlorobenzene	C NC	1.8 NE	8.1 560
1,1-Dichloroethane	C	NE	7.68
cis-1,2-Dichloroethene	NC	80	16
Trichloroethene	C NC	0.49 2.4	0.54 4.0
(1) From July 2016 CLARC Data Table for Groundwater - Method B, Method A, and ARARs NE = not established C = carcinogenic; $1x10^{-6}$ excess cancer risk NC = non carcinogenic			

3.3 New Applicable State and Federal Laws for Hazardous Substances Present at the Site

3.3.1 Chemical Specific

The cleanup at the site was governed by Chapter 173-340 WAC and all other applicable, relevant, and appropriate requirements.

WAC 173-340-702(12) (c) [2001 ed.] provides that,

"A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels, unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment."

Since the development of the CAP for the OVSL Site (Ecology, 2010), Washington State developed surface water criteria for toxic substances, including the Site indicator hazardous substances trichloroethene and vinyl chloride. The criteria are listed in Table 240 of WAC 173-201A-240, which became effective September 1, 2016. The criteria are based on 1) human consumption of water and organisms and 2) human consumption of organisms only. The criteria are:

Washington State Surface Water Criteria		
HIS	**Human Health – Water & Organism (µg/l)**	**Human Health – Organism Only (µg/l)**
Trichloroethene	0.38	0.86
Vinyl chloride	0.02	0.26

During development of the CAP, National Recommended Water Quality Criteria (NRWQC) were considered when developing cleanup levels for protection of surface water. Some of these NRWQC have changed since the CAP was developed, however, the newly promulgated State criteria for the Site IHS are lower (more protective) than the NRWQC.

WAC 173-340-720(4)(b) requires that groundwater cleanup levels must be as stringent as criteria established to protect surface water, unless it can be demonstrated that the IHS are not likely to reach surface water. When developing the CAP, the surface water studies, including studies of the Union River and site wetlands, and risk assessments conducted during the RI were considered, along with the following factors (Entrix, 2001; Arcadis, 2007):

- Neither trichloroethene nor vinyl chloride were detected in the Union River or wetland surface water samples.
- Wetlands are not a source of drinking water
- Fish have not been observed in the wetlands
- Trichloroethene and vinyl chloride are highly volatile; if released from groundwater to surface water they would be expected to volatilize rapidly or breakdown via photolysis or microbial processes upon entry to the aerobic surface water environment.

Because trichloroethene and vinyl chloride are not likely to reach surface water, and the groundwater cleanup levels are protective of carcinogenic and non-carcinogenic effects in humans ingesting groundwater, the cleanup levels were based on the groundwater standards and criteria, and not the NRWQC. The same reasoning would apply to continue basing the cleanup levels on the groundwater standards and criteria and not the new State surface water criteria for trichloroethene and vinyl chloride.

Appendix 7.11 is a table showing changes in groundwater and surface water criteria and in groundwater background concentrations from the time the CAP was developed to September 2016.

3.3.2 Other ARARs

The cleanup at OVSL is being conducted pursuant to Agreed Order No. DE 8462 issued by Ecology pursuant to MTCA, RCW 70.105D.050(1). OVSL is also subject to a Solid Waste Landfill Post Closure Permit issued by the KPHD. Therefore, MTCA and the Solid Waste Regulations were reviewed to determine if any changes had been made to these regulations during the last five years that could affect the cleanup actions at OVSL.

Significant changes were made to MTCA in 2013 primarily in order to speed up cleanup work and reduce impacts caused by stormwater (Ecology, 2013). These changes did not change the process or standards for cleaning up contaminated sites. Therefore, the 2013 changes to MTCA do not affect the cleanup actions or cleanup standards being applied to OVSL.

OVSL is also subject to a Solid Waste Landfill Post Closure Permit issued by the KPHD. The permit that was in effect for the five year period covered by this evaluation was issued on June 17, 2010 and covered the period from January 1, 2010 through December 31, 2015, the same period covered by this evaluation. There have been no changes in permit conditions or requirements during the five years since the CAP was issued by Ecology. A new permit was issued on February 5, 2016 and covers the period from January 1, 2016 through December 31, 2020

Although there have been no changes to the post closure permit, the State did adopt changes to the Criteria for Municipal Solid Waste Landfills, WAC 173-351 (the State solid waste regulations) in both November 2012 (Ecology, 2012) and October 2015 (Ecology, 2015). Specifically, in November 2012, the State adopted new post-closure care period standards, which are based on potential risk to human and environmental receptors (*i.e.*, the requirement that post-closure care be conducted for thirty years or as long as necessary for the landfill to become functionally stable), a requirement for filing an environmental covenant at closure in accordance with Chapter 64.70 RCW, Uniform Environmental Covenants Act, and a change in groundwater monitoring parameters from dissolved metals to total metals, among other items (Ecology, 2012). These changes apply to owners and operators of municipal solid waste landfills permitted under Chapter 173-351 WAC including landfills that are actively accepting waste and those landfills that closed under the rule. Therefore, these changes would apply to OVSL. The regulations state that jurisdictional health agencies that issue solid waste permits must ensure that owners and operators meet the new standards in accordance with the effective dates provided in the amended rule (Ecology, 2012). Therefore, the mechanism for implementation of these changes will be through the renewal of the post closure care permit issued by KPHD. The October 2015 changes to the Criteria for Municipal

Solid Waste Landfills were focused on adding two hazardous organic constituents to Appendix III of WAC 173-351, which is the list of hazardous inorganic and organic constituents required for assessment phase monitoring. This change affects facilities that are required to perform assessment monitoring.

With respect to the changes in the solid waste regulations, WM WA has already implemented the relevant changes. Specifically, WM WA has evaluated OVSL relative to the requirement for achievement of functional stability and updated the post-closure plan. The OVSL environmental monitoring program was previously revised to incorporate the change from monitoring for dissolved metals to monitoring for total metals (SCS, 2013a). In 2011 WM WA recorded a restrictive covenant on the OVSL property in a form that was accepted by Ecology and with recognition of Ecology's right of enforcement pursuant to both MTCA and the Uniform Environmental Covenants Act. Because the OVSL monitoring plan requires collection of samples from certain monitoring wells be subject to Appendix III monitoring, the SAP will need to be modified to include the two additional hazardous organic constituents identified in the 2015 changes to the solid waste regulations.

3.4 Current and Projected Site Use

The site consists of a 65-acre closed municipal sanitary landfill that is undergoing post-closure care and adjacent land parcels that are owned by WM WA. The site is expected to remain a closed sanitary landfill that is subject to post-closure care for the foreseeable future; that is until the criteria for functional stability have been achieved. WM WA has recorded a restriction on the property deed for the parcels that contain the closed landfill and has also recorded a restrictive covenant in favor of Ecology on the property that restricts the activities that can be conducted on the property and requires notification be submitted to Ecology prior to conveyance of any interest in the property.

WM WA has stated they may harvest timber on parcels of land owned by WM WA that are located outside of the landfill footprint and areas with associated landfill facilities, such as the leachate pond.

3.5 Availability and Practicability of Higher Preference Technologies

The remedy implemented included containment of solid waste, natural attenuation, and monitoring of groundwater and landfill gas, and it continues to be protective of human health and the environment. While higher preference cleanup technologies may be available, they are still not practicable at this Site.

3.6 Availability of Improved Analytical Techniques to Evaluate Compliance with Cleanup Levels

The analytical methods used at the time of the remedial action were capable of detection below selected Site cleanup levels. The presence of improved analytical techniques would not affect decisions or recommendations made for the Site.

4.0 COMPLIANCE MONITORING

4.1 Current Monitoring Program

Under the current Agreed Order, WM WA has monitored groundwater at the Site in accordance with the EMP (EMSI, 2009). The groundwater monitoring network consists of upgradient monitoring wells, performance monitoring wells, compliance monitoring wells, and downgradient monitoring wells.

- Four upgradient monitoring wells evaluate upgradient water quality: MW-13A, MW-13B, MW-35, and MW-16.

- Six performance monitoring wells are located at the edge of the waste and provide early indication of effectiveness of corrective actions: MW-24, MW-23A, MW-2B1, MW-20, MW-19C, and MW-4.

- Six compliance monitoring wells are located at the point of compliance (approximately 150 meters from the waste) to evaluate compliance with the groundwater cleanup standards: MW-39, MW-15R, MW-34A, MW-34C, MW-42, and MW-43.

- Five downgradient monitoring wells provide water quality data to confirm that human health and the environment are adequately protected during the remedial action period: MW-36A, MW-33A, MW-33C, MW-32, and MW-29A.

Groundwater samples are collected and analyzed quarterly from all of the wells, except two downgradient wells (MW-33A and MW-29A) are sampled and analyzed semi-annually.

Groundwater elevation is measured in all 21 monitoring wells as well as approximately 33 additional onsite wells.

4.2 Requested Modification to Monitoring Program

In a letter dated August 11, 2016, WM WA requested reductions in the groundwater monitoring network and frequency. The letter, which includes the justification for the request, is provided in Appendix 7.12.

The request was to:

- Terminate groundwater quality monitoring in performance monitoring wells.
- Reduce monitoring frequency in down gradient wells from quarterly to semi-annually
- Reduce scope of site-wide water level monitoring to the 21 wells monitored for water quality and reduce frequency from quarterly to semi-annually.

Ecology reviewed WM WA's request and agrees to:

- Termination of water quality monitoring in performance monitoring wells, except MW-19C. Monitoring of MW-19C will continue semi-annually because MW-19C provides data that may be useful in understanding groundwater quality in MW-42 and MW-32.
- Continuation of quarterly monitoring in compliance monitoring wells.
- Reduction of monitoring frequency in downgradient wells from quarterly to semi-annually, except that MW-32, where detectable vinyl chloride persists, and quarterly monitoring will continue.
- Reduction of number of monitoring wells for groundwater level measurements as proposed, except that water level measurements in MW-41A, B, and C will continue to provide data on the south side of the landfill for mapping groundwater elevations. Water levels will be measured and reported each time a well is sampled, either quarterly or semi-annually, depending on the well's sampling frequency. Groundwater flow direction and rate will be determined and reported semi-annually.

Before decommissioning any monitoring wells no longer used for sampling or water level measurements, WM WA must develop a rationale for identifying monitoring wells to be decommissioned that includes the following:

- An updated monitoring well database that lists all wells with confirmed physical locations (along with a map showing the locations), wells that cannot be located, and wells that have already been property decommissioned.
- Identification of wells proposed for decommissioning due to damage that cannot be repaired, site conditions that render well access impractical, existence of other wells that provide similar data or were installed as replacement wells, etc.
- Methods of well decommissioning to be used, per WAC 173-160, based on well construction features and current well condition.
- Format for a memo to Ecology proposing decommissioning of specific wells, including the information described in the previous three bullets.
- Ecology review of decommissioning request and response to request.
- Completion of well decommissioning notifications, per WAC 173-160, by a driller licensed in the State of Washington to complete resource protection well decommissioning.
- Documentation of well decommissioning to Ecology, including updating of the monitoring well database.

5.0 CONCLUSIONS

The following conclusions have been made as a result of this periodic review:

- The cleanup actions completed at the Site appear to be protective of human health and the environment.
- Concentrations of IHS in groundwater show significant downward trends in several monitoring wells. No increasing trends of IHSs are occurring in compliance or downgradient monitoring wells.
  - The Site groundwater cleanup level for one organic IHS, vinyl chloride, is still exceeded in groundwater at one downgradient well (MW-32).
  - Cleanup levels for arsenic, iron, and manganese are exceeded in several compliance and downgradient wells. Some decreasing trends are noted. No increasing trends are seen.
  - The ammonia cleanup level was exceeded in two compliance wells and no downgradient wells. No increasing trends are seen.
- Some reductions in the monitoring program are approved as discussed in Section 4.0.
- Solid waste in the landfill remains contained. The containment systems are adequately maintained and managed to control releases of hazardous constituents to groundwater, surface water, and air.
- Although MTCA Method B cleanup levels have changed for five of the Site IHS, and new State surface water criteria for organics have been promulgated, the cleanup action is still protective of human health and the environment.
- The Restrictive Covenant for the property is in place and continues to be effective in protecting public health and the environment from exposure to hazardous substances and protecting the integrity of the cleanup action.

Based on this periodic review, the Department of Ecology has determined that the requirements of the Restrictive Covenant continue to be met. No additional cleanup actions are required by the property owner. It is the property owner's responsibility to continue to inspect, maintain, and monitor the Site to assure that the integrity of the remedy is maintained.

The next review for the Site will be scheduled five years from the date of this periodic review. In the event that additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years from the completion of those activities.

6.0 REFERENCES

AMEC Geomatrix, 2008. *Draft Final Human Health Risk Assessment, Revision 1.0, Olympic View Sanitary Landfill, Kitsap County, Washington*. Prepared for Olympic View Sanitary Landfill, Inc. December 2008 as revised January 15, 2009.

Arcadis BBL, 2009. *Ecological Risk Assessment, Olympic View Sanitary Landfill, Kitsap County, Washington.* Prepared for Olympic View Sanitary Landfill, Inc. December 2007 as revised October 2009.

Ecology, 2010. *Cleanup Action Plan, Olympic View Sanitary Landfill, Kitsap County, Washington,* September 28, 2010.

Ecology, 2012. *Rule Adoption Notice – Criteria for Municipal Solid Waste Landfills, Chapter 173-351 WAC.* Publication No. 12-07-009. November.

Ecology, 2013. *Implementing 2013 Changes to Model Toxics Control Act.* Publication No. 13-09-054. August.

Ecology, 2015. *Rule Adoption Notice - Criteria for Municipal Solid Waste Landfills, Chapter 173-351 WAC.* Publication No. 15-07-036. September

EMSI, 2009. *Environmental Monitoring Plan, Olympic View Sanitary Landfill, Port Orchard, Washington.* Prepared for Waste Management of Washington, Inc. December 17.

EMSI, 2010. *Feasibility Study, Olympic View Sanitary Landfill, Port Orchard, Washington, prepared for Waste Management of Washington, Inc.* June.

EMSI, 2012. *Post Closure Operations & Maintenance Plan, Olympic View Sanitary Landfill, Port Orchard, WA.* Prepared for Waste Management of Washington, Inc. September.

EMSI, 2016. Five Year Review Evaluation, Olympic View Sanitary Landfill, Port Orchard, Washington, prepared for Waste Management Closed Site Management Group, September 22.
Entrix, 2001. *Wetland Investigation and Assessment Report.* Prepared for Olympic View Sanitary Landfill. March 19.

KPHD, 2010. *Solid Waste Landfill Post Closure Permit – Olympic View Sanitary.* June 17.

Parametrix, 2007. *Draft Final Remedial Investigation Report, Olympic View Sanitary Landfill*. Prepared for Olympic View Sanitary Landfill, Inc. September 21, 2007.

SCS, 2009. *Olympic View Sanitary Landfill (OVSL) Sampling and Analysis Plan.* Presented to Waste Management. December.

SCS, 2011a. *Letter to Waste Management of Washington conveying work plan for 2011 GCCS expansion for implementing Corrective Action Plan for Olympic View Sanitary Landfill*. August 5.

SCS, 2012. *2011 Annual Monitoring Report Olympic View Sanitary Landfill (OVSL).* Presented to Olympic View Sanitary Landfill, Inc. March 2.

SCS, 2013a. *Olympic View Sanitary Landfill (OVSL) Sampling and Analysis Plan*. Presented to Waste Management. April 30.

SCS, 2013b. *2012 Annual Monitoring Report Olympic View Sanitary Landfill (OVSL).* Presented to Olympic View Sanitary Landfill, Inc. March 29.

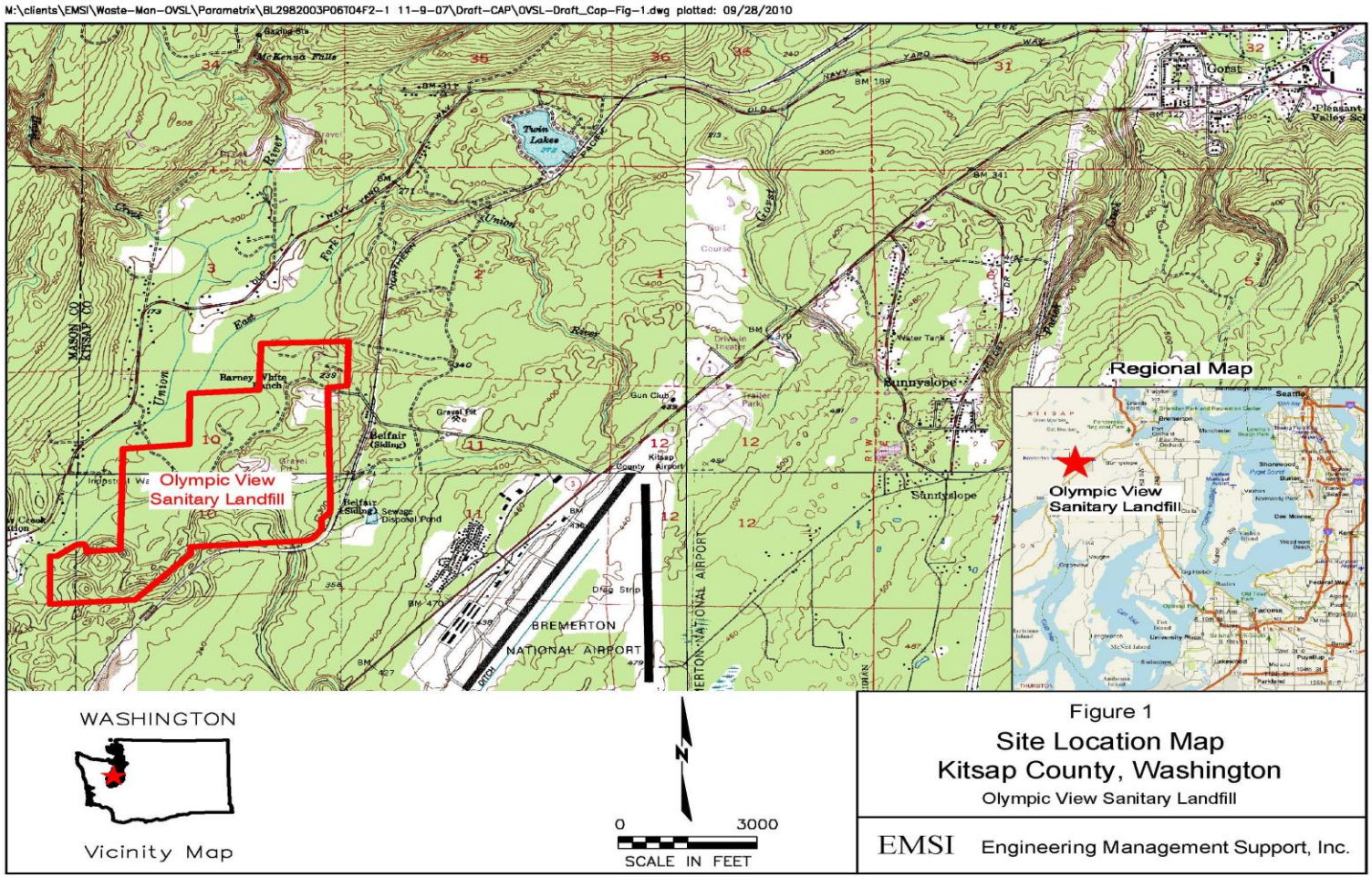
SCS, 2014. *2013 Annual Monitoring Report Olympic View Sanitary Landfill.* Presented to Olympic View Sanitary Landfill, Inc. March 24.

SCS, 2015. *2014 Annual Monitoring Report Olympic View Sanitary Landfill.* Presented to Olympic View Sanitary Landfill, Inc. March 26.

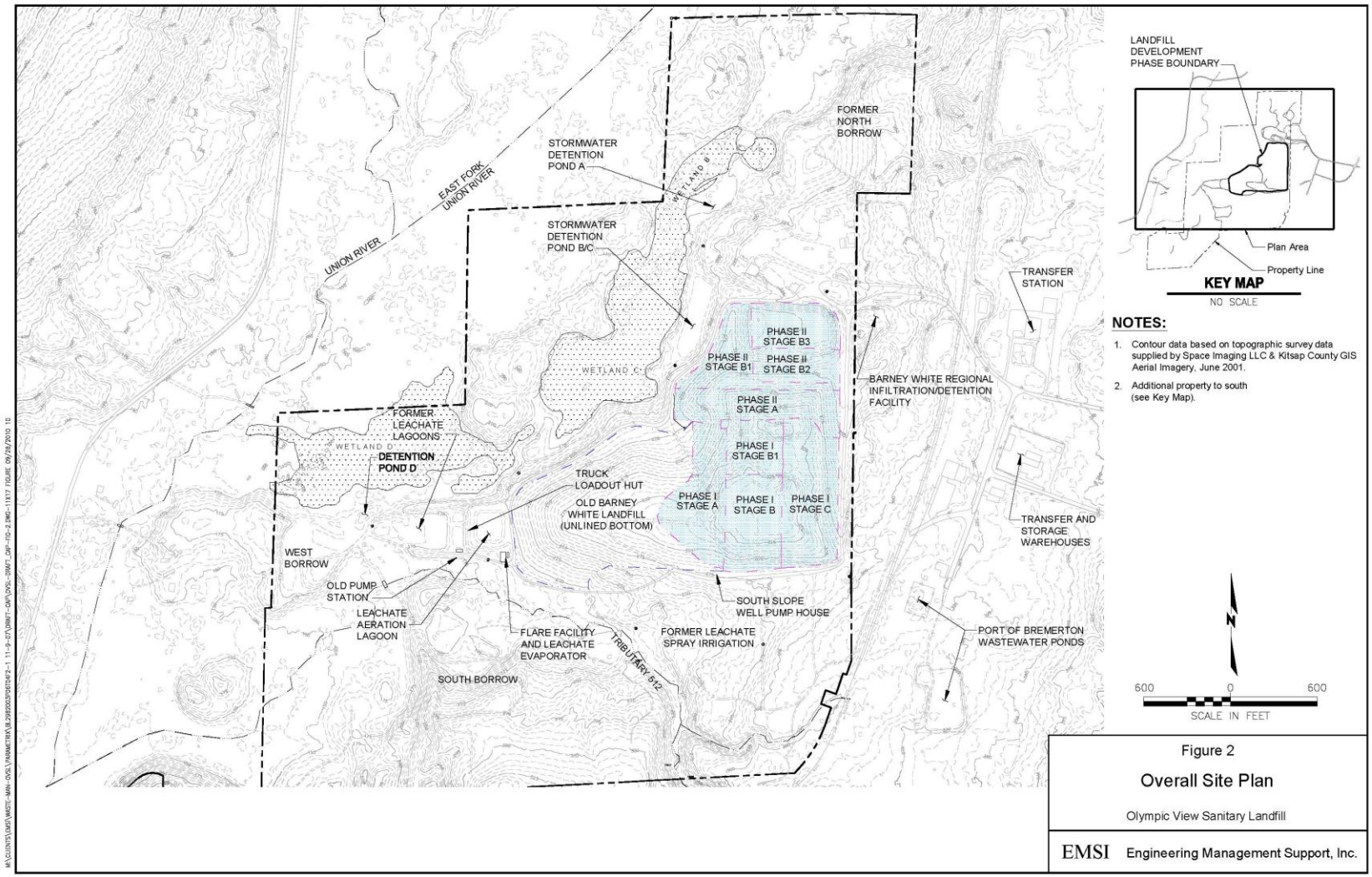
SCS, 2016. *2015 Annual Monitoring Report Olympic View Sanitary Landfill.* Presented to Olympic View Sanitary Landfill, Inc. March 18.

7.0 APPENDICES

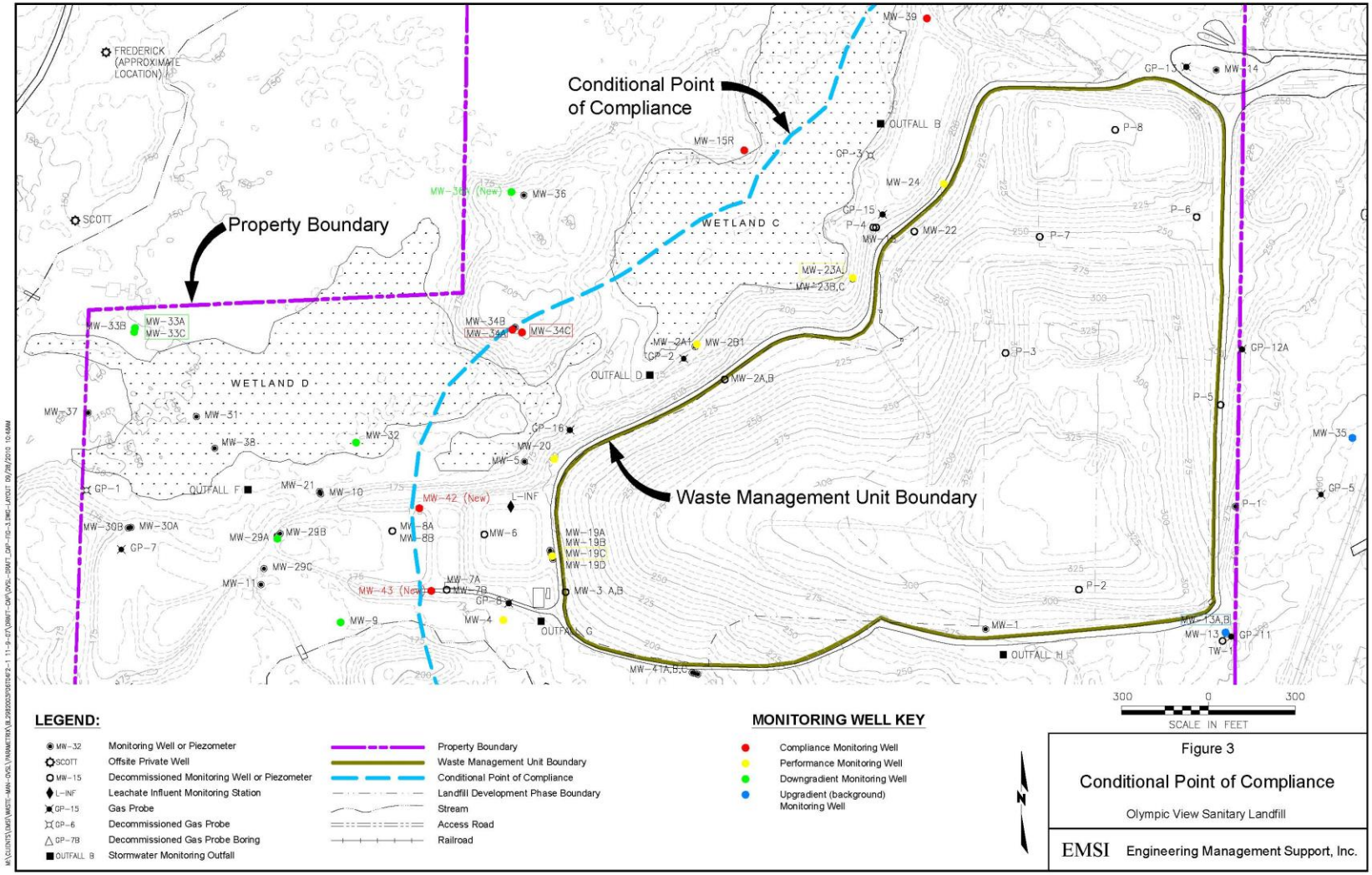
7.1 Site Location Map



7.2 Site Layout



7.3 Groundwater Monitoring Network



7.4 Restrictive Covenant

After Recording Return to:
Madeline Wall
Department of Ecology
Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008-5452

Restrictive (Environmental) Covenant

Grantor: Waste Management of Washington, Inc., a Delaware corporation, Successor by Merger to Olympic View Sanitary Landfill, Inc., a Washington corporation formerly known as Kitsap County Sanitary Landfill, Inc.

Grantee: State of Washington, Department of Ecology

Legal: SE ¼ / SE 1/4, 3 - 23N - 1W, W.M.
NE ¼ / NE ¼, 10 - 23N - 1W, W.M.
NW ¼ / NE ¼, 10 - 23N - 1W, W.M.
SW ¼ / NE 1/4, 10 - 23N - 1W, W.M.
SE ¼ / NW ¼, 10 - 23N - 1W, W.M.
NE ¼ / SE ¼, 10 - 23N - 1W, W.M.
NW ¼ / SE ¼, 10 - 23N - 1W, W.M.
E ½ / SW ¼, 10 - 23N - 1W, W.M.
W ½ / NW ¼, 10 - 23N - 1W, W.M.
SW ¼ / SW ¼, 10 - 23N - 1W, W.M.
W ½ / NW ¼ / SW ½, 10 - 23N - 1W, W.M.

Tax Parcel Nos.:
102301-1-002-1004 – 39.83 Acres
102301-1-003-1003 – 30.00 Acres
102301-4-001-1009 – 37.50 Acres
102301-2-028-1002 – 38.78 Acres
102301-4-002-1008 - 20.00 Acres
102301-1-001-1005 – 40.00 Acres
102301-1-004-1002 – 36.57 Acres
102301-1-005-1001 – 8.27 Acres
102301-3-001-1001 – 134.94 Acres
192501-1-009-2004 - 20.00 Acres

Cross Reference: None

Grantor, Waste Management of Washington, Inc., hereby binds Grantor, its successors and assigns to the land use restrictions identified herein and grants such other rights under this environmental covenant (hereafter "Covenant") made this 18th day of April, 2011 in favor of the State of Washington Department of Ecology (Ecology). Ecology shall have full right of enforcement of the rights conveyed under this Covenant pursuant to the Model Toxics Control Act, RCW 70.105D.030(1)(g), and the Uniform Environmental Covenants Act, 2007 Wash. Laws ch. 104, sec. 12.

This Declaration of Covenant is made pursuant to RCW 70.105D.030(1)(f) and (g) and WAC 173-340-440 by Waste Management of Washington, Inc., its successors and assigns, and the State of Washington Department of Ecology, its successors and assigns (hereafter "Ecology").

A remedial action (hereafter "Remedial Action") occurred at the property that is the subject of this Covenant. The Remedial Action conducted at the property is described in the following document:

Cleanup Action Plan, Olympic View Sanitary Landfill, Kitsap County, Washington, Washington State Department of Ecology, December 2010

This document is on file at Ecology's Northwest Regional Office.

This Covenant is required because the Remedial Action resulted in residual concentrations of vinyl chloride, trichloroethylene, arsenic, iron, manganese, and ammonia which exceed the Model Toxics Control Act Method B Cleanup Levels for groundwater established under WAC 173-340-720.

And

This Restrictive Covenant is required because a conditional point of compliance has been established for groundwater.

++

The undersigned, Waste Management of Washington, Inc., is the fee owner of real property (hereafter "Property") in the County of Kitsap, State of Washington, that is subject to this Covenant. The Property is legally described in Exhibit A of this covenant and made a part hereof by reference.

Waste Management of Washington, Inc. makes the following declaration as to limitations, restrictions, and uses to which the Property may be put and specifies that such declarations shall constitute covenants to run with the land, as provided by law and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in the Property (hereafter "Owner").

Section 1.

1. No groundwater may be taken from the Property for drinking, cooking, or personal washing. The use of groundwater for other purposes must be approved in writing by Ecology.
2. Any activity on the Property that may result in the release or exposure to the environment of the waste contained in the landfill, or create a new exposure pathway, is prohibited. Some examples of activities that are prohibited in the capped areas include: drilling, digging, placement of any objects or use of any equipment which deforms or stresses the surface beyond its load bearing capability, piercing the surface with a rod, spike or similar item, bulldozing or earthwork, unless such activities are conducted in accordance with the landfill Operations and Maintenance Plan approved by Ecology or prior written approval of the activity has been obtained from Ecology.

Section 2. Any activity on the Property that may interfere with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited.

Section 3. Any activity on the Property that may result in the release or exposure to the environment of a hazardous substance that remains on the Property as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval from Ecology.

Section 4. The Owner of the property must give thirty (30) day advance written notice to Ecology of the Owner's intent to convey any interest in the Property. No conveyance of title, easement, lease, or other interest in the Property shall be consummated by the Owner without

adequate and complete provision for continued monitoring, operation, and maintenance of the Remedial Action.

Section 5. The Owner must restrict leases to uses and activities consistent with the Covenant and notify all lessees of the restrictions on the use of the Property.

Section 6. The Owner must notify and obtain approval from Ecology prior to any use of the Property that is inconsistent with the terms of this Covenant. Ecology may approve any inconsistent use only after public notice and comment.

Section 7. The Owner shall allow authorized representatives of Ecology the right to enter the Property at reasonable times for the purpose of evaluating the Remedial Action; to take samples, to inspect remedial actions conducted at the property, to determine compliance with this Covenant, and to inspect records that are related to the Remedial Action.

Section 8. The Owner of the Property reserves the right under WAC 173-340-440 to record an instrument that provides that this Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only if Ecology, after public notice and opportunity for comment, concurs.

[SIGNATURES APPEAR ON FOLLOWING PAGES]

WASTE MANAGEMENT OF WASHINGTON, INC.

Steven D. Richtel
Group Director, Closed Site Management Group

Dated: 4/25/11

STATE OF COLORADO
COUNTY OF DOUGLAS

On this 25th of April, 2011, I certify that Steven D. Richtel personally appeared before me, acknowledged that he is the Group Director, Closed Site Management Group, of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument for said corporation.

Kimberly L. Vernon
Notary Public in and for the State of Colorado, residing at 8830 Cloverleaf Cir., Parker, CO 80134
My appointment expires My Commission Expires October 24, 2012.

KIMBERLY L. VERNON
NOTARY PUBLIC
STATE OF COLORADO

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

Peter D. Christiansen
Section Manager, Waste 2 Resources Program

Dated: 9 JUNE 2011

Exhibit A
Legal Description

Account No. 102301-1-001-1005

The Northeast Quarter of the Northeast Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington

Account No. 102301-01-002-1004

The Northwest Quarter of the Northeast Quarter of Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington, lying northerly of the Barney-White Road, as it existed prior to 1937; EXCEPT any portion within Barney White Road.

Account No. 102301-1-004-1002

The Southeast Quarter of the Northeast Quarter of Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington; EXCEPT that portion conveyed to Kitsap county for Masales Road per Auditor's File No. 518278.

Account No. 102301-1-003-1003

That portion of the Southwest Quarter of the Northeast Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington, lying southerly of the Barney White Road as it existed prior to 1937; EXCEPT Barney White Road

Account No. 102301-1-005-1001

That portion of the Southwest Quarter of the Northeast Quarter of Section 10, Township 23 North, Range 1 West W.M., in Kitsap County, Washington, lying northerly of the Barney White Road, as it existed prior to 1937.

Account No. 102301-2-028-1002

The Southeast Quarter of the Northwest Quarter of Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington, less portions described as follows: Beginning at the Southwest corner of the Southeast Quarter of the Northwest Quarter orf Seciton 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington, and proceeding thence along the west line of said Southeast Quarter of the Northwest Quarter northy 0 degrees 58' 51" west 1343.81 feet; thence along the north line of said Southeast Quarter of the

Northwest Quarter north 85 degrees 10' 50" east 59.53 feet; thence south 0 degrees 07' 51" East 1345.27 feet; thence along the souty line of said Southeast Quarter of the Northwest Quarter south 85 degrees 09' 12" west 39.53 feet to the point of beginning; TOGETHER WITH AN EASEMENT for ingress, egress and utilities over, under and across the existing road running in a southeasterly direction from the Old Belfair Highway across Parcel 1 as described in deed recorded under Auditor's File No. 561298.

Account No. 102301-4-001-1009

The Northeast Quarter of the Southeast Quarter, Section 10, Township 23 North, Range 1 West, W.M.; LESS portion taken by the United States of America for Bremerton naval yard Railroad right-of-way; situate in Kitsap County, Washington.

Account No. 102301-4-002-1008

The East Half of the Northwest Quarter of the Southeast Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington, except that portion if any lying within Masales Road.

Account No. 102301-3-001-1001

Parcel A: The East Half of the Southwest Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington; except that portion thereof conveyed to the United States of America by deed recorded under Auditor's file number 414305.

Parcel B: The West Half of the Northwest Quarter of the Southeast Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington.

Parcel C: The Southwest Quarter of the Southwest Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington.

Parcel D: That portion of the West Half of the Northwest Quarter of the Southwest Quarter, Section 10, Township 23 North, Range 1 West, W.M., in Kitsap County, Washington, lying south of Miller Road.

*** END OF EXHIBIT A ***

7.5 Site Inspection Checklist

SITE INFORMATION	
Site name: Olympic View Sanitary Landfill	**Date of inspection: June 21, 2016**
Location and Region: Kitsap County, NWRO	**F/S ID: 79649975/4217**
Agency, office, or company leading the five-year review: Ecology, W2R, NWRO	**Weather/temperature: Cloudy/60s**
Remedy Includes: (Check all that apply) √Landfill cover/containment √Access controls √ Institutional controls – Groundwater pump and treatment – Surface water collection and treatment √Other – landfill gas collection/flare; leachate collection/treatment; surface water controls √ Monitored natural attenuation – Groundwater containment – Vertical barrier walls	
Attachments: √ Inspection team roster attached √ Site map attached	
INSTITUTIONAL CONTROLS √ Applicable – N/A	
A. Fencing	
1. **Fencing damaged** – Location shown on site map √ Gates secured – N/A Remarks – Entry road gate kept locked. In good repair.	
B. Other Access Restrictions	
1. **Signs and other security measures** – Location shown on site map – N/A Remarks – WM reported that fencing, berms, security cameras, and security drive-through inspections are keeping trespassers out. Cameras are at the LFG flare and the leachate pump	
C. Institutional Controls (ICs)	

1. **Implementation and enforcement**

Site conditions imply ICs properly implemented √ Yes – No – N/A
Site conditions imply ICs being fully enforced √ Yes – No – N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date – Yes – No – N/A
Reports are verified by the lead agency – Yes – No – N/A

Specific requirements in deed or decision documents have been met √ Yes – No – N/A
Violations have been reported – Yes – No – N/A
Other problems or suggestions: – Report attached

Inspection requirements are described in the Post Closure Operations and Maintenance Plan (September 2012). Inspections are performed by WM staff (Matt Frame). Also, quarterly inspections are conducted by KPHD (Grant Holdcroft). The WM inspection reports should be included in the annual report submitted. This has not been done in the past, but WM said they will do this, beginning with the next annual report.

2. **Adequacy** √ ICs are adequate – ICs are inadequate – N/A
Remarks
Additionally, the Environmental Covenant requires that WM obtain Ecology approval of activities that are prohibited by the covenant, such as disturbing the landfill cover or using groundwater. Approval was requested and granted for using onsite production well water to wash the leachate pond cover and for installation of gas extraction wells through the landfill cover.

GROUND COVERS – Applicable – N/A

Surface

1. **Settlement** (Low spots) – Location shown on site map √ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Cracks** – Location shown on site map √ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** – Location shown on site map √ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Holes** – Location shown on site map √Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** √ Grass √ Cover properly established √ No signs of stress
− Trees/Shrubs (indicate size and locations on a diagram)
Remarks - Grass well established and maintained.

8. **Wet Areas/Water Damage** − Wet areas/water damage not evident
− Wet areas − Location shown on site map Areal extent_____
− Ponding − Location shown on site map Areal extent_____
− Seeps − Location shown on site map Areal extent_____
− Soft subgrade − Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** − Slides − Location shown on site map √ No evidence of slope instability
Areal extent_____
Remarks_____
_____

Treatment System (leachate) √ Applicable − N/A

1. **Treatment Train** (Check components that apply)
− Metals removal − Oil/water separation − Bioremediation
− Air stripping − Carbon adsorbers
− Filters_____
− Additive (*e.g.*, chelation agent, flocculent)_____
− Others_____
− Good condition − Needs Maintenance
− Quantity of groundwater treated annually_____
− Quantity of surface water treated annually_____
Remarks – Leachate is conveyed to a double-lined surface impoundment with a floating cover. The leachate is aerated and periodically trucked to a local POTW. Approx 802,000 gallons of leachate were pumped into the pond in 2015.

2. **Electrical Enclosures and Panels** (properly rated and functional)
− N/A − Good condition − Needs Maintenance
Remarks_____
_____

3. **Tanks, Vaults, Storage Vessels**
− N/A √ Good condition √ Proper secondary containment
− Needs Maintenance
Remarks – The surface impoundment for leachate storage appears to be in good condition, however, the cover prevents inspection of the pond itself. Liquid that accumulates between the primary and secondary liners is pumped into a graduated plastic tank for measuring before being discharged back into the leachate pond. The quantity of liquid is reported to KPHD and ECY quarterly. Now that the current measurement system has been operating for more than two years, WM needs to propose an plan for actions to be taken if increased quantities are measured.

4. **Discharge Structure and Appurtenances**
− N/A √ Good condition − Needs Maintenance
Remarks – We discussed the mention in the Post Closure Plan of Operations of an overflow pipe from the leachate pond. WM has looked for it in the field, and we looked for it during the site inspection. It appears to no longer exist, but WM needs to research site documents to confirm that it was properly abandoned or removed.

5. **Treatment Building(s)**
√ N/A − Good condition (esp. roof and doorways) − Needs repair
− Chemicals and equipment properly stored
Remarks_____
_____

6. **Monitoring Wells** (pump and treatment remedy)
− Properly secured/locked − Functioning − Routinely sampled − Good condition
− All required wells located − Needs Maintenance √ N/A
Remarks_____
_____

Monitoring Data

1. Monitoring Data – groundwater and landfill gas
√ Is routinely submitted on time − Is of acceptable quality

2. Monitoring data suggests:
− Groundwater plume is effectively contained − Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
− Properly secured/locked √ Functioning √ Routinely sampled − Good condition
− All required wells located − Needs Maintenance − N/A
Remarks – wells within the monitoring network are routinely sampled in accordance with approved Environmental Monitoring Plan. We located most of the wells. SCS samples the wells, but they were not on the site visit. WM will confirm location of all wells with SCS. Some wells were not locked and many were not clearly labeled on the outside.

OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Landfill gas extraction, conveyance, and flaring

Gas is extracted from a network of wells in the waste. Currently the average methane content of the gas is about 26%. Volume of landfill gas is about 200 SCFM. The well field is maintained and balanced by WM staff. The system appears to be adequately maintained and operated.

OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The purpose of the remedy is to reduce landfill impacts to groundwater – from gas and leachate. The goal is to reduce vinyl chloride, other VOCs, and arsenic, manganese, and iron to below the cleanup levels. Vinyl chloride and other VOCs appear to be declining in compliance and downgradient wells. Data will be evaluated for evidence of downward trends in contaminants of concern.

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. The closed landfill appears to be well operated and maintained. As the remedy largely consists of properly maintaining the closed landfill, continuing to do so is expected to provide long-term protectiveness.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, which suggest that the protectiveness of the remedy may be compromised in the future. None identified.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Inspection Team:

Ecology – Madeline Wall (W2R) and Mike Warfel (TCP)
KPHD – Jan Brower and Grant Holdcroft
Waste Management – Phil Perley, Patrick Madej, and Matt Frame

7.6 Photo Log

Photos taken by KPHD, January 2017

Photo 1: Looking southwest: Phase II area cover in foreground; Old Barney White Landfill cover in background

Photo 2: Looking west: Phase II cover

Photo 3: Landfill gas extraction wells on top of Phase II cover

Photo 4: Landfill gas blowers and flare

Photo 5: Leachate side slope riser #2

Photo 6: Leachate pond with cover

Photo 7: Stormwater detention pond B/C looking northwest

Photo 8: Groundwater monitoring wells and gas monitoring probe

7.7 Groundwater Cleanup Level Statistical Evaluation Summary

TABLE 3-1: 5-yr Review (2011-2015) Groundwater Cleanup Level Statistical Evaluation Summary

Olympic View Sanitary Landfill

Statistical Methodology: calculation of 95% UCL of mean per MTCAStat

Data Input: 5-year window Jan 1, 2011 through Dec 31, 2015

Wells Evaluated: (1) Compliance -- MW-15R, MW-34A, MW-34C, MW-39, MW-42, MW-43; (2) Downgradient -- MW-9+, MW-29A, MW-32, MW-33A, MW-33C, MW-36A

Monitoring Well	Monitoring Well Type	Corrective Action Monitoring Parameter	N[1]	% Detect	Max[2]	95% UCL of Mean[3]	Units[4]	Note	Groundwater Cleanup Level[5]	Units[4]	Does 95% UCL Exceed Cleanup Level?	Significant Trend?[6]
MW-15R	Compliance	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-15R	Compliance	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-15R	Compliance	Arsenic, dissolved	20	100%	0.26	0.22	ug/L	LN	0.462	ug/L	No	No
MW-15R	Compliance	Iron, dissolved	19[7]	5.3%	0.082	0.082	mg/L	A	0.30	mg/L	No	No
MW-15R	Compliance	Manganese, dissolved	20	95%	0.031	0.006	mg/L	Z	0.05	mg/L	No	No
MW-15R	Compliance	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-15R	Compliance	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-15R	Compliance	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-15R	Compliance	Vinyl Chloride	20	35%	0.046	0.046	ug/L	A	0.20	ug/L	No	No
MW-15R	Compliance	Ammonia as N	19[8]	32%	0.069	0.069	mg/L	A	0.19	mg/L	No	No
MW-34A	Compliance	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-34A	Compliance	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-34A	Compliance	Arsenic, dissolved	20	100%	0.57	0.47	ug/L	LN	0.462	ug/L	Yes	No
MW-34A	Compliance	Iron, dissolved	20	0%	0.06 (ND)	0.06	mg/L	B	0.30	mg/L	No	No
MW-34A	Compliance	Manganese, dissolved	20	5%	0.0019	0.0019	mg/L	A	0.05	mg/L	No	No
MW-34A	Compliance	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-34A	Compliance	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-34A	Compliance	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-34A	Compliance	Vinyl Chloride	20	10%	0.03	0.03	ug/L	A	0.20	ug/L	No	No
MW-34A	Compliance	Ammonia as N	20	35%	0.15	0.15	mg/L	A	0.19	mg/L	No	No
MW-34C	Compliance	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-34C	Compliance	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-34C	Compliance	Arsenic, dissolved	20	100%	4.2	1.65	ug/L	Z	0.462	ug/L	Yes	No
MW-34C	Compliance	Iron, dissolved	17[9]	100%	1.0	0.82	mg/L	LN	0.30	mg/L	Yes	No
MW-34C	Compliance	Manganese, dissolved	20	100%	1.3	0.77	mg/L	Z	0.05	mg/L	Yes	No
MW-34C	Compliance	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No

Prepared by: GeoChem Applications

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January 2016

TABLE 3-1: 5-yr Review (2011-2015) Groundwater Cleanup Level Statistical Evaluation Summary

Olympic View Sanitary Landfill

Statistical Methodology: calculation of 95% UCL of mean per MTCAStat

Data Input: 5-year window Jan 1, 2011 through Dec 31, 2015

Wells Evaluated: (1) Compliance -- MW-15R, MW-34A, MW-34C, MW-39, MW-42, MW-43; (2) Downgradient -- MW-9+, MW-29A, MW-32, MW-33A, MW-33C, MW-36A

Monitoring Well	Monitoring Well Type	Corrective Action Monitoring Parameter	N[1]	% Detect	Max[2]	95% UCL of Mean[3]	Units[4]	Note	Groundwater Cleanup Level[5]	Units[4]	Does 95% UCL Exceed Cleanup Level?	Significant Trend?[6]
MW-34C	Compliance	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-34C	Compliance	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-34C	Compliance	Vinyl Chloride	20	100%	0.16	0.14	ug/L	LN	0.20	ug/L	No	No
MW-34C	Compliance	Ammonia as N	20	35%	0.18	0.18	mg/L	A	0.19	mg/L	No	No
MW-39	Compliance	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-39	Compliance	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-39	Compliance	Arsenic, dissolved	20	100%	2.23	1.64	ug/L	Z	0.462	ug/L	**Yes**	No
MW-39	Compliance	Iron, dissolved	19[10]	100%	41.0	33.4	mg/L	Z	0.30	mg/L	**Yes**	No
MW-39	Compliance	Manganese, dissolved	20	100%	0.53	0.44	mg/L	Z	0.05	mg/L	**Yes**	No
MW-39	Compliance	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-39	Compliance	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-39	Compliance	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-39	Compliance	Vinyl Chloride	20	0%	0.02 (ND)	0.02	ug/L	B	0.20	ug/L	No	No
MW-39	Compliance	Ammonia as N	20	100%	0.48	0.36	mg/L	Z	0.19	mg/L	**Yes**	No
MW-42	Compliance	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-42	Compliance	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-42	Compliance	Arsenic, dissolved	20	100%	1.7	1.6	ug/L	Z	0.462	ug/L	**Yes**	No
MW-42	Compliance	Iron, dissolved	20	100%	28	26	mg/L	LN	0.30	mg/L	**Yes**	No
MW-42	Compliance	Manganese, dissolved	20	100%	5.4	5.0	mg/L	LN	0.05	mg/L	**Yes**	No
MW-42	Compliance	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-42	Compliance	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-42	Compliance	Trichloroethene	20	10%	0.51	0.51	ug/L	A	1.0	ug/L	No	No
MW-42	Compliance	Vinyl Chloride	20	90%	0.16	0.11	ug/L	LN	0.20	ug/L	No	No
MW-42	Compliance	Ammonia as N	18[11]	100%	8.4	6.2	mg/L	N	0.19	mg/L	**Yes**	No
MW-43	Compliance	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-43	Compliance	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No

TABLE 3-1: 5-yr Review (2011-2015) Groundwater Cleanup Level Statistical Evaluation Summary

Olympic View Sanitary Landfill

Statistical Methodology: calculation of 95% UCL of mean per MTCAStat

Data Input: 5-year window Jan 1, 2011 through Dec 31, 2015

Wells Evaluated: (1) Compliance -- MW-15R, MW-34A, MW-34C, MW-39, MW-42, MW-43; (2) Downgradient -- MW-9+, MW-29A, MW-32, MW-33A, MW-33C, MW-36A

Monitoring Well	Monitoring Well Type	Corrective Action Monitoring Parameter	N[1]	% Detect	Max[2]	95% UCL of Mean[3]	Units[4]	Note	Groundwater Cleanup Level[5]	Units[4]	Does 95% UCL Exceed Cleanup Level?	Significant Trend?[6]
MW-43	Compliance	Arsenic, dissolved	20	25%	0.05	0.05	ug/L	A	0.462	ug/L	No	No
MW-43	Compliance	Iron, dissolved	20	80%	0.87	0.44	mg/L	N	0.30	mg/L	Yes	No
MW-43	Compliance	Manganese, dissolved	20	100%	0.37	0.19	mg/L	N	0.05	mg/L	Yes	No
MW-43	Compliance	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-43	Compliance	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-43	Compliance	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-43	Compliance	Vinyl Chloride	20	5.0%	0.036	0.036	ug/L	A	0.20	ug/L	No	No
MW-43	Compliance	Ammonia as N	20	80%	0.18	0.10	mg/L	N	0.19	mg/L	No	No
MW-29A	Downgradient	1,1-Dichloroethane	10	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-29A	Downgradient	1,4-Dichlorobenzene	10	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-29A	Downgradient	Arsenic, dissolved	10	100%	1.99	1.67	ug/L	Z	0.462	ug/L	Yes	No
MW-29A	Downgradient	Iron, dissolved	10	100%	4.4	4.09	mg/L	LN	0.30	mg/L	Yes	No
MW-29A	Downgradient	Manganese, dissolved	10	100%	1.5	1.37	mg/L	LN	0.05	mg/L	Yes	No
MW-29A	Downgradient	cis-1,2-dichloroethene	10	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-29A	Downgradient	Ethyl ether	10	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-29A	Downgradient	Trichloroethene	10	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-29A	Downgradient	Vinyl Chloride	10	0%	0.02 (ND)	0.02	ug/L	B	0.20	ug/L	No	No
MW-29A	Downgradient	Ammonia as N	10	100%	0.14	0.11	mg/L	Z	0.19	mg/L	No	No
MW-32	Downgradient	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-32	Downgradient	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-32	Downgradient	Arsenic, dissolved	20	100%	11.4	9.6	ug/L	Z	0.462	ug/L	Yes	No
MW-32	Downgradient	Iron, dissolved	20	100%	0.87	0.70	mg/L	LN	0.30	mg/L	Yes	No
MW-32	Downgradient	Manganese, dissolved	20	100%	3.0	2.3	mg/L	LN	0.05	mg/L	Yes	No
MW-32	Downgradient	cis-1,2-dichloroethene	20	5%	0.81 (ND)	0.81	ug/L	A*	35	ug/L	No	No
MW-32	Downgradient	Ethyl ether	19	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-32	Downgradient	Trichloroethene	20	65%	0.70	0.52	ug/L	LN	1.0	ug/L	No	No
MW-32	Downgradient	Vinyl Chloride	20	100%	0.63	0.44	ug/L	LN	0.20	ug/L	Yes	No

TABLE 3-1: 5-yr Review (2011-2015) Groundwater Cleanup Level Statistical Evaluation Summary

Olympic View Sanitary Landfill

Statistical Methodology: calculation of 95% UCL of mean per MTCAStat

Data Input: 5-year window Jan 1, 2011 through Dec 31, 2015

Wells Evaluated: (1) Compliance -- MW-15R, MW-34A, MW-34C, MW-39, MW-42, MW-43; (2) Downgradient -- MW-9+, MW-29A, MW-32, MW-33A, MW-33C, MW-36A

Monitoring Well	Monitoring Well Type	Corrective Action Monitoring Parameter	N[1]	% Detect	Max[2]	95% UCL of Mean[3]	Units[4]	Note	Groundwater Cleanup Level[5]	Units[4]	Does 95% UCL Exceed Cleanup Level?	Significant Trend?[6]
MW-32	Downgradient	Ammonia as N	19	47%	0.17	0.17	mg/L	A	0.19	mg/L	No	No
MW-33A	Downgradient	1,1-Dichloroethane	10	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-33A	Downgradient	1,4-Dichlorobenzene	10	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-33A	Downgradient	Arsenic, dissolved	10	100%	0.37	0.20	ug/L	Z	0.462	ug/L	No	No
MW-33A	Downgradient	Iron, dissolved	10	90%	5.1	5.1	mg/L	A**	0.30	mg/L	Yes	No
MW-33A	Downgradient	Manganese, dissolved	10	100%	0.11	0.20	mg/L	LN	0.05	mg/L	Yes	No
MW-33A	Downgradient	cis-1,2-dichloroethene	10	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-33A	Downgradient	Ethyl ether	10	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-33A	Downgradient	Trichloroethene	10	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-33A	Downgradient	Vinyl Chloride	10	0%	0.02 (ND)	0.02	ug/L	B	0.20	ug/L	No	No
MW-33A	Downgradient	Ammonia as N	10	80%	0.28	0.28	mg/L	A***	0.19	mg/L	Yes	No
MW-33C	Downgradient	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-33C	Downgradient	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-33C	Downgradient	Arsenic, dissolved	20	100%	2.66	2.44	ug/L	LN	0.462	ug/L	Yes	No
MW-33C	Downgradient	Iron, dissolved	20	15%	0.38	0.38	mg/L	A	0.3	mg/L	Yes	No
MW-33C	Downgradient	Manganese, dissolved	20	100%	0.20	0.15	mg/L	Z	0.05	mg/L	Yes	No
MW-33C	Downgradient	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-33C	Downgradient	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-33C	Downgradient	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-33C	Downgradient	Vinyl Chloride	20	0%	0.02 (ND)	0.02	ug/L	B	0.20	ug/L	No	No
MW-33C	Downgradient	Ammonia as N	20	30%	0.15	0.15	mg/L	A	0.19	mg/L	No	No
MW-36A	Downgradient	1,1-Dichloroethane	20	0%	0.38 (ND)	0.38	ug/L	B	50	ug/L	No	No
MW-36A	Downgradient	1,4-Dichlorobenzene	20	0%	0.84 (ND)	0.84	ug/L	B	2.0	ug/L	No	No
MW-36A	Downgradient	Arsenic, dissolved	20	100%	0.96	0.73	ug/L	LN	0.462	ug/L	Yes	Yes (▼)
MW-36A	Downgradient	Iron, dissolved	20	15%	0.13	0.13	mg/L	A	0.3	mg/L	No	No
MW-36A	Downgradient	Manganese, dissolved	20	50%	0.0063	0.003	mg/L	LN	0.05	mg/L	No	No

TABLE 3-1: 5-yr Review (2011-2015) Groundwater Cleanup Level Statistical Evaluation Summary

Olympic View Sanitary Landfill

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Data Input: 5-year window Jan 1, 2011 through Dec 31, 2015

Wells Evaluated: (1) Compliance -- MW-15R, MW-34A, MW-34C, MW-39, MW-42, MW-43; (2) Downgradient -- MW-9+, MW-29A, MW-32, MW-33A, MW-33C, MW-36A

Monitoring Well	Monitoring Well Type	Corrective Action Monitoring Parameter	N[1]	% Detect	Max[2]	95% UCL of Mean[3]	Units[4]	Note	Groundwater Cleanup Level[5]	Units[4]	Does 95% UCL Exceed Cleanup Level?	Significant Trend?[6]
MW-36A	Downgradient	cis-1,2-dichloroethene	20	0%	0.81 (ND)	0.81	ug/L	B	35	ug/L	No	No
MW-36A	Downgradient	Ethyl ether	20	0%	0.72 (ND)	0.72	ug/L	B	50	ug/L	No	No
MW-36A	Downgradient	Trichloroethene	20	0%	0.46 (ND)	0.46	ug/L	B	1.0	ug/L	No	No
MW-36A	Downgradient	Vinyl Chloride	20	5.0%	0.063	0.063	ug/L	A	0.20	ug/L	No	No
MW-36A	Downgradient	Ammonia as N	19[12]	26%	0.077	0.077	mg/L	A	0.19	mg/L	No	No

NOTES:

* Well MW-9 is no longer routinely sampled and no longer included on this table

[1] N = number of data points used for UCL calculation of the mean; only SIM results used for Vinyl Chloride (e.g., duplicate results with higher RLs by non-SIM were omitted).

[2] MAX = maximum detected result in the data set; if no detected results, then = maximum reporting limit for non-detect results (indicated with ND).

[3] A 5-year data set, 2011 - 2015, is used for calculation of the UCL.

[4] ug/L - micrograms per liter; mg/L = milligrams per liter.

[5] Groundwater Cleanup Levels are listed on Table 3 of the October 2010 Draft Cleanup Action Plan.

[6] Trend analysis results are based on data for the 5-yr period January 2011 through December 2015; arrows indicated increasing (▲) or decreasing (▼) trends.

[7] For MW-15R, outlier of 0.49 mg/L from 2-24-15 sampling event was removed prior to UCL calculation

[8] For MW-15R, outlier of 0.31 mg/L from 6-7-12 sampling event was removed prior to UCL calculation

[9] For MW-34C, outliers of 25 mg/L on 3-4-14, 59 mg/L on 9-23-14, and 7.8 mg/L on 2-24-15 were removed prior to UCL calculation

[10] For MW-39, outlier of <0.06 mg/L from 12-4-12 sampling event was removed prior to UCL calculation

[11] For MW-42, outliers of 59 mg/L on 9-3-13 and <0.03 on 12-4-12 were removed prior to UCL calculation

[12] For MW-36A, outlier of 0.30 mg/L from 6-7-12 sampling event was removed prior to UCL calculation

A = Detection frequency of data set too low to calculate 95% UCL of mean; therefore, the highest detected result in the data set used to represent 95% UCL of mean.

A* = Same as note "A" except that the highest value in the data set is below the reporting limit of one or more non-detected results; therefore, the highest reporting limit is used to represent the 95% UCL of the mean.

A** = MTCAStat suggests use of lognormal formula but calculation of 95% UCL of mean by Land's formula provides unrealistic result; therefore, the highest detected result is used to represent the 95% UCL of the mean.

A*** = MTCAStat suggests use of the Z-score method but then cites inability to calculate due to too many censored values; therefore, the highest detected result is used to represent the 95% UCL of the mean.

B = Detection frequency = 0; therefore, the highest reporting limit in the data set is used to represent the 95% UCL of mean.

LN = The 95% UCL of the mean is calculated using Land's formula since lognormal distribution is indicated.

N = The 95% UCL of the mean is calculated using a normal-based t-statistic since a normal distribution is indicated.

Z = the 95% UCL of the mean is calculated using the Z-score method in MTCAStat since neither normal nor lognormal distribution can be determined.

Prepared by: GeoChem Applications

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7.8 Upper Confidence Limit Comparison to Cleanup Level: 2011 to 2015

Year-to-Year Results of UCL vs Clean-up Goal
5-year look-back (2011 - 2015)

▲ UCL above clean-up goal ▼ UCL below clean-up goal

Compliance Well	MW-15R				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▲
Arsenic, dissolved	▼	▼	▼	▼	▼
Iron, dissolved	▼	▼	▼	▼	▼
Manganese, dissolved	▼	▼	▼	▼	▼
Ammonia (as N)	▼	▼	▼	▼	▼

Compliance Well	MW-34A				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▼	▲	▲	▲	▲
Iron, dissolved	▼	▼	▼	▼	▼
Manganese, dissolved	▼	▼	▼	▼	▼
Ammonia (as N)	▼	▼	▼	▼	▼

Compliance Well	MW-34C				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▲
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▲	▲	▲	▲	▲
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▼	▼	▼	▼	▼

Compliance Well	MW-39				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▲	▲	▲	▲	▲
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▲	▲	▲	▲	▲

Compliance Well	MW-42				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▲
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▲	▲	▲	▲	▲
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▲	▲	▲	▲	▲

Year-to-Year Results of UCL vs Clean-up Goal

5-year look-back (2011 - 2015)

▲ UCL above clean-up goal | ▼ UCL below clean-up goal

Compliance Well	MW-43				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▼	▼	▼	▼	▼
Iron, dissolved	▲	▲	▲	▼	▲
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▼	▼	▼	▼	▲

Downgradient Well	MW-29A				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▲	▲	▲	▲	▲
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▼	▼	▼	▼	▼

Downgradient Well	MW-32				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▲	▲	▲	▲	▲
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▲	▲	▲	▲	▲
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▼	▼	▼	▼	▼

Downgradient Well	MW-33A				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▼	▼	▼	▼	▼
Iron, dissolved	▲	▲	▲	▲	▲
Manganese, dissolved	▲	▲	▲	▲	▼
Ammonia (as N)	▲	▲	▲	▲	▲

Downgradient Well	MW-33C				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▲	▲	▼	▼	▼
Manganese, dissolved	▲	▲	▲	▲	▲
Ammonia (as N)	▼	▼	▲	▼	▼

Year-to-Year Results of UCL vs Clean-up Goal

5-year look-back (2011 - 2015)

Downgradient Well	▲ UCL above clean-up goal		▼ UCL below clean-up goal		
	MW-36A				
	2015	2014	2013	2012	2011
1,1-Dichloroethane	▼	▼	▼	▼	▼
1,4-Dichlorobenzene	▼	▼	▼	▼	▼
cis-1,2-dichloroethene	▼	▼	▼	▼	▼
Ethyl Ether	▼	▼	▼	▼	▼
Trichloroethene	▼	▼	▼	▼	▼
Vinyl Chloride	▼	▼	▼	▼	▼
Arsenic, dissolved	▲	▲	▲	▲	▲
Iron, dissolved	▼	▼	▼	▼	▼
Manganese, dissolved	▼	▼	▼	▼	▼
Ammonia (as N)	▼	▼	▼	▼	▼

7.9 Results for Trend: 2011 to 2015

Results of Sen's Non-Parametric Test for Trend

5-yr Review **Trend Test Period:** January 2011 through December 2015

▲ Statistically significant increasing trend ▼ Statistically significant decreasing trend

	Compliance Wells						Performance Wells						Downgradient Wells					Upgradient Wells			
	MW-15R	MW-34A	MW-34C	MW-39	MW-42	MW-43	MW-2B1	MW-4	MW-19C	MW-20	MW-23A	MW-24	MW-29A	MW-32	MW-33A	MW-33C	MW-36A	MW-13A	MW-13B	MW-16	MW-35
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethene (total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butyl Alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
tert-Butyl Alcohol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrahydrofuran	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic, dissolved	--	--	--	--	--	--	--	--	--	--	▼	▼	--	--	--	--	▼	--	--	--	--
Barium, dissolved	--	--	--	--	--	--	▼	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate (as N)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Specific Conductivity	--	--	--	--	--	--	▼	--	--	--	--	--	--	--	--	▲	--	--	--	--	--
Temperature	--	▲	▲	▲	--	▲	--	▲	--	--	--	--	--	--	--	--	--	--	--	--	--
Calcium, dissolved	▼	--	▼	--	--	--	▼	--	--	--	--	--	--	--	--	--	▼	--	--	--	--
Bicarbonate Alkalinity (as CaCO3)	▼	--	▼	--	--	--	▼	--	--	--	--	--	--	--	--	--	▼	▼	--	--	--
Magnesium, dissolved	▼	--	▼	--	--	--	▼	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	--	--	--	--	▼	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium, dissolved	▼	--	▼	--	--	--	▼	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	▼	▼	▼	--	--	--	▼	--	▼	--	--	▼	--	--	--	--	--	--	--	--	--
Potassium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Alkalinity as CaCO3	▼	--	▼	--	--	--	▼	--	--	--	--	--	--	--	--	--	▼	▼	--	--	--
Iron, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia (as N)	--	--	--	--	--	--	--	--	▲	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Dissolved Solids	▼	--	▼	--	--	--	▼	--	--	--	--	--	--	--	--	--	--	--	--	--	--

7.10 Results for Trend: 2005 to 2015

TABLE 1-1

Results of Sen's Non-Parametric Test for Trend

FOURTH QUARTER 2015 REPORT

Trend Test Period: January 2005 through December 2015

Trend Test Wells:

- Compliance Wells: MW-15R, MW-34A, MW-34C, MW-39, MW-42, MW-43
- Performance Wells: MW-2B1, MW-4, MW-19C, MW-20, MW-23A, MW-24
- Downgradient Wells: MW-9*, MW-29A**, MW-32, MW-33A**, MW-33C, MW-36A
- Upgradient Wells MW-13A, MW-13B, MW-16, MW-35,

*no longer routinely sampled; **sampled semi-annually

Trend Test A *= all organic parameters listed in Appendix I and Appendix II of WAC 173-351-990 that have been detected at least once in at least one of 22 wells comprising the network of 1) compliance, 2) performance, 3) downgradient, and 4) upgradient site monitoring wells, during the trend test period. This includes the following constituents:*

	Significant Increasing Trends	Significant Decreasing Trends
1,1-Dichloroethane	None	None
1,2-Dichloroethene (total)	None	None
1,2-Dichlorobenzene	None	None
1,4-Dichlorobenzene	None	None
Acetone	None	None
Benzene	None	None
Carbon Disulfide	None	None
Chlorobenzene	None	None
Chlorodifluoromethane	None	None
Chloroethane	None	None
Chloroform	None	None
Chloromethane	None	None
cis-1,2-dichloroethene	None	None
Dichlorodifluoromethane	None	None
Ethyl Ether	None	None
Methylene Chloride	None	None
Naphthalene	None	None
n-Butyl Alcohol	None	None
tert-Butyl Alcohol	None	None
Tetrachloroethene	None	None
Tetrahydrofuran	None	None
Toluene	None	None
trans-1,2-Dichloroethene	None	None
Trichloroethene	None	MW-19C (graph 533)

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TABLE 1-1

Vinyl Chloride	None	MW-19C (graph 555) MW-24 (graph 558) MW-34C (graph 565)
Trend Test B *= all metals and groundwater quality parameters listed in Appendix I and Appendix II of WAC (173-351-990)*		
	Significant Increasing Trends	Significant Decreasing Trends
Antimony, dissolved	None	None
Arsenic, dissolved	None	MW-16 (graph 92) MW-19C (graph 93) MW-23A (graph 95) MW-24 (graph 96) MW-32 (graph 99) MW-33C (graph 101) MW-34C (graph 103) MW-36A (graph 105) MW-4 (graph 107)
Barium, dissolved	None	MW-15R (graph 113) MW-19C (graph 115) MW-24 (graph 118) MW-29A (graph 119) MW-34A (graph 124) MW-36A (graph 127)
Beryllium, dissolved	None	None
Cadmium, dissolved	None	None
Chromium, dissolved	MW-36A (graph 237)	MW-16 (graph 224)
Cobalt, dissolved	None	None
Copper, dissolved	None	None
Lead, dissolved	None	None
Nickel, dissolved	None	None
Selenium, dissolved	None	None
Silver, dissolved	None	None
Thallium, dissolved	None	None
Vanadium, dissolved	None	MW-36A (graph 677)
Zinc, dissolved	None	None
Nitrate (as N)	MW-20 (graph 402) MW-35 (graph 412) MW-36A (graph 413)	None
pH	MW-23A (graph 425) MW-42 (graph 438)	None

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TABLE 1-1

Specific Conductivity	None	MW-15R (graph 531) MW-19C (graph 533) MW-23A (graph 535) MW-24 (graph 536) MW-29A (graph 537) MW-2B1 (graph 538) MW-32 (graph 539) MW-33A (graph 540) MW-34A (graph 542) MW-34C (graph 543) MW-36A (graph 545) MW-4 (graph 547)
Temperature	MW-15R (graph 575) MW-20 (graph 578) MW-2B1 (graph 582) MW-32 (graph 583) MW-33C (graph 585) MW-34A (graph 586) MW-34C (graph 587) MW-35 (graph 588)	MW-24 (graph 580)
Calcium, dissolved	None	MW-15R (graph 179) MW-23A (graph 183) MW-24 (graph 184) MW-29A (graph 185) MW-2B1 (graph 186) MW-33A (graph 188) MW-34A (graph 190) MW-34C (graph 191) MW-36A (graph 193) MW-9 (graph 198)
Bicarbonate Alkalinity (as CaCO3)	MW-13B (graph 2) MW-35 (graph 16)	MW-15R (graph 3) MW-23A (graph 7) MW-24 (graph 8) MW-2B1 (graph 10) MW-36A (graph 17) MW-4 (graph 19)
Magnesium, dissolved	None	MW-15R (graph 333) MW-23A (graph 337) MW-24 (graph 338) MW-2B1 (graph 340) MW-33A (graph 342) MW-34A (graph 344) MW-34C (graph 345)

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TABLE 1-1

Sulfate	MW-24 (graph 558)	MW-13A (graph 551) MW-13B (graph 552) MW-19C (graph 555) MW-23A (graph 557) MW-36A (graph 567) MW-4 (graph 569)
Sodium, dissolved	MW-20 (graph 512)	MW-15R (graph 509) MW-19C (graph 511) MW-23A (graph 513) MW-24 (graph 514) MW-2B1 (graph 516) MW-34A (graph 520) MW-34C (graph 521)
Chloride	MW-39 (216)	MW-15R (graph 201) MW-16 (graph 202) MW-19C (graph 203) MW-23A (graph 205) MW-2B1 (graph 208) MW-33A (graph 210) MW-34A (graph 212) MW-34C (graph 213) MW-35 (graph 214) MW-36A (graph 215) MW-4 (graph 217)
Potassium, dissolved	MW-20 (graph 446) MW-42 (graph 460)	None
Total Alkalinity as CaCO3	MW-13B (graph 24) MW-35 (graph 38)	MW-15R (graph 25) MW-23A (graph 29) MW-24 (graph 30) MW-2B1 (graph 32) MW-36A (graph 39)
Iron, dissolved	None	MW-19C (graph 291) MW-24 (graph 294) MW-32 (graph 297) MW-34C (graph 301) MW-9 (graph 308)
Manganese, dissolved	None	MW-15R (graph 355) MW-23A (graph 359) MW-24 (graph 360) MW-34C (graph 367)
Ammonia (as N)	None	MW-29A (graph 53)
Total Organic Carbon	None	None

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TABLE 1-1

Total Dissolved Solids	None	MW-15R (graph 619) MW-23A (graph 623) MW-24 (graph 624) MW-2B1 (graph 626) MW-33A (graph 628) MW-34C (graph 631)

7.11 Groundwater and Surface Water Criteria

Groundwater Cleanup Levels

Indicator Hazardous Substance	Units	Groundwater Standards & Criteria			Protection of Surface Water												Background (f)
			MTCA Method B (b)		WA State Surface Water Quality Standards (c)				National Toxics Rule (d)				National Recommended Water Quality Criteria (e)				
		Federal & State MCL (a)	Carcinogen $1x10^{-6}$ risk	Non carcinogen	Aquatic Life Freshwater Max Conc.	Aquatic Life Freshwater Continuous Conc.	Human Health Water & Organisms	Human Health Organisms only	Freshwater Max Conc.	Freshwater Continuous Conc.	HH water + organism	HH organism only	Freshwater Max Conc.	Freshwater Continuous Conc.	HH water + organism	HH organism only	
Arsenic	mg/l	0.01	0.000058	0.0048	0.36	0.19			0.36	0.19	0.000018	0.00014	0.34	0.15	0.000018	0.00014	**0.0005** (0.000462)
Iron	mg/l	0.3	NE	**11.2** (NE)	NE	NE	**NE**	**NE**	NE	NE	NE	NE	NE	1	0.3	NE	**0.31** (0.23)
Manganese	mg/l	0.05	NE	2.2	NE	NE	**NE**	**NE**	NE	NE	NE	NE	NE	NE	0.05	0.1	**0.062** (0.031)
1,4-Dichlorobenzene	µg/l	75	**8.1** (1.8)	**560** (NE)	NE	NE	**460**	**580**	NE	NE	400	2600	NE	NE	**300** (63)	**900** (190)	NA
1,1-Dichloroethane	µg/l	NE	**7.68** (NE)	1600	NE	NE	**NE**	**NE**	NE	NE	NE	NE	NE	NE	NE	NE	NA
cis-1,2-Dichloroethene	µg/l	70	NE	**16** (80)	NE	NE	**NE**	**NE**	NE	NE	NE	NE	NE	NE	NE	NE	NA
Ethyl ether	µg/l	NE	NE	1600	NE	NE	**NE**	**NE**	NE	NE	NE	NE	NE	NE	NE	NE	NA
Trichloroethene	µg/l	5	**0.54** (0.49)	**4** (2.4)	NE	NE	**0.38**	**0.86**	NE	NE	2.7	81	NE	NE	**0.6**	**7**	NA
Vinyl Chloride	µg/l	2	0.029	24	NE	NE	**0.02**	**0.26**	NE	NE	2	525	NE	NE	**0.022**	**1.6**	NA
Ammonia	mg/l	NE	NE	NE	**20 (g, h)**	**0.00781 (g, h)**	**NE**	**NE**	NE	NE	NE	NE	NE	NE	NE	NE	**0.3** (0.19)

Red indicates new values since the 2010 Cleanup Action Plan. Numbers in parentheses are previous values.
(a) MCL = maximum contaminant level as either a federal or state primary or secondary drinking water standard
(b) All values are from the CLARC table except the vinyl chloride carcinogen value is calculated in accordance with guidance referred to in the CLARC table.
(c) WAC 173-201A-240
(d) 40 CFR Part 131
(e) Section 304 of the Clean Water Act
(f) Background is the site prediction limit calculated at 99% upper confidence level for upgradient wells
(g) Assumes avgerage surface water pH of 7.19 and temperature of 10.3 degrees (Remedial Investigation Report, Table 6-5)
(h) Previous values of 36.7 mg/l for freshwater maximum and 0.00057 mg/l for freshwater continuous were based on pH of 6 and temperature of 12 degrees C

7.12 WM WA letter requesting modifications to groundwater monitoring program

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Closed Site Management Group
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Sun Valley, CA 91352
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Solid & Hazardous Waste Program
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Bremerton, WA 98337

SUBJECT: Request to Reduce Groundwater Monitoring Network and Groundwater Monitoring Frequency, Olympic View Sanitary Landfill, Port Orchard, Washington

Dear Madeline and Janet,

Waste Management of Washington (WMW) has prepared this letter to describe proposed changes to the groundwater monitoring program for Olympic View Sanitary Landfill (OVSL).

As discussed during our meeting with the Department of Ecology (Ecology) and Kitsap County Health Department (KCHD) on August 9, 2016, WMW would like to reduce the scope of the ongoing groundwater quality monitoring program as follows:

- Termination of water quality monitoring from monitoring wells identified as performance monitoring wells in the 2009 Environmental Monitoring Plan (EMP);
- Reduction in the frequency of groundwater monitoring for those wells identified as downgradient monitoring wells in the 2009 EMP from quarterly to semi-annually, with the exception of monitoring well MW-32, which will remain on a quarterly sampling frequency; and
- Reduction in the frequency of measurement and number of monitoring wells included in the Site-wide water level monitoring program.

All other aspects of the groundwater quality monitoring program as defined in the EMP will remain the same including quarterly monitoring of the background and compliance monitoring wells.

The reasons for the proposed reductions are described below.

Termination of Water Quality Monitoring in Performance Monitoring Wells

As stated in the EMP, the intended use of water quality data obtained from the performance monitoring wells was to provide an early indication of the potential effectiveness of corrective actions implemented at the Site. The majority of the corrective actions described in Ecology's 2010 Corrective Action Plan (CAP) for the Site were already in place prior to the issuance of the CAP and additional actions were taken in 2011. Therefore, all of the corrective actions have been in place for at least five years and for most of the actions on the order of 10 or more years. Review of the water quality data from not only the performance monitoring wells, but also the compliance monitoring wells and in some instances the downgradient wells indicates that the actions that have been taken have greatly reduced the levels of volatile organic compounds (VOCs) such that with the exception of vinyl well MW-32, all of the wells meet the cleanup standards for VOCs established in the CAP. Therefore, water quality data from the performance monitoring wells are not necessary to demonstrate the effectiveness of the corrective actions.

Reduction in Monitoring Frequency for the Downgradient Wells

With the exception of vinyl chloride in monitoring well MW-32, which currently slightly exceeds the cleanup standard, all of the downgradient monitoring wells meet, and have met for some time, the cleanup standards for VOCs. The downgradient, along with other wells at the Site, do contain trace metals, notably arsenic, iron and manganese, at levels above the cleanup standards, the trace metal levels in several of the downgradient wells are in decline, although at relative slow rates. Given the overall reductions and general improvement in the levels of VOCs in groundwater and occurrences of landfill gas along in soil along the margins of the landfill relative to the slow rates of decline, or in some case the absence of any decline in the trace metal levels, suggests that the source of the trace metals may not be due to landfill gas occurrences or leachate migration. Instead, these occurrences may reflect reducing conditions associated with the reduced recharge shadow beneath the landfill resulting from the presence of a low permeability cap and in some portions of the landfill a low permeability liner, and/or the presence of reducing conditions associated with the wetlands located immediately downgradient of the landfill in the vicinity of the compliance and downgradient monitoring wells.

Reductions in the Scope of the Site-wide Water Level Monitoring Program

Waste Management of Washington currently measures water levels on a quarterly basis from 56 monitoring wells at the Site. Review of the forty groundwater elevation maps obtained over the last 10 years indicates that the direction and magnitude of hydraulic gradient has remained essentially unchanged over this period, with the general flow direction always being to the west-northwest. Given the overall consistency of the hydraulic gradient, Waste Management of Washington, is proposing to reduce the frequency of collection of Site-wide water level data from quarterly to semi-annual, to be done in the spring and fall monitoring events. Water level measurements would still be

obtained from those wells (*e.g.*, upgradient and compliance monitoring wells, and MW-32) that are sampled for water quality during the winter and summer months.

Waste Management of Washington would also propose to delete certain wells from all of the water quality monitoring activities due to access constraints, redundancy and the fact that some of the wells are located far outside of any groundwater flow path that potentially extends beneath the Site and are also unnecessary for preparation of groundwater elevation maps. We have attached two versions of the May 2016 groundwater elevation figure. The first (Figure 2) is based on the water level data obtained from all of the wells while the second (Figure 2R) is based on water level data obtained from a smaller set of wells. Both figures display similar water level contours and potentiometric surfaces. A table of the complete set of water level data for the May 2016 event, indicating which wells were used to prepare Figure 2R, is also attached. Waste Management of Washington proposes to reduce the water level monitoring program to the reduced list of wells indicated on the attached table. Subject to approval by Ecology, Waste Management of Washington would propose to abandon the other wells.

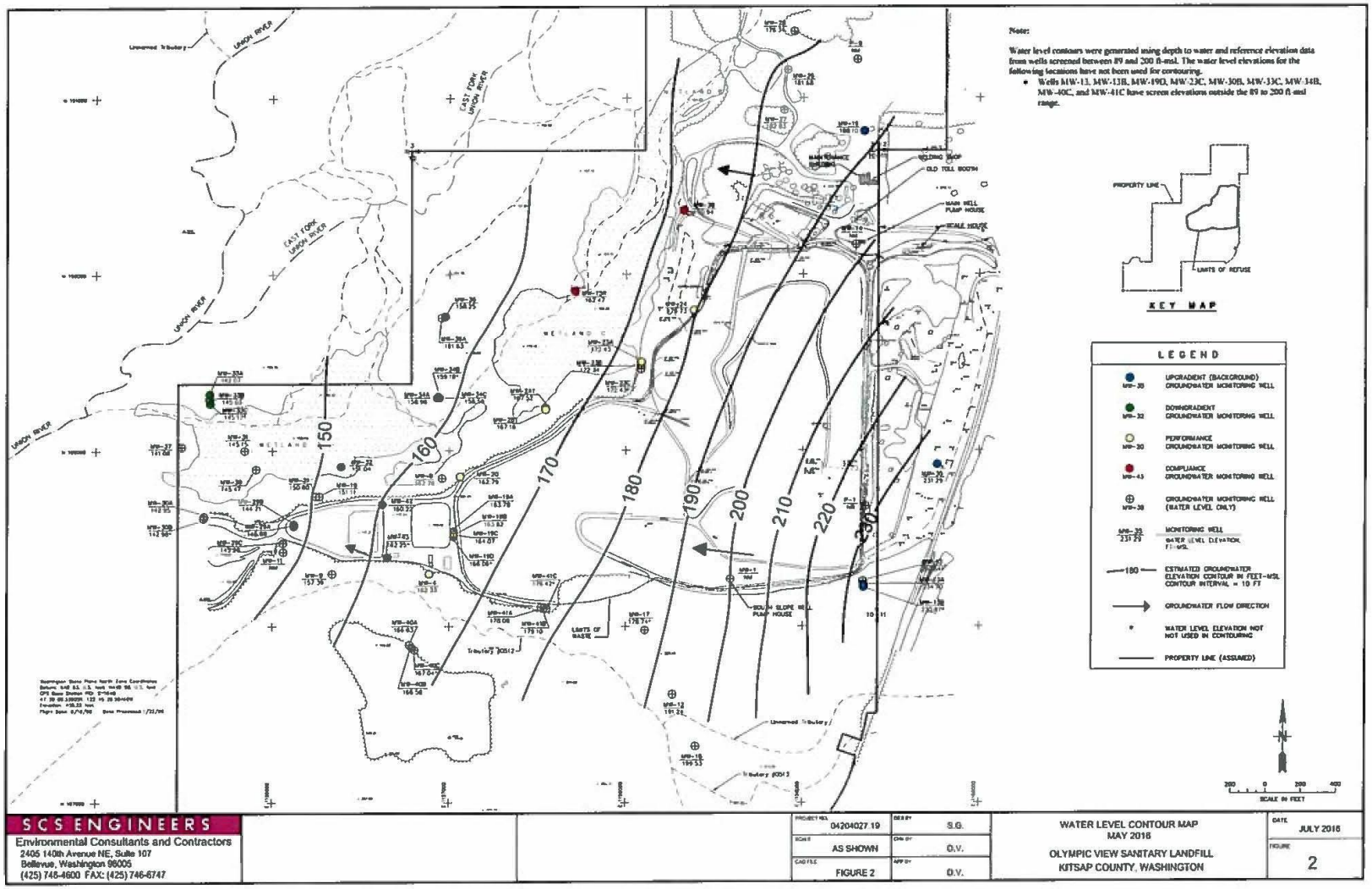
Please do not hesitate to contact us if you require additional assistance or have any questions.

Waste Management of Washington

Philip C. Perley
Senior District Manager

Attachments

Figure 2 – May 2016 Groundwater Elevation Map
Figure 2R – May 2016 Groundwater Elevation Map Based on a Reduced Set of Water Level Data
Table 1: Summary of May 2016 Water Level Data


Note:
Water level contours were generated using depth to water and reference elevation data from wells screened between 89 and 200 ft-msl. The water level elevations for the following locations have not been used for contouring.
• Wells MW-13, MW-13B, MW-19D, MW-23C, MW-30B, MW-33C, MW-34B, MW-40C, and MW-41C have screen elevations outside the 89 to 200 ft-msl range.
KEY MAP
PROPERTY LINE
LIMITS OF REFUSE
LEGEND
UPGRADIENT (BACKGROUND) GROUNDWATER MONITORING WELL
DOWNGRADIENT GROUNDWATER MONITORING WELL
PERFORMANCE GROUNDWATER MONITORING WELL
COMPLIANCE GROUNDWATER MONITORING WELL
GROUNDWATER MONITORING WELL (WATER LEVEL ONLY)
MONITORING WELL WATER LEVEL ELEVATION, FT-MSL
ESTIMATED GROUNDWATER ELEVATION CONTOUR IN FEET-MSL CONTOUR INTERVAL = 10 FT
GROUNDWATER FLOW DIRECTION
WATER LEVEL ELEVATION NOT NOT USED IN CONTOURING
PROPERTY LINE (ASSUMED)
150
160
170
180
190
200
210
220
230
CAST FORK UNION RIVER
UNION RIVER
WETLAND C
WETLAND D
LIMITS OF BASE
SCALE IN FEET
SCS ENGINEERS
Environmental Consultants and Contractors
2405 140th Avenue NE, Suite 107
Bellevue, Washington 98005
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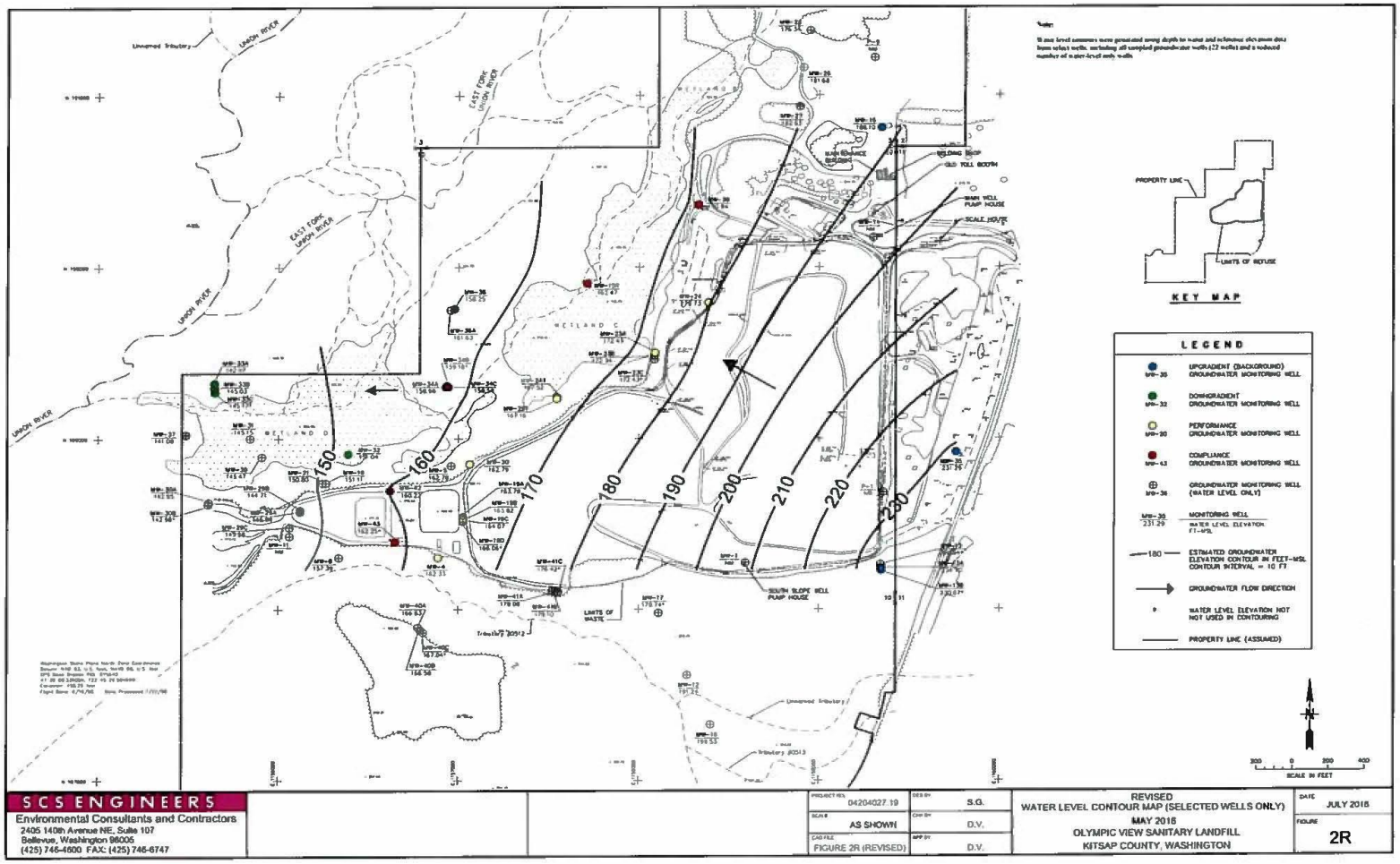
PROJECT NO. 04204027.19
SCALE AS SHOWN
CAD FILE FIGURE 2
DESIGN BY S.G.
CHK BY D.V.
APP BY D.V.
WATER LEVEL CONTOUR MAP
MAY 2016
OLYMPIC VIEW SANITARY LANDFILL
KITSAP COUNTY, WASHINGTON
DATE JULY 2016
FIGURE 2


KEY MAP
PROPERTY LINE
LIMITS OF REFUSE
LEGEND
UPGRADIENT (BACKGROUND) GROUNDWATER MONITORING WELL
DOWNGRADIENT GROUNDWATER MONITORING WELL
PERFORMANCE GROUNDWATER MONITORING WELL
COMPLIANCE GROUNDWATER MONITORING WELL
GROUNDWATER MONITORING WELL (WATER LEVEL ONLY)
MONITORING WELL
WATER LEVEL ELEVATION FT-MSL
ESTIMATED GROUNDWATER ELEVATION CONTOUR IN FEET-MSL CONTOUR INTERVAL = 10 FT
GROUNDWATER FLOW DIRECTION
WATER LEVEL ELEVATION NOT NOT USED IN CONTOURING
PROPERTY LINE (ASSUMED)
150
160
170
180
190
200
210
220
230
EAST FORK UNION RIVER
UNION RIVER
WETLAND C
WETLAND D
SOUTH SLOPE WELL PUMP HOUSE
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04204027.19
S.G.
AS SHOWN
D.V.
FIGURE 2R (REVISED)
D.V.
REVISED
WATER LEVEL CONTOUR MAP (SELECTED WELLS ONLY)
MAY 2016
OLYMPIC VIEW SANITARY LANDFILL
KITSAP COUNTY, WASHINGTON
JULY 2016
2R

SHORT WELL LIST
Second Quarter 2016 Monitoring Report
Olympic View Sanitary Landfill, Kitsap County, Washington

Location	TOC (ft. MSL)	DTW (ft.)	WLE (ft. MSL)
Water Quality Monitoring Wells			
MW-2B1	172.94	5.78	**167.16**
MW-4	175.78	13.45	**162.33**
MW-13A	288.74	54.04	**234.70**
MW-13B	288.66	57.79	**230.87**
MW-15R	180.66	18.19	**162.47**
MW-16	240.01	51.91	**188.10**
MW-19C	196.96	32.89	**164.07**
MW-20	198.41	35.62	**162.79**
MW-23A	182.28	9.85	**172.43**
MW-24	208.25	28.52	**179.73**
MW-29A	160.21	13.33	**146.88**
MW-32	152.36	1.32	**151.04**
MW-33A	147.68	5.61	**142.07**
MW-33C	147.59	2.42	**145.17**
MW-34A	197.95	38.97	**158.98**
MW-34C	199.89	41.30	**158.59**
MW-35	302.69	71.40	**231.29**
MW-36A	192.68	31.05	**161.63**
MW-39	189.92	18.98	**170.94**
MW-42	187.43	27.21	**160.22**
MW-43	186.42	24.17	**162.25**
Water Level Measurement Only Wells			
MW-1			
MW-2A1	174.22	6.70	**167.52**
MW-5			
MW-9			
MW-10	155.12	4.01	**151.11**
MW-11			
MW-12			
MW-13			
MW-14			
MW-17			
MW-18			
MW-19A			
MW-19B			
MW-19D			
MW-21	156.03	5.23	**150.80**
MW-23B			
MW-23C			
MW-26	189.73	8.05	**181.68**
MW-27	200.65	17.82	**182.83**
MW-28	181.05	4.71	**176.34**
MW-29B			
MW-29C	156.92	11.64	**145.28**
MW-30A	166.74	23.79	**142.95**
MW-30B			
MW-31			
MW-33B			
MW-34B			
MW-36	189.39	31.14	**158.25**
MW-37			
MW-38			
MW-40A			
MW-40B			
MW-40C			
MW-41A			
MW-41B			
MW-41C	199.67	23.25	**176.42**

Notes:
Bold Well number is proposed water level measurment well
WLE = Water level elevation

7.13 List of Acronyms

CAP	Cleanup Action Plan
Covenant	Restrictive Covenant
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management System
EMP	Environmental Monitoring Program
EMSI	Engineering Management Support, Inc.
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FS	Feasibility Study
HHRA	Human Health Risk Assessment
IHS	Indicator Hazardous Substance
KPHD	Kitsap Public Health District
MSL	Mean Sea Level
MTCA	Model Toxics Control Act
NRWQC	National Recommended Water Quality Criteria
OBWL	Old Barney White Landfill
OVSL	Olympic View Sanitary Landfill
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
UCL	Upper confidence limit
WAC	Washington Administrative Code
WM WA	Waste Management of Washington