



FIFTH PERIODIC REVIEW

**Kent Highlands Landfill
Facility Site ID#: 2042**

**23076 Military Road South,
Kent, Washington 98032**

Northwest Regional Office

TOXICS CLEANUP PROGRAM

September 2019

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1.0 INTRODUCTION

This document is a review by the Washington State Department of Ecology (Ecology) of post-cleanup site conditions and monitoring data at the Kent Highlands Landfill (Site or Kent Highlands). The Site was placed on the Federal National Priorities List (NPL) on August 30, 1990 for cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA sites are known as Superfund sites. The Washington State Department of Ecology (Ecology) is the lead agency for cleanup of Kent Highlands as stipulated by an agreement with Region 10 of the Environmental Protection Agency (EPA). Accordingly, cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

The purpose of this fifth periodic review is to determine whether the cleanup remedy at the City of Seattle's Kent Highlands Landfill Superfund Site continues to be protective of human health and the environment. This periodic review is the latest in an ongoing series, the last of which was completed in 2014 (the fourth periodic review). This periodic review focuses on three areas: (1) activities undertaken by the City of Seattle since the last periodic review, (2) actions that need to be performed or modifications that need to be considered during the next five year period, and (3) a protectiveness discussion.

Cleanup activities at this Site were conducted under a Consent Order between Ecology and the City of Seattle, as executed on May 26, 1987. The cleanup actions were necessary because of high concentrations of landfill decomposition gas, and leachate with high specific conductance, high chemical oxygen demand, and high concentrations of ammonia and iron. Major metals detected were iron, zinc, and manganese. Volatile organic compounds detected were primarily ketones, aromatic hydrocarbons, and chlorinated hydrocarbons. The primary semivolatile organic compounds were low molecular weight polycyclic aromatic hydrocarbons, alkyl phenols, benzoic acid, and chlorinated benzene. The presence of the volatile and semivolatile organic compounds was consistent with the disposal of household products in the landfill. Contaminants remaining at the Site exceed MTCA cleanup levels. The MTCA cleanup levels for soil are established under WAC 173-340-740. The MTCA cleanup levels for groundwater are established under WAC 173-340-720.

WAC 173-340-420 (2) requires that Ecology conduct a periodic review of a site every five years under the following conditions:

- (a) Whenever the department conducts a cleanup action;
- (b) Whenever the department approves a cleanup action under an order, agreed order or consent decree;
- (c) Or, as resources permit, whenever the department issues a no further action opinion;
- (d) And one of the following conditions exists:
 - 1. Where an institutional control and/or financial assurance is required as part of the cleanup action;
 - 2. Where the cleanup level is based on a practical quantitation limit; or
 - 3. 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 or mixtures present at the Site;
- (c) New applicable state and federal laws for hazardous substances present at the Site;
- (d) Current and projected Site and resource uses;
- (e) The availability and practicability of more permanent remedies; and
- (f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

The department publishes a notice of all periodic reviews in the site register and provides an opportunity for public comment.

2.0 SITE CONDITIONS

2.1 Site Description and History

The Site is situated on the eastern flank of the Des Moines upland, where it adjoins the Green River valley. The landfill occupies a former natural ravine that extended about 2,500 feet from near the top of the upland down to the valley floor. The current fill surface slopes downward from a top elevation of 260 feet mean sea level (MSL) to a base elevation of 35 feet MSL at the eastern toe of the landfill.

The Seattle Solid Waste Utility started landfilling operations at the Site in 1968. The landfill received mostly municipal garbage until 1983. After 1983, the landfill also took in industrial wastes and construction debris. Disposal operations terminated on December 31, 1986. The City of Seattle was in the process of completing a closure plan at that time.

2.2 Site Regulation and Investigation

The Landfill has been subject to federal, state, and local agency regulation since its inception. It initially operated under a “Nonconforming Permit” from the Seattle-King County Department of Public Health, and Ecology imposed leachate collection and treatment requirements in 1974. No specific regulatory actions were taken with regard to landfill gas in the early years, although there were complaints of odors coming from the landfill. Gas migration was first measured directly in 1984 in gas probes installed west of the landfill. A gas monitoring program was finally initiated in 1988 at the request of the Washington State Department of Health.

Ecology conducted a Potential Hazardous Waste Site Preliminary Assessment in 1984. Based on this assessment, the Site was proposed for listing as a Superfund site. The EPA performed a preliminary assessment under its hazard ranking system, and performed a subsequent evaluation in 1990. The site was placed on the NPL on August 30, 1990 because of the presence of an unknown quantity of hazardous waste at the site. Recognizing their responsibility to conduct the investigations necessary to close the landfill, the City of Seattle entered into a Consent Order with Ecology that called for the City to conduct a remedial response program in a manner consistent with the National Contingency Plan, beginning with a remedial investigation.

The remedial investigation (RI) found that offsite gas migration had occurred, primarily on the north and west sides of the landfill. Gas migration toward the south was prevented by subsurface hydrogeologic conditions. Gas migration to the east was prevented by a shallow water table. Air dispersion modeling indicated that estimated concentrations of trace gas compounds at the landfill boundaries did not exceed Acceptable Source Impact Levels. The RI found that about 35% of the leachate within the landfill was not collected in the leachate collection system and migrated downward into the groundwater and thence eastward to the Green River. The leachate had high specific conductance, high chemical oxygen demand, high concentrations of ammonia and iron, a neutral pH, and low concentrations of sulfate and trace metals. Major metals detected were iron, zinc, and manganese. Volatile organic compounds detected were primarily ketones, aromatic hydrocarbons, and chlorinated hydrocarbons. The primary semivolatile organic

compounds were low molecular weight polycyclic aromatic hydrocarbons, alkyl phenols, benzoic acid, and chlorinated benzene. The RI report concluded that the presence of the volatile and semivolatile organic compounds was consistent with the disposal of household products in the landfill.

Contamination was found in the Sand Aquifer and in the Recent Alluvium Aquifer. Leachate in the landfill discharges primarily to the Sand Aquifer, which in turn discharges to the Recent Alluvium Aquifer. The Recent Alluvium Aquifer is in hydraulic connection with the Green River. Surface water in Midway Creek was found to be degraded by the landfill. No effects of the landfill on the water quality of the Green River were observed. Based on the results of the remedial investigation and further work, groundwater monitoring at the site was done for field parameters, conventional chemical parameters, dissolved metals, volatile organic compounds, herbicides, and pesticides.

2.3 Site Cleanup Components

Proposed remedies were evaluated in the *Closure Action Report* (Seattle, 1992) and the remedy to be implemented selected in the *Cleanup Action Plan* (Ecology, 1993). The remedy includes the following components initially implemented in 1995, and as subsequently modified at a later date (see Ecology, 1993, p. 8 ff.):

- Access Control – A 6-foot-high chain link fence provides primary access control. Environmental staff are also generally present on the landfill during working hours providing additional security.
- Site Grading – The site is graded to achieve adequate drainage slopes.
- Landfill Cover – A geomembrane cover with a prepared soil base extends over the landfill. A drainage layer above the membrane directs water away from the landfill, and is covered with a final layer of topsoil. Shallow rooted vegetation was planted in topsoil.
- Stormwater Conveyance – A stormwater drainage system was constructed to control runoff from the landfill. Sheet flow runoff from the landfill is diverted to a perimeter ditch system, which drains into a stormwater detention pond at the lower end of the Site. Water in the detention pond discharges to the Green River through a piped outfall.

Much of the water gathered by a pre-cleanup leachate collection system consisted of uncontaminated groundwater from a series of springs on the north slope of the ravine in which the landfill refuse was placed. The Cleanup Action Plan concluded that separating collected spring flow from true landfill leachate and then constructing a separate spring drain treatment and discharge system would not be cost-effective. However, the flow from the spring drain was ultimately separated, and this “clean” flow diverted into the stormwater detention pond. During dry periods most or all of the flow through the detention pond is from the Spring Drain.

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- **Leachate Control** – An existing leachate collection system at the toe of the landfill was completely rebuilt during remedial construction, including a new seep collection system below the cover. Collected leachate is directed to a pond, from which it is pumped into King County's wastewater treatment system under a Waste Discharge permit. The discharge line extends north along the abandoned Frager Road South and crosses the Green River before reaching a King County conveyance.
 - **Landfill Gas Control** – Landfill gas is controlled by maintaining a vacuum in extraction wells installed within the landfill and around its perimeter. Gas generated within the landfill thus flows toward and into the extraction wells, and then is manifolded to a thermal incinerator. The incinerator with enclosed flare is located at the base of the eastern edge of the landfill.

The initial upgrade of the gas collection system was completed as part of the remedial construction. Subsequent monitoring data indicated exceedances of compliance standards at the property boundary at the southeast corner of the landfill. The gas collection system was extended farther into this area in 2000, bringing the landfill into compliance. Appendix 9.7 shows the gas control system and wells. Because the rate of gas generation from the landfill has declined over time, the original flare was replaced with two smaller burners in 2007.

3.0 CURRENT STATUS OF POST-CLOSURE CARE

3.1 Compliance Overview

MTCA cleanup standards were not established for this Site in the Cleanup Action Plan (CAP) (Ecology, 1993). Instead, the Remedial Investigation report included a risk assessment demonstrating that carcinogenic and noncarcinogenic risks for the Site were below the acceptable levels specified by MTCA. The CAP explicitly states for the Site: "...cleanup standards have been met and the determination of cleanup standards for specific substances and pathways are not necessary." (P. 71, Ecology, 1993).

Compliance standards were therefore developed either on the basis of requirements from other regulations or as part of monitoring programs designed to confirm continued protection of human health and the environment. These compliance standards have been modified over the past years in some cases in response to changes in regulatory values and other factors.

3.2 Facility and Systems Maintenance

Facility systems maintenance and monitoring was acceptable during the periodic review period, and the facility systems (fencing and access control, landfill cover, stormwater drainage, leachate collection, landfill gas extraction, etc.) continued to function as intended, except in a few cases (see Section 4).

There were no significant system upsets or accidents during the periodic review period.

A slope stability analysis showed that the landfill continues to be stable under both static and seismic loading conditions (see Section 4.5).

Maintenance and tracking of the landfill facility and remedial systems is conducted in accordance with the Kent Highlands Landfill Post-Closure Operations and Maintenance Manual (CH2M, 1996).

Cap integrity, landfill settlement, and slope stability are also monitored periodically. Landfill settlement has the potential to change existing grades and create areas of ponded stormwater. It can also indicate a destabilized slope at the steeper eastern end of the landfill.

Slope stability is evaluated at each periodic review by considering whether the land surface has steepened and whether fluid levels have increased within the toe of the landfill. If the slope and fluid levels exceed the factors of safety used in the original stability analysis, immediate remedial action might be needed.

To provide the necessary topographic data for evaluating settlement and slope stability, aerial photogrammetric maps are prepared. The first was prepared as part of the 1991 landfill remedial action (closure), and a second in 2005, with the intent to prepare additional maps at approximately 10-year intervals. Ultimately, the aerial surveys will be replaced with a ground-based system involving one survey monument per acre of landfill. This system will be instituted at least 10 years before the City anticipates applying to discontinue post-closure care.

Fluid levels are measured at four locations within the toe of the landfill to provide data for use in slope stability analyses. The fluid levels are checked once a year, near September 1.

3.3 Stormwater Monitoring and Compliance

Stormwater discharge continued to meet compliance criteria during the periodic review period either at the point of discharge or within the Green River before the edge of the acute or mixing zone boundaries established pursuant to the Clean Water Act.

The combination of stormwater runoff and Spring Drain discharge is monitored at the outlet structure of the stormwater detention pond (as described above). Regulatory and monitoring requirements for the discharge are outlined in the *Kent Highlands Spring Drain Separation Technical Memorandum* (CH2M-Hill, 1995). The document notes that in order to discharge groundwater from the Spring Drain as a point discharge to the Green river, a National Pollutant Discharge Elimination System (NPDES) permit is normally required. However, the site has been operating pursuant to permit exemption of federal law and has been meeting the substantive requirements of the NPDES permit.

The primary regulatory requirements that must be met are the surface water quality criteria (SWQS) [Chapter 173-201A WAC] and Green River Surface Water Discharge Regulations. The SWQS parameters include pH, temperature, turbidity, biological oxygen demand, dissolved oxygen, N-ammonia, total and dissolved metals, and volatile organic compounds.

In the Third Periodic Review (Ecology, 2009), the point of compliance for stormwater was changed from the end-of-discharge pipe at the Green River to the beginning-of-pipe-discharge at the stormwater detention pond. The change was made for safety reasons.

3.4 Leachate Monitoring and Compliance

The leachate collection system continued to work effectively, and the leachate discharge to the King County wastewater system continued to meet effluent limits during the periodic review period.

Landfill leachate includes gas system condensate, purge water from groundwater monitoring wells, and groundwater from the leachate collection system at the toe of the landfill. The collected leachate is pumped into King County's wastewater treatment system. Leachate

compliance standards are therefore established and monitored by the King County Wastewater Treatment Division. Leachate samples are collected and analyzed monthly by the City in accordance with an industrial wastewater discharge permit.

As noted above, leachate compliance standards are established by King County. The effective point of compliance (POC) for leachate (i.e., the location where leachate samples are collected prior to discharge) is the wet well at the leachate pump station. Samples at this location are currently tested for pH, temperature, total dissolved solids, and metals – cadmium, chromium, copper, lead, nickel, and zinc. Total flow volumes are also measured at this location.

Leachate flow from discrete collection lines are also monitored monthly by the City. Four lines were initially monitored. Monitoring from one of these, the Spring Drain Line, was discontinued after it was diverted to the stormwater detention pond in 1996. Ecology later approved reporting flow at only two locations: the toe buttress and the leachate pond. (Ecology, 2015).

Ecology receives copies of the City’s monthly monitoring reports to King County providing total flow data and analytical results.

3.5 Groundwater Monitoring and Compliance

Groundwater at the Site continued to meet cleanup standards during the periodic review period, with the following exceptions. Three constituents present at the site and identified during the cleanup exceed applicable MTCA cleanup standards: vinyl chloride (VC), iron (Fe), and manganese (Mn) (See Sections 4.9, 4.10).

Groundwater compliance monitoring is conducted at the Site under the *Kent Highlands Landfill Groundwater Compliance Monitoring Plan* (CH2M, 1996). The monitoring plan identifies compliance, background, and indicator wells, and establishes the methods to be used in determining compliance with cleanup levels. Appendix 9.3 shows the locations of groundwater monitoring wells.

In the Third Periodic Review (Ecology, 2009), the schedule for submitting groundwater monitoring results was changed from annual to every five years, to coincide with the periodic review schedule.

Groundwater compliance values, termed “regulatory values” (RVs), were established in the *Groundwater Compliance Monitoring Plan* (GCMP) (Table 5-6, CH2M-Hill, 1996). The RVs are typically the most stringent of MTCA Method B levels or Washington drinking water standards, adjusted for quantitation limits. Compliance with the RVs is determined through a combination of direct comparison and statistical/graphical comparisons to background.

The standard point of compliance (POC) for groundwater at landfills under Washington’s Minimum Functional Standards was, “that part of groundwater that lies beneath the perimeter of a solid waste facility’s active area as that active area would exist at closure of the facility” [WAC 173-304-100(58)]. Pursuant to MTCA, a conditional POC was set as “...the vertical surface

extending down into the uppermost aquifer, at the down gradient site boundary.” (Table 9-1, CH2M-Hill, 1996). In this instance, the term “site” refers to the property boundary.

In the Third Periodic Review (Ecology, 2009), the RVs changed due to regulatory action: manganese was reduced from 747 ug/l to 0.050 ug/l, and vinyl chloride was reduced from 0.029 ug/l to 0.025 ug/l. In addition, the method for calculating carcinogenic concentrations in groundwater was changed to comport with MTCA requirements under WAC 173-340-720.

In the Fourth Periodic Review (Ecology, 2014), it was noted that the City had requested Ecology to agree with their determination that the property boundary at Frager Road South (lower end of Site) be moved closer to the Green River, based on a new analysis of historical documentation. If so adjusted, the City proposed that the POC could be moved further downgradient. Ecology has not yet made a determination on this request.

3.6 Landfill Gas Monitoring and Compliance

Landfill gas control was maintained in accordance with compliance standards throughout the periodic review period, except for a departure from gas flare operating parameters (See Section 4.12).

Landfill gas monitoring is conducted at the Site under the *Kent Highlands Landfill Post-Closure Operations and Maintenance Manual* (CH2M, 1996). The monitoring system includes gas extraction wells, gas probes situated outside the perimeter of the landfill, and a few “operational” gas probes situated between gas extraction wells.

The number and location of landfill gas probes were initially established in the document referenced above, but have since been modified to account for development around the landfill. Specifically, construction of Veterans Drive and the Riverview Blvd. S. interchange along the northern edge of the landfill required some probes be abandoned and replaced with new re-located probes. Appendix 9.8 shows the current location of gas probes.

Gas system monitoring includes the following:

- The gas flares are continuously monitored, and landfill staff inspect the flaring facility five days a week and respond to off-hour system alarms.
- The above ground portion of the collection system is visually inspected monthly.
- Methane concentrations and static pressures are measured monthly or quarterly in gas probes, and measured monthly in the gas extraction wells.

A gas system status report, including monitoring results, is submitted to Ecology quarterly.

Landfill gas compliance standards were established in the *Cleanup Action Plan* (Ecology, 1993) as follows:

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- No exceedance of the lower explosive limit (5%) for methane at the facility property boundary.
 - No exceedance of 25% of the lower explosive limit in any facility structure, excluding gas control or recovery system components.
 - No exceedance of 100 parts per million by volume for hydrocarbons (expressed as methane) in offsite structures.
 - No exceedance of any air quality criteria established under the federal Clean Air Act and the Washington Clean Air Act associated with the gas collection and disposal system.

3.7 Institutional Controls - Restrictive Covenant

The April 1993 Cleanup Action Plan for the Site was approved by Ecology in the form of a Declarative Statement, signed by Ching-Pi Wang, Project Manager and Michael Gallagher, Section Head, Northwest Region Toxics Cleanup Program. The Declarative Statement stated in part "...it is determined by Ecology that the selected cleanup actions are protective of human health and the environment, attain Federal and State requirements which are applicable or relevant and appropriate,... and provide for compliance monitoring....Furthermore it is Ecology's opinion that the selected cleanup actions are consistent with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300)...."

A Restrictive Covenant (also known as an Environmental Covenant) was subsequently placed on the City of Seattle owned property on March 14, 2002 to ensure the continued integrity of the cleanup action. The Restrictive Covenant explicitly defines the cleanup action as the "work done to clean up the property, described in the Cleanup Action Plan for Kent Highlands Landfill dated April 19, 1993". A second covenant on City of Kent owned property was recorded in 2003. The following limitations in both covenants were imposed:

Section 1. Any activity on the Site that may interfere with the Cleanup Action is prohibited. Any activity on the Site that may result in the release of a hazardous substance that was contained as part of the Cleanup Action is prohibited. Any activity on the Site that may result in endangerment to human health or the environment by hazardous substances contained on site or by gas generated by and emitted from the Site is prohibited.

Section 2. Except for groundwater monitoring, no groundwater may be taken for any purpose from any well on the Site without Department of Ecology ("Ecology") approval.

Section 3. The owner of the Site must give written notice to Ecology, or to its successor agency, of the owner's intent to convey any fee interest in the Site. Seattle and all subsequent owners shall provide for the continued operation, maintenance and monitoring of the Cleanup Action.

Section 4. The owner must notify and obtain approval from Ecology, or from its successor agency, prior to any use of the Site that is inconsistent with the terms of this Restrictive Covenant. Ecology or its successor agency may approve such a use only after public notice and comment.

Section 5. The owner shall restrict leases to uses and activities consistent with this Restrictive Covenant and notify all lessees of the restrictions on the use of the property.

Section 6. The owner shall allow authorized representatives of Ecology, or its successor agency, the right to enter the Site at reasonable times and with reasonable prior notice for the purpose of evaluating compliance with the Cleanup Action Plan and to inspect records that are related to the Cleanup Action.

Section 7. The owner of the Site reserves the right under WAC 173-340-720 and WAC 173-340-440 (1991 ed.), to record an instrument which provides that this Restrictive Covenant shall no longer limit use of the Site or be of any further force or effect. However, such an instrument may be recorded only with the consent of Ecology, or its successor agency. Ecology or a successor agency may consent to the recording of such an instrument only after public notice and comment.

The Restrictive Covenants are available as Appendix 9.9.

4.0 ACTIONS AND CHANGES DURING THE LAST FIVE-YEAR PERIOD

4.1 New Documents

The following new documents were submitted to Ecology:

- February, 2019. *Kent Highlands Landfill Gas Evaluation, Northwest Landfill Boundary Property Redevelopment*. Parametrix/EHSI-International.
- February 27, 2019. *Technical Memorandum: Kent Highlands Landfill Well Inventory*. Parametrix/EHSI-International.
- May 2019. *Kent Highlands Landfill Groundwater Compliance Evaluation*. Parametrix, Inc.
- May 2019. *Kent Highlands Landfill 2014-2018 Remedial Action Status Report*. Parametrix, Inc.
- 2019 (Preliminary Report in Preparation). *Slope Stability Evaluation Update, Kent Highlands Landfill*. Soil & Environmental Engineers, Inc.

4.2 Facility and Systems Maintenance

King County Public Health conducted an inspection of the Site in 2016 and noted several issues including damaged perimeter fencing and cracked access roadways. These conditions were fixed and the City instituted more regular monthly surveys and better documentation of the results in a “General Inspection and Maintenance” log (Appendix E, Parametrix, May 2019).

4.3 Administrative Changes

In the 4th periodic review, Ecology requested the City replace the annual groundwater monitoring reports with a broader status report issued at 5-year intervals to coincide with Ecology’s periodic review. The City provided the first such summary report in 2019 (Parametrix, May 2019).

4.4 Land Use Activities

Significant development of property within a few hundred feet of the north edge of the landfill began in 2015 and finished by 2018. The development, Grandview Apartments, included approximately 260 rental units built for affordable housing purposes.

This development occurred in an area where landfill gas had previously been present in the subsurface, prior to the landfill remedial action. Although a study was conducted showing that landfill gas had been eliminated from the apartment area, and was not migrating from the landfill

(EHSI, February 2019), vapor intrusion mitigation features were included in the apartment buildings as a precaution.

4.5 Cap Integrity and Slope Stability

Cap Integrity: Cap integrity monitoring was modified to a monthly visual inspection, as noted above (Section 4.2).

Settlement Effects: Topographic surveys are completed periodically as noted in Section 3.4 to confirm that stormwater drainage has not been affected by landfill settlement. A second aerial topographic survey was completed in 2016 as a follow-on to the earlier surveys completed in 1991 and 2005.

Comparison of the 2016 and 2005 surveys showed between 0 and 3 feet of settlement over most of the landfill, with a maximum of 5 feet in the center where the refuse is thickest. The City concluded that this settlement and the settlement prior to 2005 “has not adversely impacted stormwater drainage or other landfill systems.” (Parametrix, May 2019).

Slope Stability: The stability of the landfill at the eastern, steeper end of the Site could also be affected by settlement, and more significantly by the build-up of fluids at the toe of the landfill (Section 3.4). A steepening of the slope or fluid buildup would indicate potential destabilization.

During this periodic review period, fluid levels remained about the same or decreased slightly from the previous period, and the slope did not appear to be steeper, based on the 2016 topographic survey. However, a new slope stability analysis was conducted to account for changes in seismic criteria since the original 1991 analysis (Soil & Environmental Engineers, Inc., 2019).

Under static conditions, the 2019 slope stability analysis showed that the landfill slope is stable with an overall factor of safety > 1.5 . However, it also concluded that the factor of safety is less than 1.5 for the steepest lower portion of the landfill slope, if a more conservative value is used for refuse shear strength.

Under seismic loading conditions, the stability analysis estimates 12 inches of displacement will occur. This level of movement is not expected to create a major failure, but would likely require re-grading of the landfill face and repair of the cover system.

The slope stability report also recommended two new groundwater monitoring wells be installed during the next five-year period to augment the existing fluid monitoring network. Ecology concurs with this recommendation.

4.6 Stormwater NPDES Permit and Hardness Testing

In 2019, the City Attorney conducted an analysis to re-examine whether an individual NPDES permit was required for the Site; an individual permit had not been established as part of the

original landfill closure, nor has it been instituted since. The analysis concluded that a permit “... is not required for stormwater discharges resulting from the implementation of corrective actions performed at solid waste handling facilities to comply with a state and/or federal cleanup order.” (Page 5-1 and Appendix B, Parametrix, May 2019). Ecology is evaluating this analysis and may require additional information during the next periodic review period.

Also in 2019, Green River surface water samples were tested for hardness to confirm that the value established in the Remedial Investigation, and used to date (20 mg/L), was accurate. Three samples were collected, with hardness values ranging from 19.0 to 20.5. These data confirmed that the 20 mg/L value is appropriate for use in updating hardness-dependent SWQS values (see Section 3.4).

4.7 New Wastewater (Leachate) Discharge Permit and Gravity Line Cleaning

A new discharge permit for the Site took effect on April 3, 2019; it expires on April 2, 2024. The new permit added a requirement for calibrating flow meters, and removed two previous provisions requiring a flow-proportional compositing plan and an updated Slug Control Plan. Both plans were submitted during this periodic review period.

A portion of the leachate discharge line that is gravity drained was cleaned and inspected by TV in August 2017. This action was undertaken in response to an apparent discharge of leachate to land surface at a downgradient manhole on a Kent city street. The next inspection will be in 2020 and will continue at 3 year intervals thereafter.

4.8 Groundwater Point of Compliance

As mentioned above, the City requested acknowledgement of their determination that the eastern property line is not on the west side of Frager Road South, but is further east at the Green River. Because the groundwater point of compliance (POC) was established at the property line, moving the property line could theoretically allow the POC to be at a further downgradient location (subject to a more thorough Ecology review prior to determining whether this is an appropriate modification).

Ecology has not yet reviewed the property line documentation provided by the City, and therefore still considers the groundwater POC to be at the west edge of Frager Road South. This means that the provisions of WAC 173-340-720(8)(c) for an on-property conditional POC still apply.

Ecology will prioritize reviewing and/or evaluating the City’s property line documentation during the next periodic review period.

4.9 Vinyl Chloride in Groundwater

Ecology previously noted in the 2nd, 3rd, and 4th Periodic Reviews that vinyl chloride (VC) was exceeding the RV in downgradient compliance wells, and had requested an evaluation of further remedial options. Parametrix included an evaluation in a document submitted in 2019 (the Parametrix report) (Parametrix, May 2019).

The three compliance wells (KMW-10A, -17, -19A) are located near the eastern property boundary and completed in the Recent Alluvium Aquifer. The latest data from these wells is provided in the following table. Among the compliance wells, KMW-17 has historically had the highest VC concentrations.

Three other wells completed in the Recent Alluvium Aquifer are also listed in the table below:

- KMW-15 is located south of the landfill in an area unaffected by leachate migration.
- KMW-16 is located at the edge of the landfill where the Sand Aquifer discharges into the Recent Alluvium Aquifer.
- KMW-17Z is located off-property and downgradient of KMW-17.

Recent Alluvium Aquifer: Maximum/Minimum Vinyl Chloride Concentrations 2014-2018

Vinyl Chloride Regulatory Value (Cleanup Level) – 0.025 ug/L

WELL NUMBER	VINYL CHLORIDE (ug/L)
10A (compliance well)	0.037/0.022
17 (compliance well)	0.540/0.362
19A (compliance well)	ND at 0.020 detection limit
15A (background well)	ND at 0.020 detection limit
16A (indicator well)	0.022/ND at 0.020 detection limit
17Z (indicator well)	0.180/0.067

VC concentrations remain above the RV in two of the three compliance wells (see monitoring well location map in Appendix 9.3). However, the concentrations have declined since compliance monitoring began in 1997 (Parametrix, 2019). The decline has been most consistent since 2009, as shown in the logarithmic plot of VC concentrations (Figure 7, Parametrix, 2019), which is included in Appendix 9.6.

The logarithmic plot also shows an estimate of current VC concentrations at the point of discharge into the Green River, and estimates of when VC concentrations in individual wells will decline to the RV. These projections are based on BIOSCREEN and BIOCHLOR modeling.

As illustrated, the VC concentrations at the KMW-17 POC may reach the RV somewhere between 34 and 46 years. For the KMW-10A POC, the RV has been, or will soon be, reached. At locations downgradient of KMW-17, groundwater at the point of discharge into the Green River is projected to reach the RV within 4 to 5 years and at KMW-17Z within 15 to 18 years. These projections assume sources within the landfill are subject to natural attenuation processes. However, additional parameters would need to be monitored in order to evaluate to what extent natural attenuation is occurring.

In sum, the available monitoring data and modeling projections indicate that VC concentrations in groundwater already do meet or soon could meet the RV at two compliance wells (KMW-10A and KMW-19A), but will not meet the RV within a reasonable restoration timeframe at the other compliance well (KMW-17). However, the modeling projections suggest that groundwater downgradient of KMW-17 at the point of discharge into the Green River could potentially meet the RV within a reasonable restoration timeframe (less than 10 years).

Further analysis of this out-of-compliance situation in the portion of the aquifer represented by KMW-17 could be addressed in three ways in the next five year periodic review period:

- (1a) Measuring VC concentrations directly through porewater sampling where groundwater discharges into the Green River.
- (1b) Estimating concentrations of groundwater discharging into the Green River via extrapolation (modeling) using data from upgradient wells KMW-17 and 17Z.
- (2) Implementing additional remedial actions to reduce VC concentrations in groundwater.

With respect to 1a, the physical conditions at the river bank are treacherous. The river bank is steep, the river currents can be strong, and river levels rise and fall quickly in response to headwater management activities at the Howard Hansen dam. While this option is technically possible, it may be difficult to implement for repeated compliance monitoring.

The second option 1b is potentially feasible. But it would rely on estimation (modeling), rather than direct measurement, which would provide a lower level of confidence regarding whether groundwater discharging into the Green River is meeting the RV.

Option 2 is also potentially feasible. Two general methods to reduce VC concentrations in groundwater were evaluated in the *Groundwater Compliance Evaluation* report (Parametrix, May 2019) (the Parametrix report): (1) Air sparging/air stripping with vapor extraction (Aeration), and (2) Chemical injection to form a reactive barrier (Barrier).

The Aeration method would involve injecting air into the aquifer, volatilizing the VC in groundwater, and then removing vapor through extraction wells. Essentially this process would create a vertical aerated zone in the aquifer within which VC concentrations are reduced. Injection/extraction wells would be necessary for this purpose, and would need to be located in a line extending perhaps 600 feet across the toe of the landfill. In terms of well spacing, the Parametrix report mentions only that “several” wells would be necessary. This translates to perhaps 3 or 4 wells spaced at 150 - 200 feet.

The approximate cost for such a system was estimated to be \$150,000 for installation and \$12,000 for annual upkeep. Ecology believes a substantially greater number of wells would be necessary to create a continuous zone of aerated aquifer (perhaps 30 wells based on a spacing of 20 feet), and the cost would be proportionately higher. In addition, annual maintenance costs could be higher because extraction/injection wells in shallow alluvial aquifers are often subject to biological fouling. This option should be evaluated further.

The Barrier method is similar to the Aeration method in that it would create a vertical zone within the aquifer wherein VC concentrations are reduced. The difference is that various substances and/or nutrients would be placed into the aquifer to break down or absorb the VC. The Parametrix report evaluated two possible treatment substances – Oxygen Release Compound – Advanced (ORC-A) and PlumeStop™. The latter utilizes a type of liquefied activated carbon as an absorptive medium within the aquifer. Both products could potentially work, although the ORC-A would require repeated injections, whereas the PlumeStop would not.

The Parametrix report estimated the cost of the PlumeStop™ application at \$ 200,000 plus \$8,000 annually for water quality monitoring. This cost assumed a 10 foot-wide, 1,000 foot-long barrier. Costs for a similar ORC-A system were not presented in the Parametrix report, but would likely be comparable.

The Parametrix report did provide the cost for a reduced ORC-A system utilizing treatment socks in existing monitoring wells. While the cost was substantially less, this option would likely do little to reduce VC concentrations in the portion of the aquifer monitored by KMW-17.

Based on the above, it may be possible to proceed with a combination of Option 1a and 1b: utilizing modeling methods to demonstrate compliance and performing limited pore-water sampling to “spot check” the modeling results. Implementing this option would require the following:

- Ecology would need to determine whether the Consent Order must be amended, and whether the action complies with the February 23, 2000 agreement between EPA and Ecology: *Superfund Management in Washington*.
- The City would need to demonstrate that the provisions of WAC 173-340-720(8)(e) have been met.

- Evaluate monitoring results in accordance with EPA's Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. For example, additional parameters would need to be added to the sampling program to meet this requirement.
- The City would need to take pore-water samples at the point of discharge to "spot check" the modeling results; the number and timing of such spot checks to be as approved by Ecology.

However, the total amount of time that VC has exceeded the regulatory level in groundwater is not considered a reasonable restoration timeframe, and the contaminated groundwater is migrating off-site. Therefore, implementing more active remedial actions (Option 2) to reduce VC concentrations in groundwater may be more appropriate.

Ecology has determined that a complete feasibility study and disproportionate cost analysis should be completed in order to evaluate the most appropriate remedial action. A new Consent Decree to amend the old Consent Order may also be necessary in association with future remedial actions. This concept will be under discussion with the city.

4.10 Manganese and Iron Exceedances in Groundwater

Similar to the VC issue, Ecology requested in the 3rd and 4th Periodic Reviews that a further evaluation be made of options to reduce manganese and iron in groundwater. Both metals continue to exceed the compliance standards in downgradient compliance well KMW-19A. This issue was discussed in the two reports (Parametrix, May 2019 and Parametrix, 2019).

Both manganese and iron are naturally present in groundwater. Their concentrations are often highly variable in Puget Lowland aquifers due to their sensitivity to redox conditions and the amount of these metals in natural earth materials. They also tend to be elevated in areas downgradient from landfills due to anaerobic conditions created through biological degradation of leachate-impacted groundwater.

The groundwater compliance standard for metals at the Site is that they not exceed the Shewart Control Limit (SCL), the tolerance limit (TL), and the RV. The SCL represents conditions present at the time of landfill closure, and the TL represents background conditions. All three of these parameters are available for Recent Alluvium Aquifer compliance wells KMW-10 and KMW-17, but only the TL and RV are available for KMW-19A.

The 2014 – 2018 data for manganese and iron indicate that they are in compliance at two of the three compliance wells. KMW-19A is out of compliance, exceeding both the TL and RV for both metals.

There was no further discussion of treatment options in the Parametrix reports cited above. Instead, it was concluded that the two metals "do not present a human health or ecological threat at the concentrations present in groundwater at the Site but could cause aesthetic problems such as staining of porcelain fixtures" (P. 3-1, Parametrix, May, 2019). Based on this conclusion, a

proposal was made to raise the RVs from drinking water secondary MCL criteria to MTCA Method B risk-based surface water quality criteria. Groundwater would be in compliance for iron and manganese if the RVs were to be raised.

Ecology generally agrees with the characterization of iron and manganese as natural constituents of groundwater that are typically variable in concentration and that they are not a current risk to human health or the environment at the Site. However, we are compelled to maintain the RV at the lower secondary MCL based on the following:

1. MTCA groundwater ARARs include the maximum contaminant levels established by the state board of health and published in 246-290 WAC.

WAC 173-340-720(3)(b): Method A cleanup levels shall be at least as stringent as all of the following: (ii): Concentrations established under applicable state and federal laws including the following requirements: (C): Maximum contaminant levels established by the state board of health and published in chapter 246-290 WAC. WAC 173-340-720(4)(b) references the above (173-340-720(3)(b)(ii)(C)) as a requirement.

2. There does not seem to be a distinction between primary and secondary MCLs when requiring compliance, although the Department of Health (DOH) does make compliance with primary MCLs its first priority.

WAC 246-290-310: Maximum contaminant levels (MCLs) and maximum residual disinfectant levels (MRDLs). (1) General. (a) The purveyor shall be responsible for complying with the standards of water quality identified in this section. If a substance exceeds its MCL or its maximum residual disinfectant level (MRDL), the purveyor shall take follow-up action under WAC 246-290-320. (b) When enforcing the standards described under this section, the department shall enforce compliance with the primary standards as its first priority.

3. DOH must be notified of violations of secondary MCLs. When secondary MCLs are exceeded, DOH requires treatment for new systems without customers and may require treatment for existing systems with customers.

WAC 246-290-320 Follow-up action: (1) General. (a) When an MCL or MRDL violation or exceedance occurs, the purveyor shall take follow-up action as described in this section. (b) When a primary standard violation occurs, the purveyor shall: (i) Notify the department under WAC 246-290-480; (ii) Notify the consumers served by the system and the owner or operator of any consecutive system served in accordance with 40 CFR 141.201 through 208, and Part 7, Subpart A of this chapter; (iii) Determine the cause of the contamination; and (iv) Take action as directed by the department. (c) When a secondary standard violation occurs, the purveyor shall notify the department and take action as directed by the department.

4. The 2001 Concise Explanatory Statement, page 173:

GQ 10.1.8

Why have the secondary maximum contaminant levels been deleted as an applicable requirement under WAC 173-340-720?

Response:

The federal secondary maximum contaminant levels were deleted as an applicable standard based on a comment on an earlier draft of the rule. That comment pointed out that these part of the federal drinking water standards were advisory and did not establish enforceable standards. While this particular reference has been deleted, it should be noted that, except for the federal odor standard, the secondary MCLs are incorporated into the State Department of Health's regulations for public water supplies. Since the State's standards remain an applicable state law, they are still considered applicable standards under MTCA.

The following is a summary of potential regulatory values for the Site applicable to iron and manganese. The most stringent values (Secondary MCLs) apply.

Method B CULs for Fe and Mn (ug/L)

	Iron	Manganese
Secondary MCL	300	50
Basis for secondary MCL	Rusty water color, sediment, metallic taste, reddish or orange staining of fixtures and laundry	Black to brown water color, black staining of fixtures and laundry, bitter metallic taste
Method B GW noncancer eq.	1.12E4	2.24E3
Basis for RfD	Gastrointestinal effects	Central nervous system effects
GW CUL for protection of drinking water	300	50
Minimum WQC	1,000	50
Basis for WQC	Freshwater aquatic life Natl Rec WQC	Human health consumption of fish & water Natl Rec WQC
Method B SW noncancer eq.	Not available (no BCF)	Not available (no BCF)
GW CUL for protection of surface water	1,000	50

Although the iron and manganese remain out of compliance at KMW-19A, Ecology may not require additional remedial action to correct this situation for a number of reasons:

-
- It does not appear that the metals pose a risk to human health or the environment since the basis for the secondary MCLs are aesthetic issues, such as staining of porcelain fixtures.
 - The use of groundwater downgradient of the landfill to the property line for drinking water purposes is prohibited by the Restrictive Covenant. The property line is currently established at Frager Road South, but may be at the Green River as indicated by research completed by the City.
 - Groundwater in the portion of the Recent Alluvium Aquifer represented by KMW-19A is likely to have high levels of naturally occurring Fe and Mn due to low levels of dissolved oxygen, and an associated low oxidation-reduction (redox) potential. Under low redox conditions, the two metals are more soluble in groundwater and thus present in higher concentrations. The low oxygen concentrations are partly the result of biological degradation of naturally occurring organic matter in the aquifer. In addition, the area around KMW-19A is covered with a wetland pond, in which oxygen levels are naturally low, due again to the biological degradation of organic matter.
 - Attempting a remedy for this situation would be costly and potentially ineffective. The aquifer could potentially be oxygenated through a line of sparge wells at the upgradient starting point of the Recent Alluvium Aquifer. Many wells would be necessary, and they would likely be subject to biofouling, requiring constant maintenance. In addition, a high volume of air would need to be injected on a 24-hour basis to change the existing redox conditions, and it is possible the area of influence would only extend some tens of feet downgradient of the line of sparge wells. After this point, the oxygen would have been used up and the aquifer would likely revert back to its natural low redox condition. An alternative approach would be to blanket the area with sparge wells installed at 20 to 50 feet on center. This approach would require many more wells.

However, since a feasibility study and disproportionate cost analysis is necessary for vinyl chloride, manganese and iron may also need to be evaluated during that process. There will be further discussions regarding these constituents prior to finalizing the RI and FS.

4.11 Water Supply Well Inventory Update

In 2015, Ecology requested a water supply well inventory to determine whether new water supply wells had been installed downgradient of the landfill since the last well inventory in 1991. The inventory was completed in 2019 (Parametrix-EHSI, February, 2019). Ecology's request was driven in part by the discovery in 2015 of a hitherto unknown well directly across the Green River from the landfill (Well 15J1), and in part by the recognition that there should be a periodic check for new wells across the river outside the area governed by the Restrictive Covenant. The concern is the installation of a new high capacity well with a large area of aquifer capture.

The 15J1 well directly across the river was sampled and the results reported to Ecology in 2015 (the results are also included in the Parametrix report (May, 2019)). The well sample was

analyzed for volatiles, standard water quality parameters (e.g., nitrate-nitrite), and metals (Ca, Mg, K, Na). Sample conductivity and temperature were also measured. There was no indication of leachate impact.

The updated well inventory showed that a number of new water supply wells had been drilled within 2,000 feet of the landfill on the east side of the Green River, and another had been drilled on the west side of the river upgradient from the landfill. In addition, review of Ecology's water right records showed numerous historical surface water rights in the area, including one for a local residential development (The Lakes). The Lakes has a large area of interconnected ponds throughout the development. Of the water rights identified, only the one for The Lakes appeared to be potentially in use.

Three issues requiring further evaluation by the City during the next five-year period were identified:

- Confirm that a well owned by the City of Kent (15H1) is used for groundwater monitoring or has been decommissioned.
- Contact the owner of a new residential well (22A2) to confirm its use and advise them of the landfill proximity. This well is located approximately 1,000 feet from the southern edge of the landfill in an up-river location on the east side of the Green River.
- Contact The Lakes development to confirm whether or to what degree it is withdrawing surface water and/or groundwater for maintenance of its ponds.

4.12 Landfill Gas Flare System

The Puget Sound Clean Air Agency (PSCAA) inspected the gas flare system in 2015, and noted an out of compliance condition with respect to operating temperatures. The flare temperature was to be maintained at a minimum of 1548-degrees Fahrenheit, but actual temperatures were less due to decreasing gas generation and methane concentrations from the landfill. A change was then made to the system to provide supplemental natural gas for combustion support, and a source test was made demonstrating that lower temperatures achieved the 20 ppm non-methane organic compounds (NMOCs) compliance limit. PSCAA approved the modified system in an Order of Approval Notice of Construction No. 11399, dated October 11, 2017.

An additional plan required by the PSCAA Order of Approval was submitted in 2018: *Startup, Shutdown, and Malfunction Plan for the Landfill Flare Supplemented with Natural Gas*, March 12, 2018. This plan is posted at the flare station.

4.13 Landfill Gas Migration at Northwestern Landfill Boundary

Construction of the Grandview Apartment close to the northwestern edge of the landfill (see Section 4.4) raised concern about landfill gas control in an area that historically had high

concentrations of methane in the subsurface. Geologic conditions in this area are conducive to subsurface gas migration.

Because of this concern, a comprehensive gas migration study was undertaken in this northwestern portion of the Site (EHSI, February 2019). The results of the study indicated that landfill gas was not migrating northward beyond the Site boundary, and that the existing gas extraction system was continuing to be effective in controlling migration.

The study also concluded that the gas monitoring system would be improved with the installation of new probes in an area outside the landfill where the existing probes were widely spaced. Three new probes were therefore installed at the one location and completed at different depth intervals (KGP-200S, -200M, and 200D for shallow, middle, deep). Static pressure measurements in these new probes were consistently negative with respect to barometric pressure, indicating that the suction from nearby gas extraction wells was reaching the area with the probes.

As a result of this study, a new compliance standard was established for determining whether gas migration was under control at any particular location on the perimeter of the landfill:

“The key parameters to demonstrate control are: (1) Consistent, continuous negative static pressures in the line of perimeter gas extraction wells and operational gas probes, and (2) Consistent and continuous “zero” gas concentrations measured in perimeter/outside probes.” (EHSI, 2019)

4.14 Landfill Gas Concentrations in Probe 35-S

In the Fourth Periodic Review (Ecology, 2014), it was noted that methane was being routinely detected at 0.5 to 4.7% measured as a lower explosive limit (LEL) (concentrations are explosive when they reach 5%) in Probe 35-S outside the landfill boundary. This probe is located at the edge of a METRO park and ride lot directly across Military Road from the landfill. The compliance standard at this location is 5% LEL. Although the detections did not exceed the compliance limit, Ecology requested an evaluation of the situation because of businesses in the area.

Initially in 2013, the gas extraction rates were increased in nearby wells to see if the methane concentrations would decrease at 35-S. The result was more oxygen (atmospheric air) being pulled into the gas system, but no change at 35-S. Geologic logs from the area were also checked to evaluate the potential for a preferential gas transport horizon between the probe location and the landfill. It was initially determined that none was present.

A plan was then developed for addressing the situation. The plan included an initial survey of underground structures in the area (catch basins, manholes, etc.) to check for elevated methane levels. If elevated levels were detected, remedial measures would be implemented immediately. If they were not detected, the survey of underground structures would be repeated if or when gas concentrations at 35-S reached 3.5% LEL.

The initial survey was completed in December 2014, with no detection of methane in subsurface structures in the area. No additional surveys have been conducted even though the gas concentrations at the probe reached the 3.5% threshold in early 2017 (Appendix D, Parametrix, May 2019).

Ecology has reconsidered whether there might be a preferential transport pathway between the landfill and 35-S. The geologic log for 35-S shows that the probe was completed in a 30-foot thick deposit of surficial sand and gravel. Normally such a deposit at the surface would allow gas to dissipate into the atmosphere before migrating any distance from the edge of a landfill. However, the area between the landfill and 35-S is largely covered with impermeable pavement, in effect capping the 30-foot thick deposit. If landfill gas were escaping from the nearby edge of the landfill, and if the sand and gravel layer extends to the landfill, gas could enter the sand and gravel layer with little chance to dissipate before reaching 35-S.

Based on the above, the City needs to reconsider the 35-S issue during the next periodic review period.

5.0 PERIODIC REVIEW CRITERIA

5.1 Effectiveness of Completed Cleanup Actions

The Restrictive Covenant for the Site was recorded and is in place. This Restrictive Covenant prohibits activities that will 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 March 5, 2019, the remedy at the Site continues to prevent exposure to contaminated soils by ingestion and direct contact. Soils with various landfill related contaminants with concentrations higher than MTCA cleanup levels are still present at the Site. The Restrictive Covenant for the property will ensure that the contamination remaining is contained and controlled.

However, surface water and groundwater may not be adequately protected based on the vinyl chloride concentrations in the groundwater compliance wells. The Restrictive Covenant does not allow drinking water wells on the property, but contaminated groundwater discharges to the Green River. The vinyl chloride exceedances theoretically pose a risk to those who might use the Green River for consumption of both drinking water and organisms (fish), and therefore is not protective of human health and the environment. However, it should be noted that people using the Green River for drinking water in this area is unlikely, so it is not considered an imminent threat to human health.

The landfill cover and all controls appear in satisfactory condition and no repair, maintenance, or contingency requirements have been altered. The Site is no longer operating as a landfill. A photo log is available as Appendix 9.10.

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

There have been changes to the approach of establishing cleanup standards since the Cleanup Action Plan was completed in 1993, including new scientific information for hazardous substances that have a potential effect on cleanup standards at the site (for example, changes in toxicology information for vinyl chloride since 1993). A thorough analysis of cleanup standards is likely needed to determine whether the existing cleanup standards are sufficiently protective and what regulatory/legal actions might be necessary if some of the cleanup standards need to be updated. Ecology will evaluate the cleanup standards during the next periodic review period. This considerable effort may need to be associated with a new Consent Decree.

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

The cleanup at the site was governed by Chapter 173-340 WAC (1996 ed.). 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.”

As discussed in the previous section, there have been changes to the approach of establishing cleanup standards since the Cleanup Action Plan was completed in 1993 (for example, changes in vinyl chloride cleanup levels since 1993). A thorough analysis of cleanup standards is likely needed to determine whether the existing cleanup standards are sufficiently protective and what regulatory/legal actions might be necessary if some of the cleanup standards need to be updated. Ecology will evaluate the cleanup standards during the next periodic review period.

5.4 Current and Projected Site and Resource Use

The site is currently a closed landfill. There have been no changes in current use of the area underlain by the landfill. However, future use could change, as development on the landfill and in areas adjoining the landfill are under consideration.

The City of Kent has been marketing the land for sale between the Grandview Apartments and the northwestern edge of the landfill. If this land is developed, particular care will be needed in providing for vapor intrusion protection. A re-evaluation of the landfill gas monitoring protocol to account for the specifics of the development may also be necessary.

WSDOT is designing an expansion project at the nearby SR 509/I-5 exchange. The expansion may increase stormwater runoff flows to Midway Creek (located on the Green River floodplain within the Site boundary). This project and another project by Sound Transit to extend light rail through the area on the west edge of I-5 are expected to create new development in the area, particularly in the area west of the landfill. Development of portions of the landfill itself is also possible, and the City is planning to conduct a market evaluation of the landfill in the near future. Careful consideration will be needed of the impact of area development on post-closure care of the landfill and vice versa.

5.5 Availability and Practicability of More Permanent Remedies

The remedy implemented included containment of hazardous substances. However, surface water and groundwater does not appear to be adequately protected based on the detected vinyl chloride concentrations in the groundwater compliance wells. Therefore, additional actions are being considered (see Section 6.4).

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

There have been no changes in analytical techniques since the 2015 periodic review that affect decisions or recommendations made for the site.

5.7 EPA Questions

EPA Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the 1993 Cleanup Action Plan:

- Landfill gas is under control;
- Storm water runoff is being handled appropriately, and its discharge to the Green River meets surface water quality standards;
- The refuse has been encapsulated and is not accessible to the public or to sensitive species;
- Access to the landfill is controlled and restricted;
- The leachate collection and discharge system is operating effectively.

EPA Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

As previously discussed, there have been changes to the approach of establishing cleanup standards since the Cleanup Action Plan was completed in 1993. A thorough analysis of cleanup standards is likely needed to determine whether the existing cleanup standards are sufficiently protective and what regulatory/legal actions might be necessary if some of the cleanup standards need to be updated. Ecology will evaluate the cleanup standards during the next periodic review period.

EPA Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Surface water and groundwater may not be adequately protected based on the vinyl chloride concentrations in the groundwater compliance wells. The vinyl chloride exceedances theoretically pose a risk to those who might use the Green River for consumption of both drinking water and organisms (fish).

6.0 ACTIONS AND CHANGES FOR THE NEXT FIVE-YEAR PERIOD

6.1 Land Use

The City of Kent has been marketing the land for sale between the Grandview Apartments and the northwestern edge of the landfill. If this land is developed, particular care will be needed in providing for vapor intrusion protection. A re-evaluation of the landfill gas monitoring protocol to account for the specifics of the development may also be necessary.

WSDOT is designing an expansion project at the nearby SR 509/I-5 exchange. The expansion may increase stormwater runoff flows to Midway Creek (located on the Green River floodplain within the Site boundary). This project and another project by Sound Transit to extend light rail through the area on the west edge of I-5 are expected to create new development in the area, particularly in the area west of the landfill. Development of portions of the landfill itself is also possible, and the City is planning to conduct a market evaluation of the landfill in the near future. Careful consideration will be needed of the impact of area development on post-closure care of the landfill and vice versa.

6.2 Slope Stability

Two new groundwater monitoring wells will be installed to monitor fluid levels at the toe of the landfill.

6.3 NPDES Permit Evaluation

Ecology will evaluate during the next five year period whether Seattle's existing general municipal stormwater permit is sufficient, or whether an individual permit is needed for stormwater discharges from the Site.

6.4 Vinyl Chloride in Groundwater and Landfill Property Boundary

The City has proposed re-locating the groundwater point of compliance to the point of discharge into the Green River and utilizing modeling methods to demonstrate compliance within a reasonable restoration timeframe. The following would be required in order for Ecology to consider this approach:

- Ecology would need to review the eastern property line documentation provided by the City to determine whether the property line should be moved closer to the Green River.
- Ecology would need to determine whether the Consent Order must be amended (via a new Consent Decree), and whether the action complies with the February 23, 2000 agreement between EPA and Ecology: *Superfund Management in Washington*.

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- The City would need to demonstrate that the provisions of WAC 173-340-720(8)(e) have been met.
 - The City would need to evaluate monitoring results in accordance with EPA's Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. For example, additional parameters would need to be added to the sampling program to meet this requirement.
 - The City would need to take pore-water samples at the point of discharge to "spot check" the modeling results; the number and timing of such spot checks to be as approved by Ecology.

However, the total amount of time that VC has exceeded the regulatory level in groundwater is not considered a reasonable restoration timeframe, and the contaminated groundwater is migrating off-site. Therefore, implementing more active remedial actions to reduce VC concentrations in groundwater may be more appropriate.

Ecology has determined that a complete feasibility study and disproportionate cost analysis should be completed in order to evaluate the most appropriate remedial action. A new Consent Decree to amend the old Consent Order may also be necessary in association with future remedial actions.

In the interim, the City should follow the EPA's Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water, including adding additional parameters to their sampling program. The City should also collect pore-water samples at the point of discharge to evaluate the reliability of their modeling results.

6.5 Manganese and Iron in Groundwater

Although iron and manganese remain out of compliance at KMW-19A, Ecology may not require additional remedial action to correct this situation for the reasons outlined in Section 4.10. However, since a feasibility study and disproportionate cost analysis is likely necessary for vinyl chloride, manganese and iron may also be evaluated during that process.

6.6 Water Supply Well Inventory

Three issues requiring further evaluation by the City were identified:

- Confirm that a well owned by the City of Kent (15H1) is used for groundwater monitoring or has been decommissioned.
- Contact the owner of a new residential well (22A2) to confirm its use and advise them of the landfill proximity. This well is located approximately 1,000 feet from the southern edge of the landfill in an up-river location on the east side of the Green River.

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- Contact The Lakes development to confirm whether or to what degree it is withdrawing surface water and/or groundwater for maintenance of its ponds.

6.7 Landfill Gas Concentrations in Probe 35-S

Further evaluation by the City is required in the next periodic review period of the potential for a preferential transport pathway between the landfill and 35-S. Ecology's recommendation is for temporary gas probes to be installed at a spacing of approximately 20 feet on center in a line perpendicular to the potential pathway between the landfill and 35-S. These probes should be installed and sampled immediately after methane has been measured in 35-S at a concentration equal to or greater than 2% LEL. Alternatively, the City can propose another approach that accomplishes the same goal.

6.8 Cleanup Standards

There have been changes to the approach of establishing cleanup standards since the Cleanup Action Plan was completed in 1993. A thorough analysis of cleanup standards is likely needed to determine whether the existing cleanup standards are sufficiently protective and what regulatory/legal actions might be necessary if some of the cleanup standards need to be updated. Ecology will evaluate the cleanup standards during the next periodic review period. This considerable effort may need to be associated with a new Consent Decree.

7.0 PERIODIC REVIEW CONCLUSIONS

The following conclusions can be made as a result of this periodic review:

- While the remedy at the Site can be considered protective of human health and the environment with respect to refuse encapsulation, landfill gas control, stormwater quality maintenance, and leachate capture, vinyl chloride continues to exceed regulatory values in groundwater, which discharges to surface water (the Green River). The vinyl chloride exceedances pose a risk to those who might use the Green River for consumption of both drinking water and organisms (fish), and therefore is not protective of human health and the environment. In other words, the Site failed the periodic review since it is not adequately protective.
- The Environmental Covenant for the property is in place and appears to continue to be effective in protecting public health and the environment from exposure to hazardous substances by ingestion and direct contact, as well as protecting the integrity of the existing remedy.
- Actions that need to be performed and modifications that need to be considered during the next five year period are summarized in the previous section (Section 6).

It is the property owner's responsibility to continue to inspect and manage the site to assure that the integrity of the remedy is maintained.

The next periodic 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.

8.0 REFERENCES

Documents which include detailed information on landfill conditions and cleanup activities include:

- *Final Remedial Investigation Report for the Kent Highlands Landfill*, CH2M-Hill, 1991;
- *Closure Action Report for the Kent Highlands Landfill*, Seattle, 1992;
- *Cleanup Action Plan*, Ecology, 1993;
- *Kent Highlands Spring Drain Separation Technical Memorandum*, CH2MHill, 1995;
- *Waste Discharge Permit 7115 for City of Seattle, Public Utilities – Kent Highlands Landfill*, King County, 1999;
- *Groundwater Compliance Monitoring Plan for the Kent Highlands Landfill*, Seattle, 1996;
- *Restrictive Covenants*, Ecology, 2002 and 2003;
- *Third Periodic Review, Kent Highlands Landfill, Facility Site ID#2042, 23076 Military Road South, Kent, Washington 98032*, prepared by Ecology, June 2009;
- *Kent-Highlands Landfill Flood Plan*, prepared by City of Seattle, October 2009;
- *Kent Highlands Landfill Groundwater Monitoring 2008 Annual Report*, prepared by Parametrix, December 2009;
- *Kent Highlands Landfill Groundwater Monitoring 2009-2013 Report*, prepared by Parametrix, October 2014;
- Quarterly reports in 2010, 2011, 2012, 2013, and 2014, prepared by City of Seattle;
- Kent Highlands Meeting Notes – Periodic Review, 5-year Monitoring Report. Email from Mark Adams to Jeff Neuner, Min-Soon Yim, and Eugene Freeman. June 18, 2015.
- Ecology Site Visit. March 5, 2019.

These documents as well as the complete file for the landfill may be reviewed at Central Records, Washington State Department of Ecology, Northwest Regional Office, 3190 160th Avenue SE, Bellevue, Washington. Call 425-649-7000 to make an appointment for record review.

9.0 APPENDICES

Prepared by Parametrix: U:\PSO\Projects\Clients\1550-CityOfSeattle\1550-063 KentHighMidway\FPost\09Svcs\GIS\KentHighlands_Fig1_SiteMap.mxd, 5/7/2019

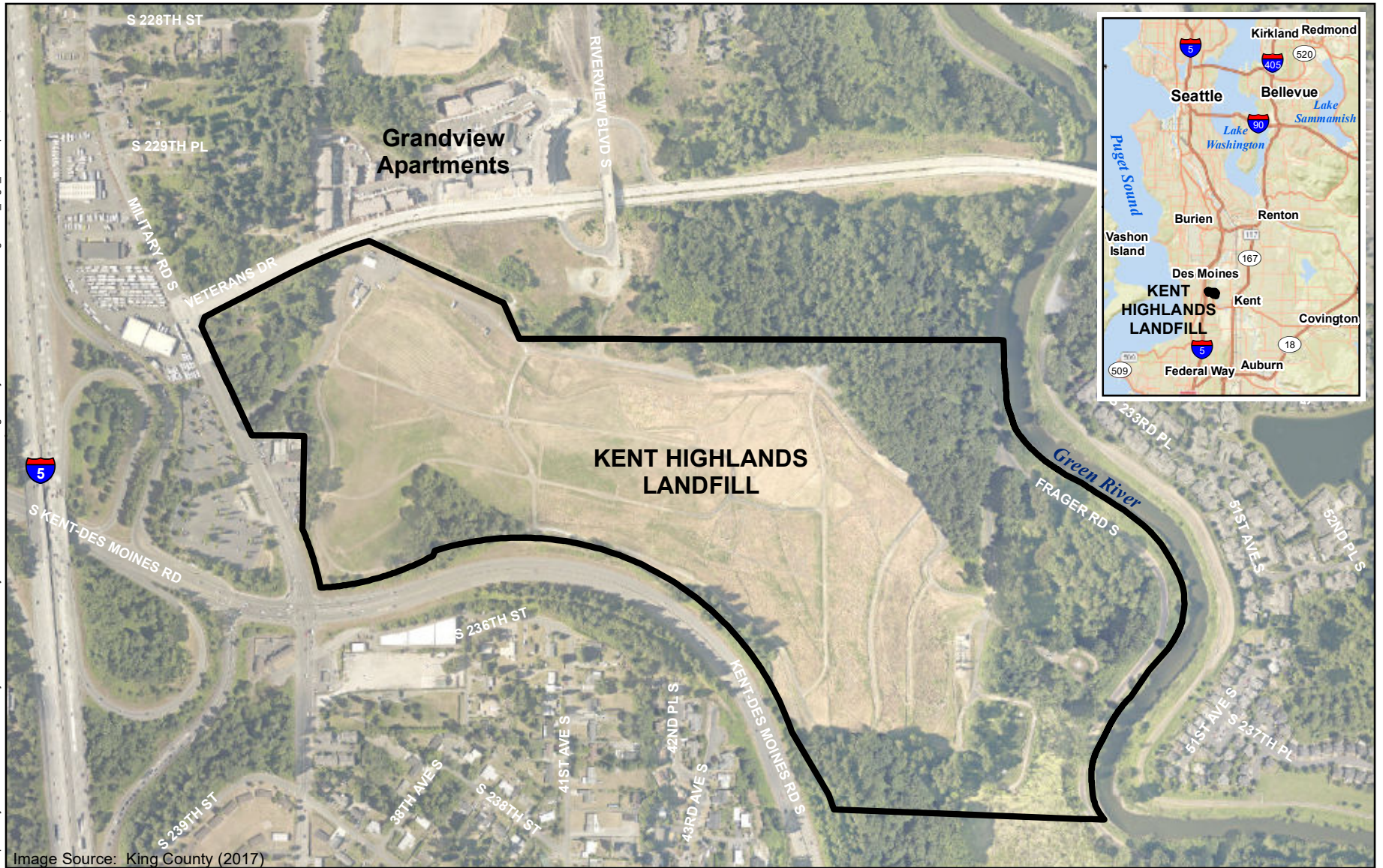
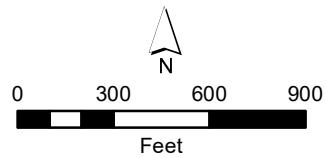


Image Source: King County (2017)

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES




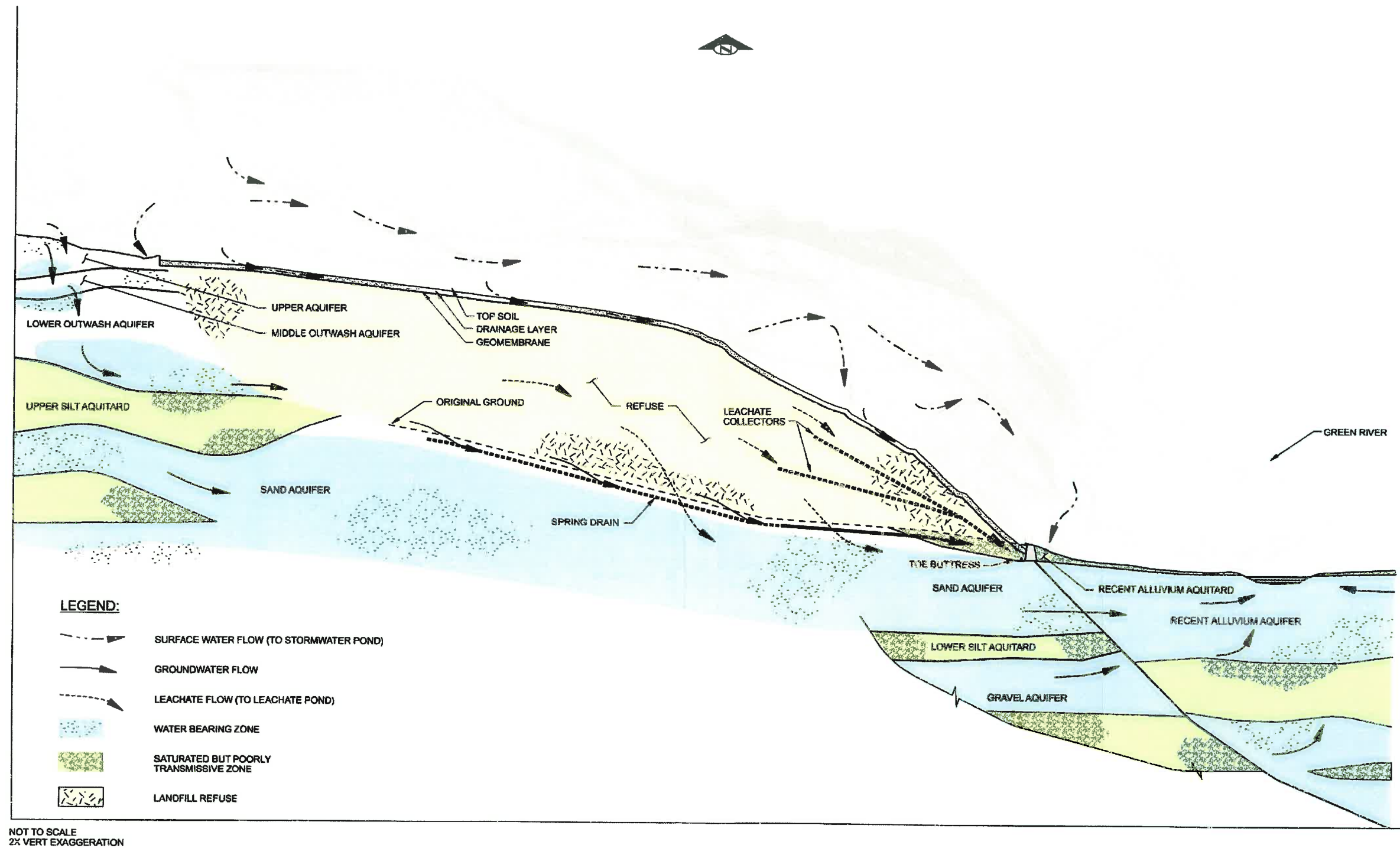
 City of Seattle, Seattle Public Utilities Owned Parcel
Boundary That Includes Kent Highlands Landfill

Figure 1
Site Location Map
Kent Highlands Landfill
Kent, Washington



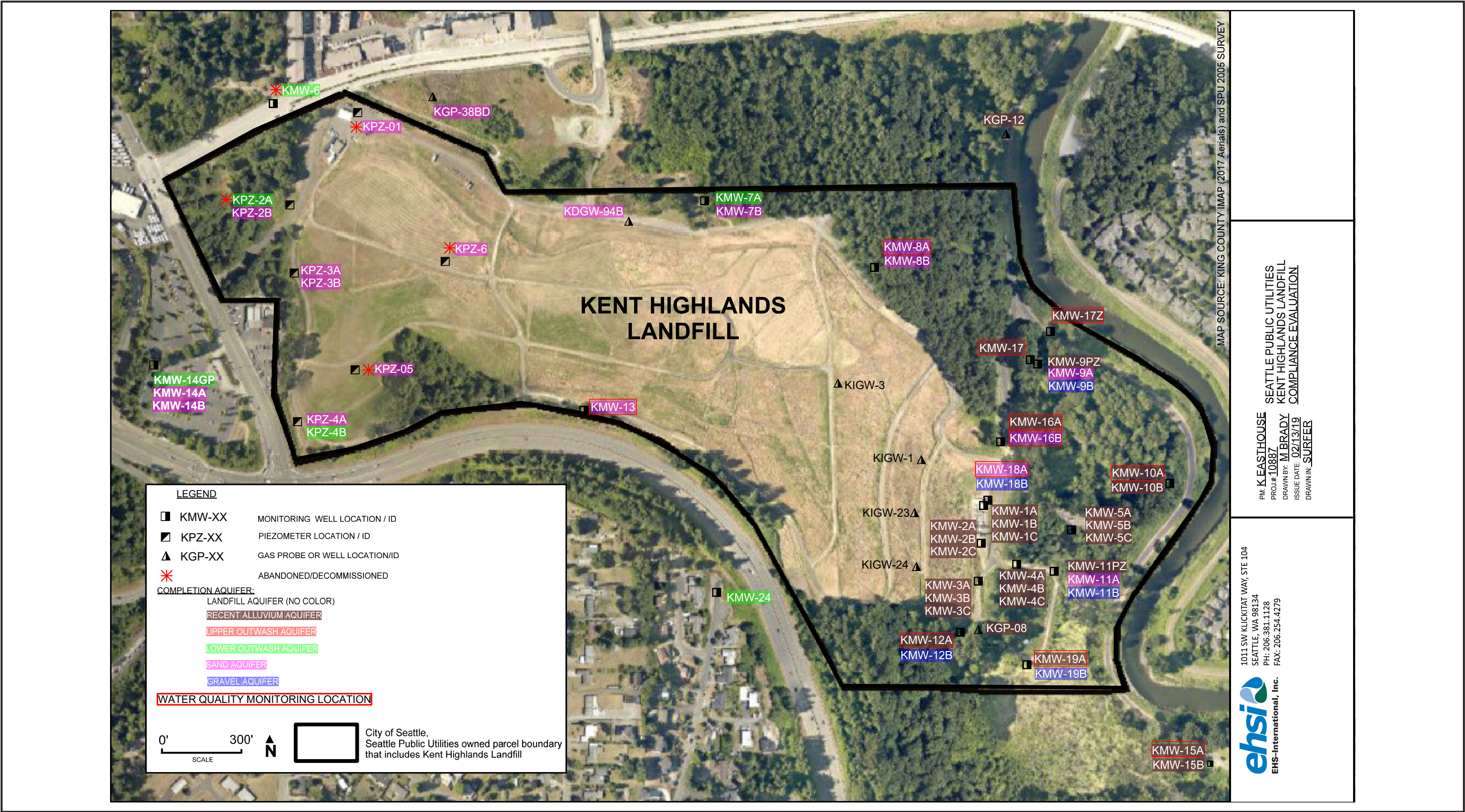
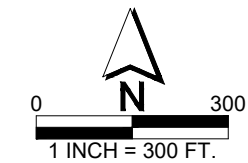
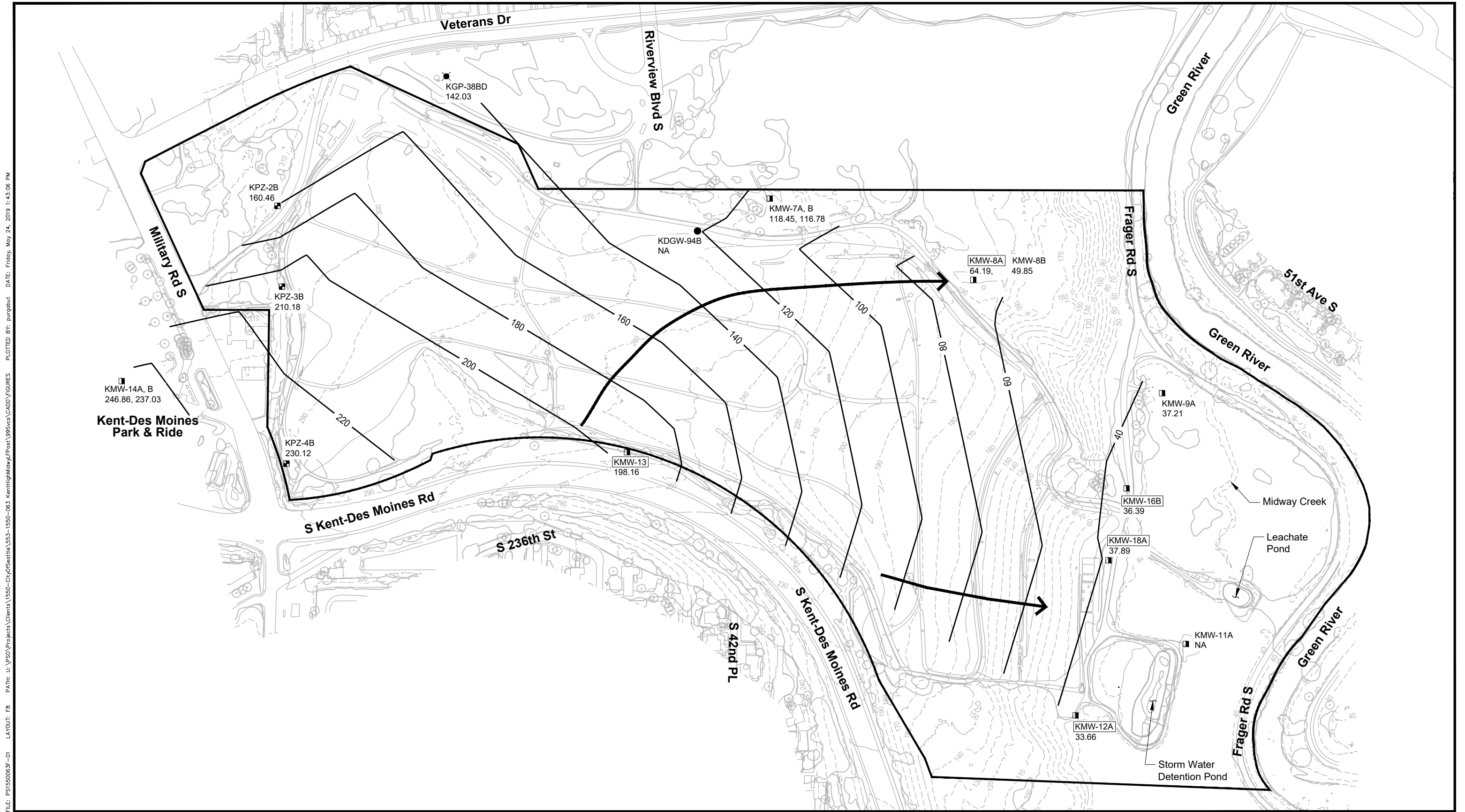


Figure 3
Monitoring Well Location Map
Kent Highlands Landfill
Kent, Washington

FILE: PS1550063F-01 LAYOUT: F8 PATH: U:\PSO\Projects\Clients\1550-CityOfSeattle\553-1550-063 KentHighMidway\FPost\995ves\CAOD\FIGURES PLOTTED BY: purgubut DATE: Friday, May 24, 2019 1:43:06 PM



Legend:

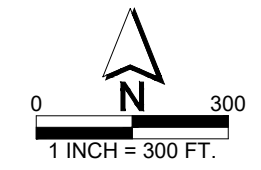
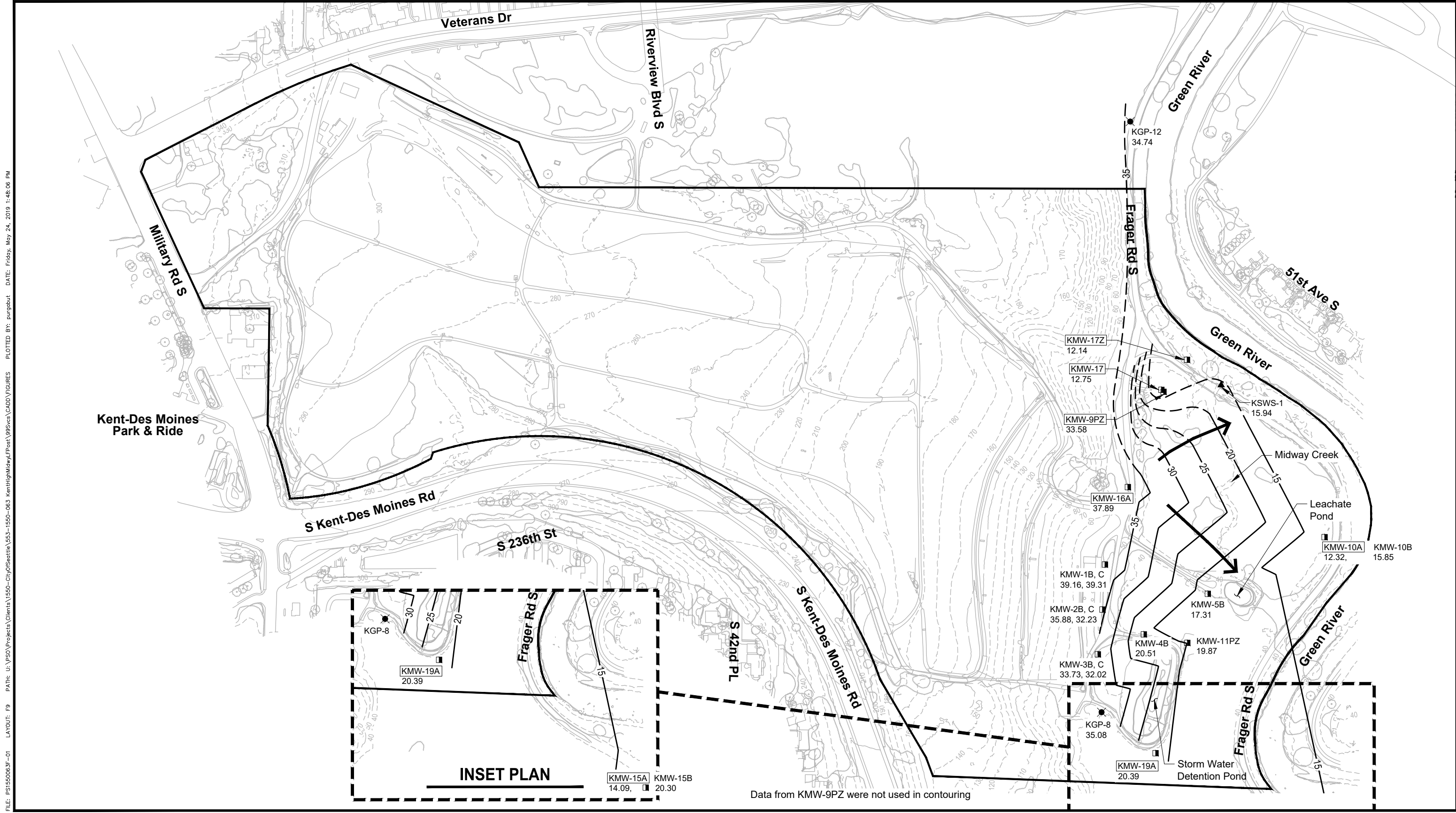
- Groundwater Monitoring Well (MW)
A=Shallow completion
B=Intermediate completion
C=Deep completion
- Piezometer (PZ)
- ⦿ Gas Probe (GP)

- Gas Extraction Well (GW)
- Groundwater Quality Monitoring Well
- ▲ Surface Water Station
- ⦿ Manhole (MH)

- City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill
- 100 — Potentiometric Surface Elevation Contour
- General Direction of Groundwater Flow
- NA Water Level Data Not Available

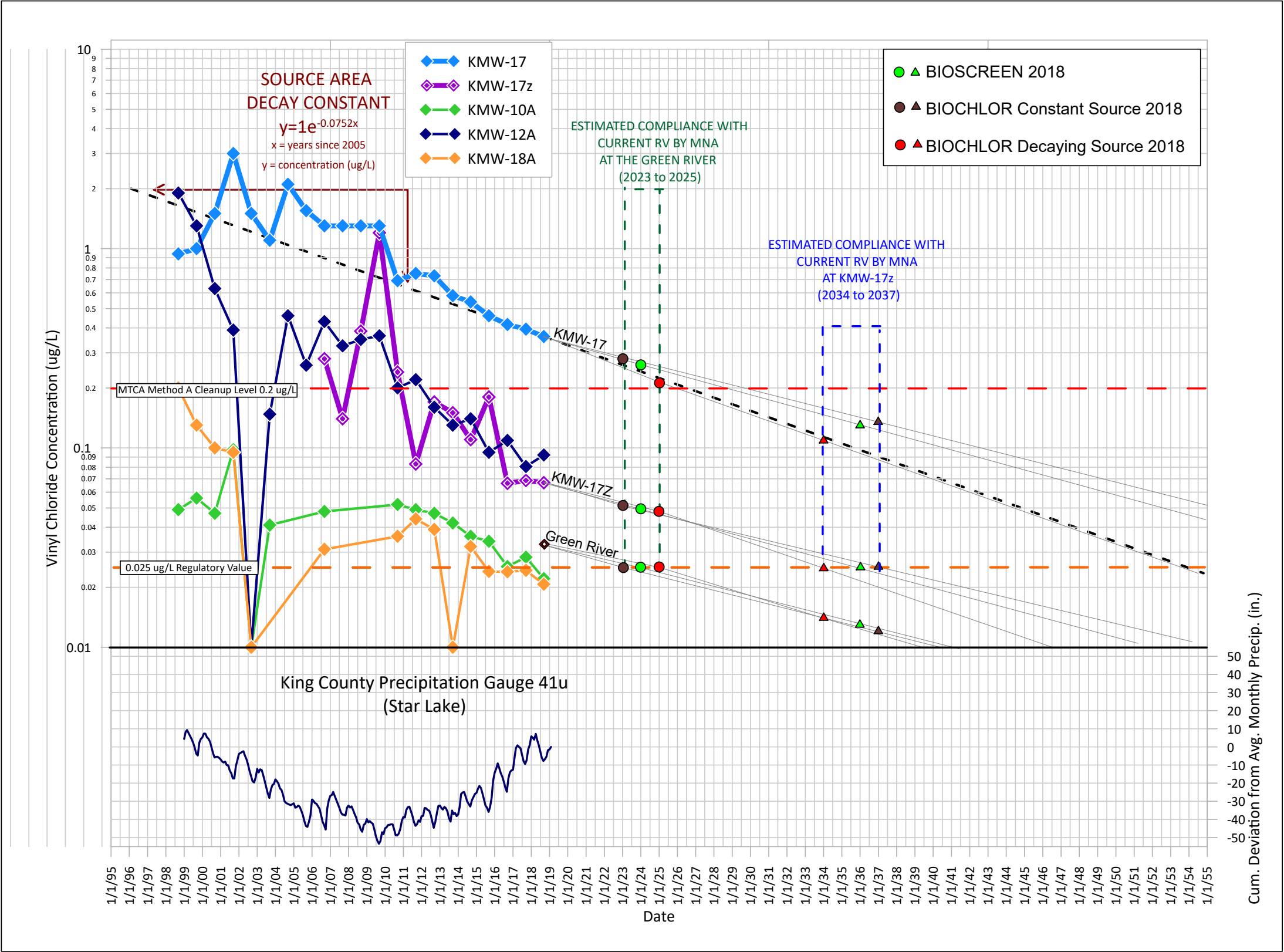
Figure 8
Potentiometric Surface Map of
the Sand Aquifer
September 4, 2018
Kent Highlands Landfill

FILE: PS1550063F-01 LAYOUT: F9 PATH: U:\PSO\Projects\Clients\1550-CityOfSeattle\553-1550-063 KentHighMidway\FPost\99Sves\CAOD\FIGURES PLOTTED BY: purgubut DATE: Friday, May 24, 2019 1:46:06 PM



- Legend:**
- | | | |
|--|---------------------------------------|---|
| ■ Groundwater Monitoring Well (MW)
A=Shallow completion
B=Intermediate completion
C=Deep completion | ⊗ Gas Probe (GP) | — City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill |
| ■ Piezometer (PZ) | □ Groundwater Quality Monitoring Well | — 100 — Potentiometric Surface Elevation Contour |
| | ▲ Surface Water Station | → General Direction of Groundwater Flow |
| | ● Manhole (MH) | |

Figure 9
Potentiometric Surface Map
of the Recent Alluvium Aquifer
September 4, 2018
Kent Highlands Landfill



EHS-International, Inc.
1011 SW Klickitat Way, Suite 104
Seattle, Washington 98134
Ph: 206.381.1128
Fax: 206.254.4279

KENT HIGHLANDS LANDFILL
Compliance Analysis

SEATTLE PUBLIC UTILITIES
Kent, Washington

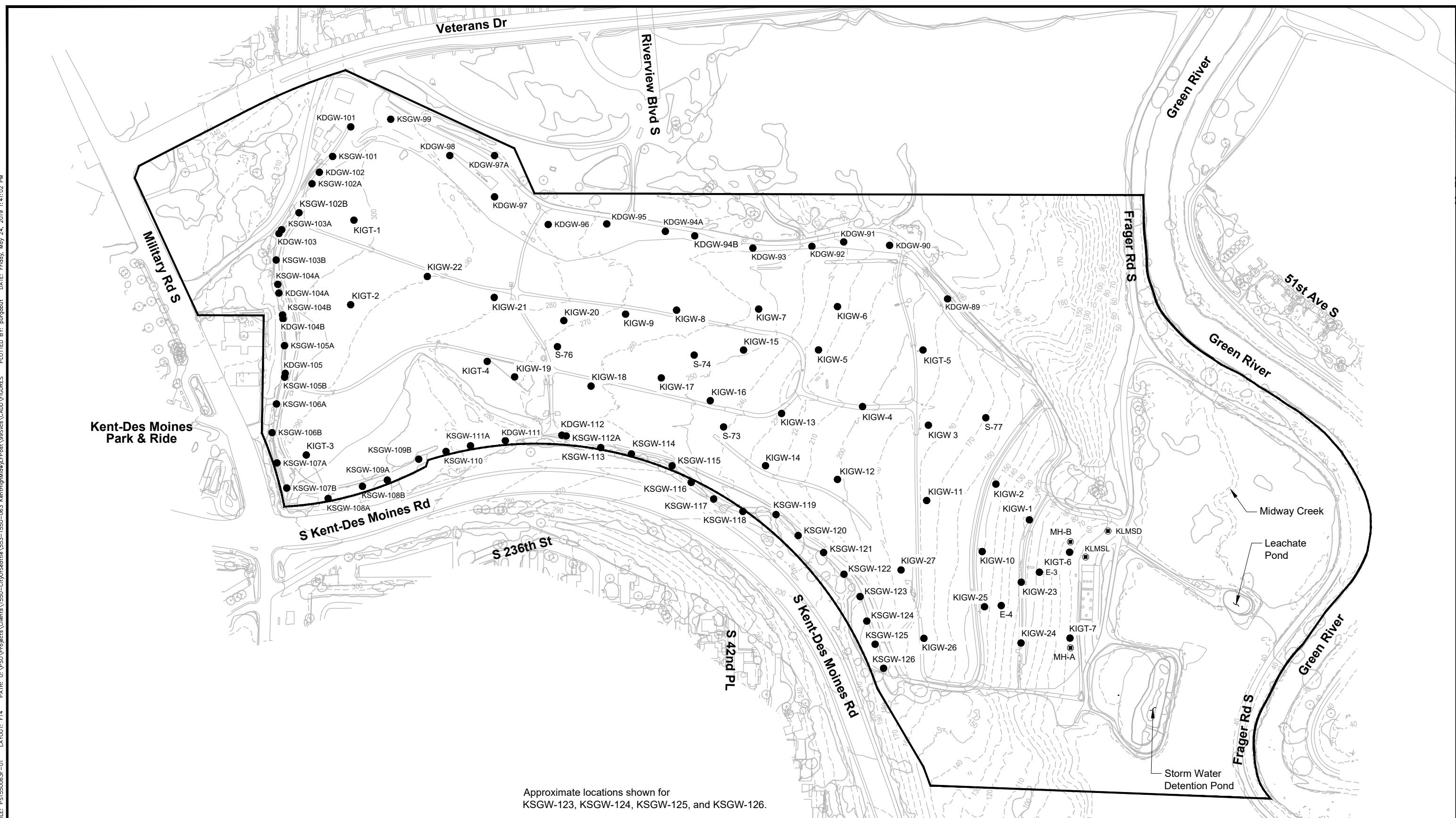
PROJECT MANAGER:
K. EASTHOUSE
CREATED BY:
M. BRADY
DATE:
1999 - 2018 DATA

EHSI PROJECT #:
10887


ISSUE DATE:
MARCH 2019

Figure 7
Vinyl Chloride Degradation Hydrograph
Kent Highlands Landfill
Kent, Washington

FILE: PS1550063F-01 LAYOUT: F14 PATH: U:\PSO\Projects\Clients\1550-CityOfSeattle\551-1550-063 KentHighlands\FPost\99Sves\CADD\FIGURES PLOTTED BY: purgubut DATE: Friday, May 24, 2019 1:41:02 PM




Approximate locations shown for
KSGW-123, KSGW-124, KSGW-125, and KSGW-126.



DATE: May 24, 2019

FILE: PS1550063F-01

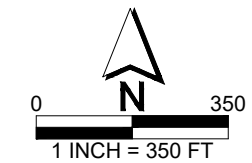
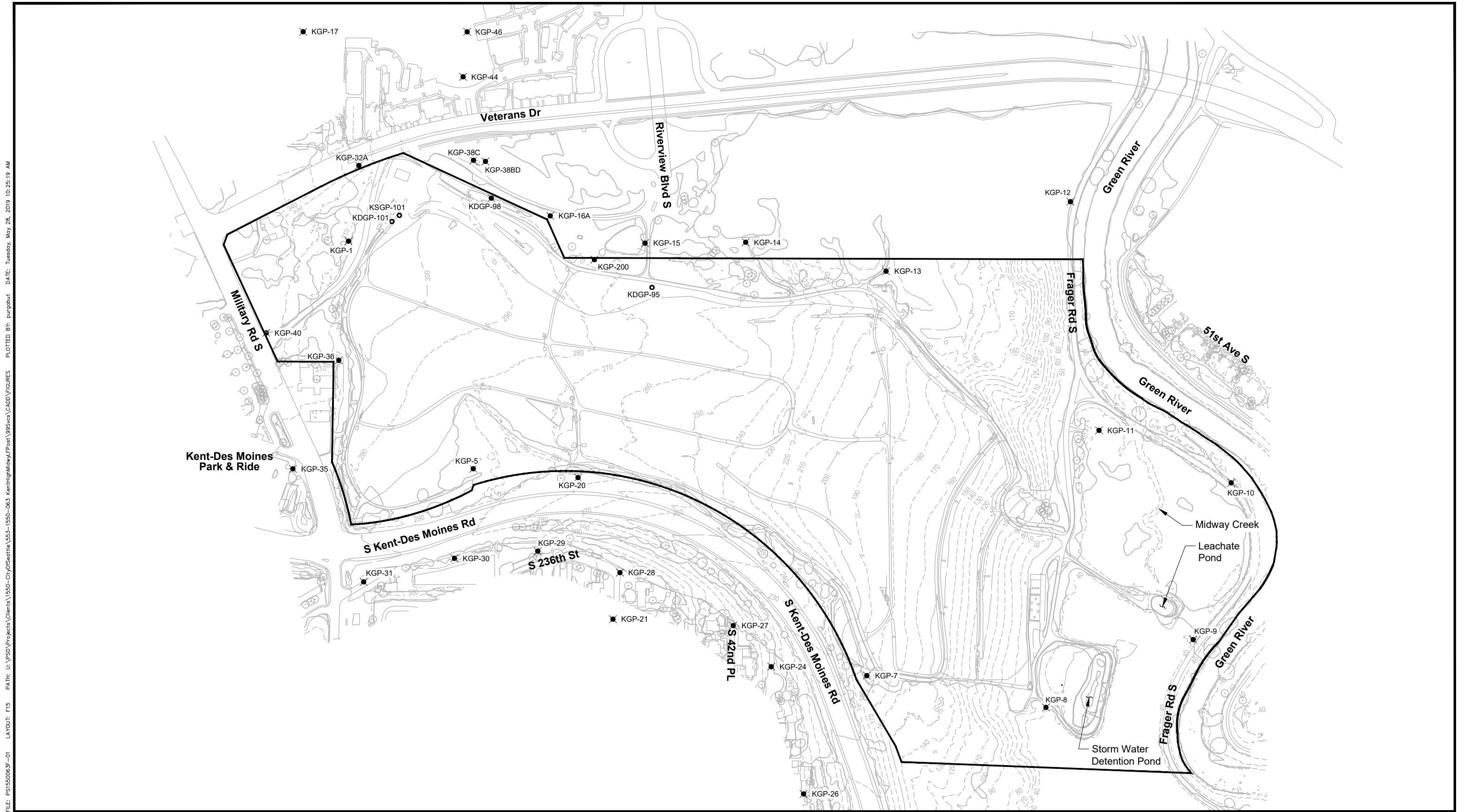


0 300
1 INCH = 300 FT.

- Legend:**
- Gas Extraction Well
 - ⊙ Manhole (MH)
 - City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 14
Landfill Gas Well Locations
Kent Highlands Landfill

FILE: PS1550063F-01 LAYOUT: F15 PATH: U:\PSO\Projects\Clients\1550-CityOfSeattle\551-1550-063 KentHighway4\FPost\99Sves\CADD\FIGURES PLOTTED BY: purgabut DATE: Tuesday, May 28, 2019 10:25:19 AM



- Legend:**
- Gas Probe (GP)
 - Operational Gas Probe
 - City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Kent Highlands Landfill

Figure 15
Landfill Gas Probe Locations
Kent Highlands Landfill

9.9 Environmental Covenants

Kent Highlands Landfill/SIT8.7

CONFORMED COPY

Return Address:

City of Seattle SPU/Real Prop - SWU
710 Second Avenue 10th Floor
Seattle, WA 98104

20020314002279
SEATTLE PUBLIC RECORDS 145.00
PAGE 001 OF 138
03/14/2002 15:29
KING COUNTY, WA

Document Title(s) (or transactions contained therein):
1. Restrictive Covenant
Reference Number(s) of Documents assigned or released: (on page ___ of document(s))
Grantor(s) (Last name first, then first name and initials)
1. The City of Seattle
Grantee(s) (Last name first, then first name and initials)
1. Washington State Department of Ecology
Legal Description (Abbreviated: i.e. lot, block, plat or section, township, range)
Portion of Enos Cooper Donation Claim No. 38 in Section 15, Township 22 North, Range 4 East, W.M.
Additional legal is on page <u>4</u> of document
Assessor's Property Tax Parcel/Account Number
Tax Parcel/Account Number 000200-0005-03
The Auditor/Recorder will rely on the information provided on the form. The staff will not read the document to verify the accuracy or completeness of the indexing information provided herein.

RECEIVED

MAY 20 2003

DEPT OF ECOLOGY

RESTRICTIVE COVENANT KENT HIGHLANDS LANDFILL

The property that is the subject of this Restrictive Covenant has been the subject of remedial action under Chapter 70.105D RCW. The work done to clean up the property (hereinafter the "Cleanup Action") is described in the Cleanup Action Plan for Kent Highlands Landfill dated April 19, 1993. This Restrictive Covenant is required by WAC 173-340-440 to assure the continued integrity of the Cleanup Action.

The undersigned, City of Seattle ("Seattle"), is the fee owner of real property in King County (legal description attached), hereinafter referred to as the "Site." For the purposes of this Restrictive Covenant, the Site refers to the Seattle-owned portions of the former Kent Highlands Landfill, located Northeast of the intersection of State Route 516 (AKA Kent-DesMoines Road) and Military Road in Kent, Washington. Seattle makes the following declaration as to limitations, restrictions, and uses as to which the Site may be put, and specifies that such declarations shall constitute covenants running with the land, as provided by law, and shall be binding on all parties and all persons claiming under them.

Section 1. Any activity on the Site that may interfere with the Cleanup Action is prohibited. Any activity on the Site that may result in the release of a hazardous substance that was contained as part of the Cleanup Action is prohibited. Any activity on the Site that may result in endangerment to human health or the environment by hazardous substances contained on site or by gas generated by and emitted from the Site is prohibited.

Section 2. Except for groundwater monitoring, no groundwater may be taken for any purpose from any well on the Site without Department of Ecology ("Ecology") approval.

Section 3. The owner of the Site must give written notice to Ecology, or to its successor agency, of the owner's intent to convey any fee interest in the Site. Seattle and all subsequent owners shall provide for the continued operation, maintenance and monitoring of the Cleanup Action.

Section 4. The owner must notify and obtain approval from Ecology, or from its successor agency, prior to any use of the Site that is inconsistent with the terms of this Restrictive Covenant. Ecology or its successor agency may approve such a use only after public notice and comment.

Section 5. The owner shall restrict leases to uses and activities consistent with this Restrictive Covenant and notify all lessees of the restrictions on the use of the property.

Section 6. The owner shall allow authorized representatives of Ecology, or its successor agency, the right to enter the Site at reasonable times and with reasonable prior notice for the purpose of evaluating compliance with the Cleanup Action Plan and to inspect records that are related to the Cleanup Action.

Section 7. The owner of the Site reserves the right under WAC 173-340-720 and WAC 173-340-440 (1991 ed.), to record an instrument which provides that this Restrictive Covenant shall no longer limit use of the Site or be of any further force or effect. However, such an instrument may be recorded only with the consent of Ecology, or its successor agency. Ecology or a successor agency may consent to the recording of such an instrument only after public notice and comment.

DATED this 14th day of March, 2002.

Chuck Clarke

The City of Seattle
Chuck Clarke, Director, Seattle Public Utilities

STATE OF WASHINGTON)
)SS.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that Chuck Clarke signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the Director of Seattle Public Utilities of the City of Seattle to be the free and voluntary act of the City of Seattle for the uses and purposes mentioned in the instrument.

Dated: March 14, 2002



Linda D. Moreno

NOTARY PUBLIC in and for the
State of Washington,
My appointment expires 8-10-02

- All of Parcel, tax lot number 000200-0005-03. Said parcel described as:
That portion of the west 400 feet of the north 1436 feet of the south 1944 feet of the Enos Cooper Donation Claim Number 38 lying north of the Kent-Des Moines right-of-way north boundary line, and being more particularly described as Follows:

Beginning at the center of Section 15, T22N, R4E. Thence eastward along a line parallel to the south boundary of said Enos Cooper Claim to a point on the west boundary of said claim; Thence southward along the west boundary of said Enos Cooper Claim 500 feet to the true point of beginning;
thence north $88^{\circ}45'52''$ east 400 feet;
thence south 220 feet along a line parallel to the west boundary line of said Enos Cooper Claim;
thence south $36^{\circ}00'$ west a distance of about 330 feet to the north boundary of the SR-516 right-of-way;
thence northwestward along said north right-of-way line to the west boundary line of said Enos Cooper Claim;
thence north along the west boundary line of Said Enos Cooper Claim to the true point of beginning.

36



20030711003046

PACIFIC NW TIT COV 157 88
PAGE 001 OF 139
07/11/2003 15:08
KING COUNTY, WA

City of Kent
Attn. Property Management
220 - 4th Avenue South
Kent, Washington 98032

Reference Number of Related Document. N/A

Grantor(s) City of Kent

Grantee(s) The Public

139/157 PNWT
W 6175

Abbreviated Legal Description. A ptn of Enos Cooper Donation Claim, SE 1/4, Sec 15,
T22N, R4E, W M, King County

Additional Legal Description is contained in Exhibit "A" of Document

Assessor's Property Tax Parcel or Account No.. 152204-9022

PROJECT NAME Kent Highlands Landfill

157 88
139/157 PNWT
W 6175

RESTRICTIVE COVENANT KENT HIGHLANDS LANDFILL

The property that is the subject of this Restrictive Covenant has been the subject of remedial action under Chapter 70.105D RCW. This Restrictive Covenant is required by WAC 173-340-440 to assure the continued integrity of the Cleanup Action.

The undersigned, City of Kent, ("Kent"), is the fee owner of real property in King County (legal description attached as Exhibit "A"), hereinafter referred to as the "Site". For the purposes of this Restrictive Covenant, the Site refers to the Kent-owned portions

KENT HIGHLANDS LANDFILL RESTRICTIVE COVENANT

(July 1, 2003)

RECEIVED
JUL 30 2003
DEPT OF ECOLOGY

of the former Kent Highlands Landfill, located Northeast of the intersection of State Route 516 (aka Kent-DesMoines Road) and Military Road in Kent, Washington. The work done to clean up the property (hereinafter the "Cleanup Action") is described in the Cleanup Action Plan for Kent Highlands Landfill dated April 19, 1993 (attached as Exhibit "B").

Kent makes the following declaration as to limitations, restrictions, and uses as to which the Site may be put, and specifies that such declarations shall constitute covenants running with the land, as provided by law, and shall be binding on all parties and all persons claiming under them.

SECTION 1. Any activity on the Site that may interfere with the Cleanup Action is prohibited. Any activity on the Site that may result in the release of a hazardous substance that was contained as part of the Cleanup Action is prohibited. Any activity on the Site that may result in endangerment to human health or the environment by hazardous substances contained or by gas generated by and emitted from the Site is prohibited.

SECTION 2. Except for groundwater monitoring, no groundwater may be taken for any purpose from any well on the Site without Department of Ecology ("Ecology") approval.

SECTION 3. The owner of the Site must give written notice to Ecology, or to its successor agency, of the owner's intent to convey any fee interest in the Site. Kent and all subsequent owners shall provide for the continued operation, maintenance, and monitoring of the Cleanup Action.

SECTION 4. The owner must notify and obtain approval from Ecology, or from its successor agency, prior to any use of the Site that is inconsistent with the terms of this Restrictive Covenant. Ecology or its successor agency may approve such a use only after public notice and comment.

SECTION 5. The owner shall restrict leases to uses and activities consistent with this Restrictive Covenant and notify all lessees of the restrictions on the use of the property.

SECTION 6. The owner shall allow authorized representatives of Ecology, or its successor agency, the right to enter the Site at reasonable times and with reasonable prior notice for the purpose of evaluating compliance with the Cleanup Action Plan and to inspect records that are related to the Cleanup Action.

SECTION 7. The owner of the Site reserves the right under WAC 173-340-720 and WAC 173-340-440 (1991 ed.), to record an instrument which provides that this Restrictive Covenant shall no longer limit use of the Site or be of any further force or effect. However, such an instrument may be recorded only with the consent of Ecology, or its successor agency. Ecology or a successor agency may consent to the recording of such an instrument only after public notice and comment.

DATED this 8th day of July, 2003.

CITY OF KENT:

By Jim White

Its Mayor

DATE: 7-8-03

STATE OF WASHINGTON)


: ss.

COUNTY OF KING)

I hereby certify that on the 8th day of July, 2003, I know or have satisfactory evidence that **JIM WHITE** is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he is authorized to execute the instrument on behalf of the **CITY OF KENT** as its Mayor, and such execution to be the free and voluntary act of such party for the uses and purposes mentioned in the foregoing instrument.

-Notary Seal Must Appear Within This Box-

IN WITNESS WHEREOF, I have hereunto set my hand and official seal the day and year first above written.



Janice D. Banister
JANICE D. BANISTER
NOTARY PUBLIC, in and for the State of Washington
residing at Kent
My appointment expires 12-19-04

APPROVED AS TO FORM:

Kent City Attorney
Kent City Attorney

P:\C:\H-FILES OpenFiles\0722 RestrictiveCovenant.doc

KENT HIGHLANDS LANDFILL RESTRICTIVE COVENANT

(July 1, 2003)

EXHIBIT "A"

THAT PORTION OF THE ENOS COOPER DONATION CLAIM LYING WITHIN THE SOUTHEAST QUARTER OF SECTION 15, TOWNSHIP 22 NORTH, RANGE 4 EAST, W.M., KING COUNTY, WASHINGTON, DEFINED AS FOLLOWS:

BEGINNING AT A POINT OF INTERSECTION WITH THE CENTERLINE OF KENT-DES MOINES HIGHWAY AND THE SOUTH LINE OF THE NORTH HALF OF SAID SUBDIVISION;

THENCE SOUTHEASTERLY ALONG SAID CENTERLINE A DISTANCE OF 135.48 FEET;

THENCE NORTH 62°30'00" EAST 30 FEET TO THE TRUE POINT OF BEGINNING;

THENCE CONTINUING NORTH 62°30'00" EAST 525 FEET;

THENCE NORTHWESTERLY ON A CURVE TO THE LEFT AND RUNNING PARALLEL WITH THE PROPOSED NORTHEASTERLY MARGIN OF STATE ROUTE 516 (AS SHOWN ON THAT CERTAIN MAP DATED MAY 8, 1969, SHEET 2 OF 11 SHEETS, JUNCTION STATE ROUTE 5 TO JUNCTION STATE ROUTE 167 MILEPOST 2.21 TO MILEPOST 4.83) TO THE WEST LINE OF SAID DONATION CLAIM;

THENCE SOUTH ALONG THE WEST LINE OF SAID DONATION CLAIM TO THE CENTERLINE OF SAID HIGHWAY;

THENCE SOUTHEASTERLY TO A POINT WHICH BEARS SOUTH 62°30'00" WEST FROM THE TRUE POINT OF BEGINNING;

THENCE NORTH 62°30'00" EAST 30 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT THAT PORTION DEFINED AS FOLLOWS:
BEGINNING AT A POINT OF INTERSECTION OF THE WEST LINE OF THE COOPER DONATION CLAIM WITH THE NORTH MARGIN OF SSH 5A (KENT-DES MOINES HIGHWAY) BEING THE TRUE POINT OF BEGINNING OF EXCEPTION HEREIN DESCRIBED;

THENCE NORTH ALONG SAID DONATION CLAIM LINE 450 FEET;

THENCE EAST AT RIGHT ANGLES TO SAID DONATION CLAIM LINE 400 FEET;

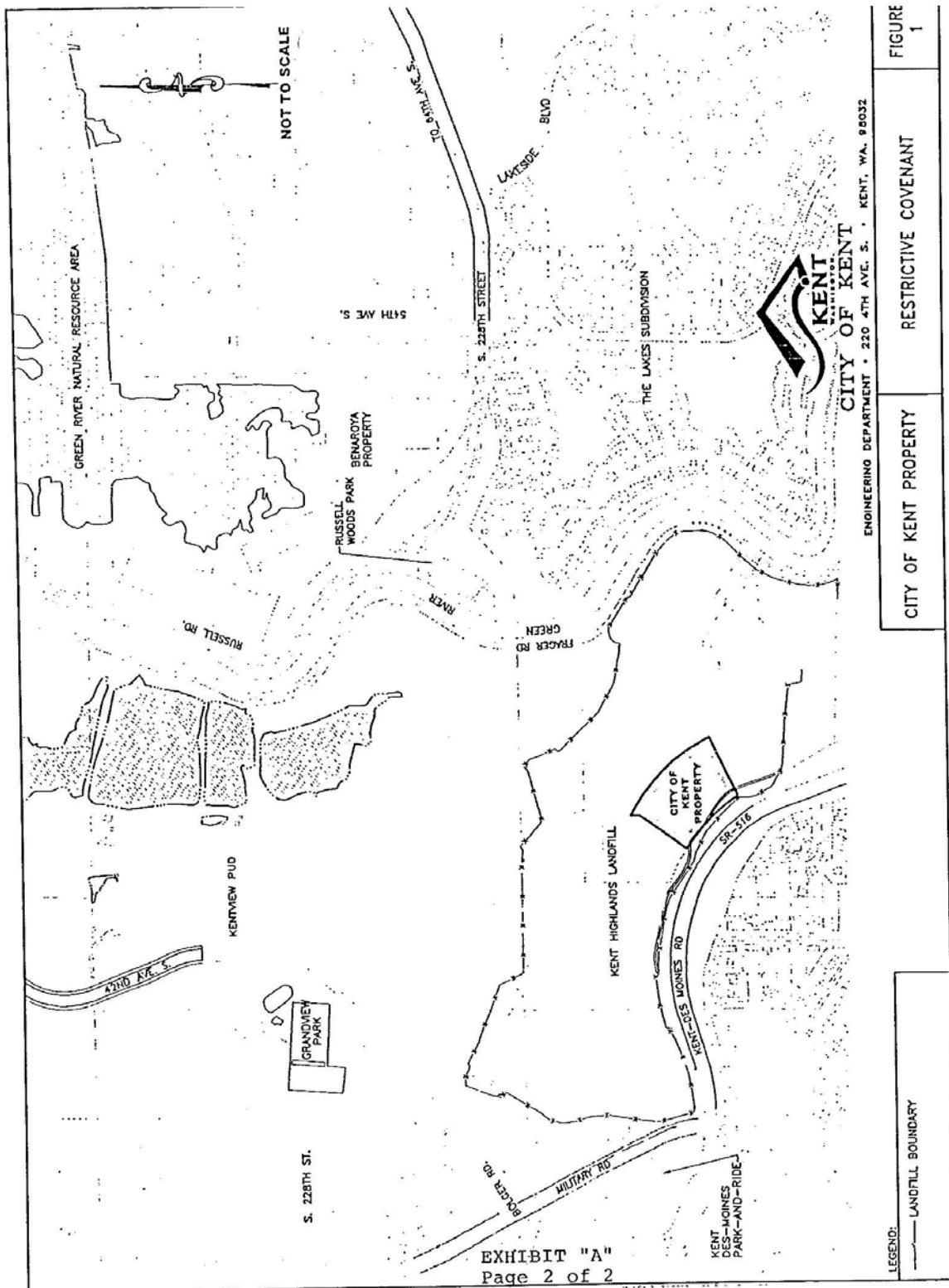
THENCE SOUTH PARALLEL WITH THE WEST LINE OF SAID DONATION CLAIM LINE 220 FEET;

THENCE SOUTH 36° WEST 440 FEET MORE OR LESS TO NORTHERLY MARGIN OF SSH 5A;

THENCE NORTHWESTERLY ALONG THE NORTHERLY MARGIN OF SSH 5A TO THE TRUE POINT OF BEGINNING OF EXCEPTION HEREIN DESCRIBED.

AND ALSO EXCEPT THAT PORTION LYING SOUTHERLY OF SAID NORTHEASTERLY MARGIN OF SAID STATE ROUTE 516.

EXHIBIT "A"
Page 1 of 2



9.10 Photo log

Photo 1: Gas extraction well with the gas control facility in the distance, facing southeast.



Photo 2: Gas extraction piping, facing northwest.



Photo 3: View of the landfill slope, facing north.



Photo 4: New gas probes near the property boundary.



Photo 5: Gas control facility, facing southwest.



Photo 6: Gas control facility, facing west.



Photo 7: Lined stormwater aeration pond that discharges to Green River.



Photo 8: Lined leachate aeration pond that discharges to sanitary sewer.



Photo 9: Groundwater monitoring well at the toe of the landfill near the marshy area.



Photo 10: Wetland area between the toe of the landfill and the Green River.

