

Executive Summary

Stericycle owns and operates a hazardous waste treatment, storage, and disposal facility on the Stericycle property located at 20245 77th Avenue South in a heavily industrial area of Kent, Washington. A Remedial Investigation (RI) Report was prepared in 2007 and a Feasibility Study Work Plan (FSWP) was prepared in 2015. The FSWP presented updated contaminant distribution information and outlined the process that would be used to conduct the Feasibility Study (FS). A draft FS was submitted in April 2016 and conditionally approved by Ecology in October 2016. This final RI/FS includes reissuing the 2007 RI and the Revised FS, including revisions and additional information requested by Ecology as part of the 2016 FS conditional approval.

The site is located on a 6.25-acre parcel of land that can be divided into two areas, the waste management facility on the eastern 3 acres of the site, and the 10-day hazardous waste transfer yard on the western 3.25 acres of the site. Five areas of concern (AOCs) have been identified based on previous studies:

- AOC-1: Former Underground Storage Tanks (USTs);
- AOC-2: Tank Farm Area;
- AOC-3: Stabilization Area;
- AOC-4: Stormwater Drainage System; and
- AOC-5: Process and Storage Area.

Conceptual Site Model

The near-surface geology and hydrogeology at the site is characterized by alternating sand and silty/clayey layers and is distinguished by the following eight units, listed in order of increasing depth:

- Sandy Fill/Shallow Water-Bearing Unit - Hydraulically unconfined, becomes unsaturated during the period of low rainfall in summer and early fall.
- Upper Silt and Clay Unit/Upper Aquitard – Up to 9 feet thick. Partially unsaturated during the late summer and early fall. High in organic carbon content which combined with the low permeability of the silt and clay should make the upper aquitard a natural barrier to downward contaminant transport. Seasonally perched groundwater influences the oxidation-reduction potential favoring a tendency toward reducing conditions in shallower groundwater zones at the site.
- Upper Silty Sand Unit/Intermediate Aquifer Zone A - fully saturated year-round.
- Intermediate Silt Unit/Intermediate Aquitard - Up to 7 feet thick. Appears to be present in the eastern and southeastern portions of the site, but absent in the north and south central portions of the site.
- Intermediate Sand Unit/Intermediate Aquifer Zone B – Fully saturated, hydraulically connected to Zone A of the intermediate aquifer.
- Lower Silt Unit/Lower Aquitard –Thickness varies from about 2 to 10 feet.
- Lower Sand Unit/Deep Aquifer - Hydraulically confined year-round by the overlying Lower Aquitard. Groundwater flow direction is uniform, suggesting that lower aquitard is continuous, and directed to the west.

- Deep Silt Unit/Deep Aquitard- Appears to be continuous across the site.

Groundwater within the fill unit likely perches on the upper aquitard during wet months, and this water drains slowly into Zone A, the upper portion of the intermediate aquifer. In the intermediate aquifer, groundwater within Zone A is hydrologically connected to Zone B, because the intermediate aquitard is discontinuous. Except for the discontinuities, the intermediate aquifer is separated from the deep aquifer by a relatively thick silt and silty sand aquitard.

Constituents of Concern (COCs) - The primary sources of COCs at the site are releases from tanks and piping, and constituents spilled at the site, resulting in soil and groundwater impacts.

Soil - The RI identified a list of preliminary soil COCs which was narrowed as part of the FS, based on concentration and preliminary cleanup levels. Soil COCs considered in the FS include VOCs (benzene and vinyl chloride), PAHs (benzo(a)pyrene, benzo(b)fluoranthene, and chrysene), total petroleum hydrocarbons (TPH), arsenic, and cyanide. Soil data indicate that the tank farm may be the primary source for releases to the soil and groundwater. The lateral and vertical extent of these COCs appears to be limited, and primarily present in the area of AOC-2 (tank farm), and they do not appear to be migrating from the site at concentrations exceeding preliminary groundwater cleanup levels.

Groundwater - In groundwater, the COCs considered are vinyl chloride, arsenic, hexavalent chromium, cyanide, and iron.

Current vinyl chloride concentrations in groundwater have declined and evidence of biodegradation continues. Trends indicate concentrations will be below the preliminary cleanup level around 2020.

In contrast, arsenic concentrations in groundwater have not exhibited any significant increasing or decreasing trends over time. Arsenic levels may be related to seasonal variability in the geochemistry of groundwater, as evidenced by seasonally higher concentrations in the shallower groundwater zones.

Data for hexavalent chromium in groundwater prior to the FS were flagged for data quality issues since many reported hexavalent chromium results were higher than corresponding total chromium results. Stericycle collected additional samples as part of the FS. Total/dissolved chromium has not been detected at any location above the preliminary cleanup level (for hexavalent chromium) and is consistently lower than the reported hexavalent chromium fraction. Hexavalent chromium was considered in the FS based on results from 2015 and earlier; however since recent results yield information that indicates hexavalent chromium is not as high as previously reported, the recent results will be used in the Cleanup Action Plan as the site remedy is designed.

Cyanide has been detected sporadically in groundwater at the site. As part of the FS, additional samples were analyzed during the FS for total, free, and weak acid dissociable cyanide to evaluate if the cyanide detected was in strong metal bound forms or if it was more biologically available. Results indicate that the cyanide present in groundwater at the site is not free cyanide and is not biologically available. Therefore, cyanide results from the FS will be used for the design of the remedy in the Cleanup Action Plan.

Iron concentrations in groundwater at the site have not exhibited any significant increasing or decreasing trends over time. Historical releases of organic constituents could have contributed to reducing conditions and solubilization of iron, leading to higher concentrations of inorganic constituents.

Nature and Extent of Contamination

COCs in surface soil are unlikely to be mobilized in fugitive dust since the site is mostly developed; and constituents detected in soil are also unlikely to leach to groundwater unless the industrial development is removed in the future. COCs in groundwater at the facility may migrate and affect groundwater in off-site areas. Constituents in groundwater may migrate to local surface water bodies via a drainage ditch along the northern border of the facility. This ditch could also be a source of recharge to the fill unit during the winter.

The potential for exposure to contaminated soils or the migration of the COCs identified in soil and groundwater at concentrations exceeding cleanup levels is unlikely under both current and future land use scenarios. The surface of the facility and most of the transfer yard is entirely covered with asphalt, concrete, or buildings. This surface cover effectively minimizes the leaching of soil COCs to groundwater, except where groundwater is in direct contact with COCs, which occurs only during the wettest periods of the year. As long as this low-permeability cover remains in place on most of the site, leaching of COCs is assumed to be low. The only area on the site where COCs in soil have also affected groundwater is in AOC-2. However, the COCs in groundwater are a much smaller subset of those found in soil, the concentrations are generally very low, and the areal extent of groundwater impacts is limited.

Remedial Objectives established in the FS for the site are summarized below:

- Prevent direct contact with surface or subsurface soil and inhalation of dust from surface soil affected with COCs at concentrations that exceed industrial CULs or reduce the risks associated with these exposure pathways to acceptable levels.
- Reduce, as practicable, COC mass in soil and groundwater within a reasonable timeframe (including subsurface VOC concentrations).
- Protect human and ecological receptors by reducing COC concentrations in affected groundwater at the CPOC within a reasonable time frame.
- Support current and future industrial use of the property.
- Comply with applicable state and federal regulations for site cleanup, health and safety, and waste management.

Remedial Alternatives – Several in situ technologies (chemical oxidation, chemical reduction, caps/covers) and ex situ technologies (excavation/treatment) were considered for remediation of soil. Groundwater technologies considered included enhanced anaerobic biodegradation, bioaugmentation, monitored natural attenuation, chemical reduction, chemical oxidation, and permeable reactive barriers.

Using these technologies, three remedial alternatives were developed for the site with the following common elements:

- Institutional controls (ICs);
- Active treatment of remaining source soils in active areas of the facility as they become accessible or at facility closure;
- Pavement or concrete surface cover;

- Targeted treatment of arsenic in groundwater; Stericycle proposes to limit treatment of arsenic in groundwater to areas where anthropogenic sources of carbon have exacerbated the existing arsenic concentrations.
- Compatibility of treatments chosen with hexavalent chromium treatments; and
- Long-term compliance monitoring.

Alternative 1 Monitored Natural Attenuation - Alternative 1 relies on eventual contaminated soil remediation in AOC-2 and AOC-3 when the areas become accessible, maintenance of surface cover over remaining source soils, and monitored natural attenuation to address affected site soil and groundwater.

Alternative 2 Permeable Reactive Barriers and Monitored Natural Attenuation - Alternative 2 supplements the soil remediation, surface cover, and natural attenuation processes that would occur under Alternative 1 with the installation of permeable reactive barriers (PRB) to reduce off-site migration of affected groundwater.

Alternative 3 In Situ Chemical Reduction and In Situ Bioremediation - Alternative 3 supplements the soil remediation, surface cover, and natural attenuation processes that would occur under Alternative 1 with in situ chemical reduction (ISCR) and in situ bioremediation (ISB), which consists of the injection of a in situ chemical reductant and substrate to promote anaerobic degradation and bio-mediated precipitation of ferrous iron and sulfide.

Comparison of Alternatives - Alternatives 1 and 3 received the highest total rating, followed closely by Alternative 2. Each of the alternatives would likely result in the attainment of groundwater cleanup levels within approximately five to ten years, with Alternative 3 projected to have the most rapid attainment of clean up levels.. Alternative 1 received a higher score than the others for technical and administrative implementability and cost, Alternative 3 received higher marks for protectiveness and risk reduction, permanence, and restoration time frame, while Alternative 2 was generally in the middle ranking for all criteria.

The preferred remedial alternative for the site is Alternative 1, which would fully attain remediation objectives as well as:

- Prevent direct contact with soils and inhalation of dust at the site and be protective of industrial workers;
- Address groundwater COCs above CULs including chlorinated VOCs and inorganic COCs caused by anthropogenic releases of carbon sources;
- Reduce risks due to inhalation of vapors or dust by incorporating ICs;
- Protect human and ecological receptors in Mill Creek by natural degradation of groundwater COCs and limiting the further release of COCs by remediation of site soils; and
- Support current and future industrial use of the site.

The Preferred Alternative would control potential exposures related to affected soil, groundwater, and soil gas, achieving the environmental indicator goals for the site.