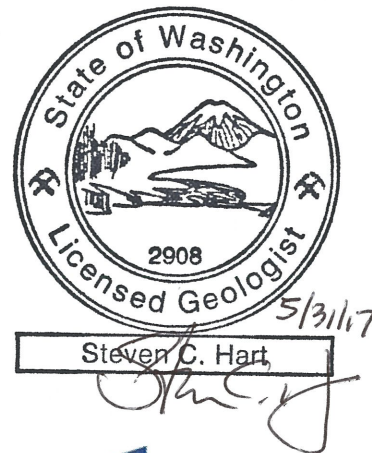


**Soil Sampling Work Plan
Chemtrade Performance
Chemicals US LLC Site
(aka Former Clariant Corporation Facility)**

**Kalama, Washington
Facility No. 24634187
VCP Project No. SW0492**

**H&H Job No. CLR-045
May 31, 2017**



SMARTER ENVIRONMENTAL SOLUTIONS

**Soil Sampling Work Plan
Chemtrade Performance Chemicals US LLC Site
404 N Hendrickson Drive
Kalama, Washington
H&H Job No. CLR-045**

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1.0 Introduction and Background

On behalf of Clariant Corporation (Clariant), Hart & Hickman, PC (H&H) is submitting this work plan for soil sampling in the manufacturing plant area of the Chemtrade Performance Chemicals US LLC site (Cleanup Site No. 1784, Facility/Site No. 24634187) located at 404 N. Hendrickson Drive in Kalama, Cowlitz County, WA. Note that we have previously referred to the site as the former Clariant Corporation facility site. The site is currently enrolled in the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP Project No. SW0492). A site location map is included as Figure 1.

Previous investigations indicate that there are soil and groundwater impacts at the site, and that the compounds of concern are cadmium and zinc. There are two main areas of impact at the site: the Former Settling Basins (FSB) area and the Manufacturing Plant Area (MPA). Impacts in the FSB area are associated with former settling basin #1 (FSB1) and former settling basin #2 (FSB2). A site map is provided as Figure 2.

In an opinion letter dated February 9, 2017, Ecology recommends preparation and submittal of an updated conceptual site model (CSM) and that the updated CSM should evaluate the MPA as a possible source of contamination. As has been documented in previous submitted reports, the existing CSM incorporates the presence of cadmium and zinc impacts in MPA soil and groundwater. However, the opinion letter notes that industrial processes which utilized zinc were conducted in the MPA through October 2016 may have been a potential continuing source of environmental impacts. As such, Ecology recommended additional assessment to evaluate current conditions in the MPA in order to update the site CSM.

Background information and the proposed scope of work are presented in the following sections. Site background information is presented in Section 2.0. A brief summary of soil remedial action (RA) activities previously completed at the site, a discussion of soil cleanup levels (CULs) and points of compliance (POCs) which are currently and potentially applicable at the site, and evaluation of sample data for soil which remains in place at the site following completion of the RA activities are presented in Section 3.0. Our proposed scope of work for soil sampling in the MPA is presented in Section 4.0.

In addition to providing Ecology the opportunity to comment on the soil sampling scope of work, we are requesting that Ecology provide comment/technical assistance regarding the applicability of soil CULs and POCs we have presented in Section 3.2 and the methods we have proposed for evaluating data in comparison to the CULs.

2.0 Site Background

2.1 Site Description

The site is an approximately 6.7-acre parcel which is zoned industrial and located in the Port of Kalama industrial area. The site is currently owned by Chemtrade Logistics, Inc. (Chemtrade). Chemtrade purchased the site from Clariant in January 2003. The site is bordered to the west by the Columbia River, and to the north, south, and the east by parcels which are zoned commercial and owned by the Port of Kalama. The parcels to the north and south of the site are undeveloped. The parcel to the east of the site is developed with Hendrickson Drive and the parcel to the east of Hendrickson Drive is owned by Burlington Northern, Inc. and is developed with railroad lines.

An approximately 17,000-square foot (sf) manufacturing building that contains offices, storage, loading docks, a mechanic shop, a lab, and product manufacturing areas is located on the southeastern portion of the site. To the north and northwest of the manufacturing building are two concrete secondary containment areas that contain process tanks and equipment, an approximately 1,000-sf building that contains a zinc oxide dryer, a truck loading area, a tank and two silos. The area to the south of the manufacturing building and large portions of the areas to the east and west of the building are paved. A railroad spur runs along the east side of the site structures and crosses Hendrickson Drive to the north of the manufacturing structures. These portions of the site are collectively referred to as the MPA. North of the manufacturing facility structures, the site is undeveloped where four settling basins were formerly located. In these undeveloped areas, the ground is primarily sandy and portions of the undeveloped land are sparsely vegetated with grasses. The site is almost entirely fenced except for perimeter areas along Hendrickson Drive, the railroad spur, and the Columbia River.

2.2 Site History

Prior to 1969, the site was undeveloped and was built up with approximately 20 ft of dredge

spoils from the Columbia River shortly before the start of manufacturing operations. The site was developed in 1969 with a manufacturing plant facility. The plant manufactured zinc hydrosulfite from 1969 to 1973 and sodium hydrosulfite from 1974 through mid-2016 when the plant was shut down. The latter process generated zinc oxide as a byproduct. From approximately 1974 until the late 1970s or early 1980s, the manufacturing process also generated zinc carbonate sludge as a byproduct. This sludge was discharged to FSB2. Zinc carbonate sludge was apparently not discharged to FSB2 after 1984. Former settling basins #3 and #4 (FSB3 and FSB4) were never used. FSB1 received minor spillage of zinc carbonate sludge from conveyance of the sludge to FSB2. The settling basins were closed in 1989 by removing the marketable zinc carbonate sludge from FSB2 and filling in the basins. Prior to January 2004, cadmium sulfate was used as a catalyst in manufacturing processes.

3.0 Soil Summary

3.1 Previous Soil Remedial Actions

In September and October 2003, Clariant excavated and disposed of approximately 16,000 tons of soil from the MPA and the FSB1 and FSB2 areas. Surface soils located in the eastern and western portions of the MPA were excavated to an average depth of 1.5 ft below ground surface (bgs). Soil located under the railroad spur was not excavated in the MPA; however, this area was later paved over. Soil was removed to an average depth of approximately 7 ft bgs in the FSB1 area and to an average depth of approximately 15 ft bgs in the FSB2 area. The excavation areas are identified in Figure 3.

Soils located beneath a truck access road that crosses the southern portion of the FSB2 area were not excavated during 2003. The soil left in place below the access road was sloped away from either side of the road to prevent the excavation sidewalls from collapsing under the road. Sidewall confirmation samples collected from the walls of the excavation located along this portion of the access road contained concentrations of zinc and cadmium exceeding CULs. In addition to the soil left in place because of the access road, an approximately 4,500 sf area of soil to the southeast of the access road was excavated to a depth ranging from approximately 5.5 to 8 ft bgs, which is shallower than the standard POC for soil.

Soil removal activities targeting soil beneath the access road that crossed the southern portion of FSB2 and soil beneath the previous depth of excavation within the FSB2 area southeast of the access road were conducted at the site in August and September 2010. The excavation activities consisted of excavation and off-site disposal of impacted soils located beneath the access road to a depth of 15 ft bgs (including soil that sloped outward from either side of the access road during the 2003 excavation), and excavation of soil beneath the previous depth of excavation within the FSB2 area southeast of the access road to a depth of 15 ft bgs. In total, approximately 11,500 tons of soil were excavated and disposed off-site during the 2010 excavation activities.

Soil removed from the top four feet of the FSB2 area during the 2003 excavation activities was used to backfill the bottom five feet of the 2003 FSB2 excavation (i.e., from 10 to 15 ft bgs). Approximately one-half of this soil was subsequently removed and disposed off-site during excavation activities complete in 2010. The remainder of the 2003 and 2010 excavations were backfilled with Columbia River dredge spoils obtained from the Port of Kalama-owned property located to the south of the site.

Cadmium and zinc data for soil samples which remain in-place at the site (i.e., locations not removed during the 2003 and 2010 excavation activities) are summarized in Table 1 and the remaining soil sample locations are depicted in Figure 3.

3.2 CULs and POCs

Under the Model Toxics Control Act (MTCA), a cleanup level (CUL) is the concentration of a hazardous substance in soil, water, air or sediment that is determined to be protective of human health and the environment under specified exposure conditions. CULs, in combination with points of compliance (POCs), may then be used to define the area or volume of soil, water, air or sediment at a site to be addressed by a cleanup action.

CULs and POCs which are currently applicable to the site and those which we interpret to be potentially applicable to the site are presented below for the soil – direct contact, terrestrial environment, and protection of groundwater scenarios. Evaluation of cadmium and zinc concentrations in remaining site soil are also compared to the CULs for each scenario.

3.2.1 Soil – Direct Contact

Per WAC 173-340-740 (6)(d), for soil CULs based on human exposure via direct contact or other exposure pathways where contact with the soil is required to complete the pathway, the POC shall be established in the soils throughout a site from the ground surface to 15 ft bgs. Per Ecology, this represents a reasonable estimate of the depth of soil that may be excavated and

distributed at the soil surface as a result of hypothetical development activities. The February 9, 2017 opinion letter indicates that the soil – direct contact CUL applicable to the site is 2 milligrams per kilogram (mg/kg) for cadmium. This CUL is the Method A cadmium concentration presented in WAC 173-340-790, Table 740-1. However, as noted in the table, this cadmium CUL is based on protection of groundwater for drinking water use. Therefore, we do not believe this CUL is applicable for human exposure where direct contact with the soil is required to complete the pathway.

Per WAC 173-340-705, Method B is applicable to all sites and shall be used to develop cleanup levels unless one or more of the conditions for using Method A or Method C are demonstrated to exist and the person conducting the cleanup action elects to use that method. Per WAC 173-340-740 (3)(b)(iii)(B)(1), the unrestricted land use soil – direct contact Method B soil CULs for substances with noncarcinogenic effects (such as cadmium and zinc) shall be determined using Equation 740-1. The soil – direct contact CULs calculated using this equation are 80 mg/kg for cadmium and 24,000 mg/kg for zinc. We believe these values are the appropriate CULs for protection of human health due to direct contact with soil.

There were no cadmium or zinc concentrations above the calculated Method B soil – direct contact CULs of 80 mg/kg and 24,000 mg/kg, respectively in remaining soil samples collected to the standard POC of 15 ft bgs. Maximum concentrations of cadmium and zinc in remaining soil samples collected from 0 to 15 ft bgs at the site were detected in MPA sample SS7 (8.5 mg/kg and 19,100 mg/kg, respectively). Soil sample SS7 was collected from the 0 to 0.5 ft bgs depth interval in a location near the rail spur and near the 2003 excavation to the east of the manufacturing plant. This area is currently covered with pavement, which precludes direct contact with the soil.

3.2.2 Soil – Protection of Terrestrial Environment

WAC 173-340-7490 defines the goals and procedures Ecology will use for determining whether a release of hazardous substances to soil may pose a threat to the terrestrial environment,

characterizing existing or potential threats to terrestrial plants or animals exposed to hazardous substances in soil, and establishing site-specific cleanup standards for the protection of terrestrial plants and animals.

Per WAC 173-340-7490 (2), in the event of a release of a hazardous substance to the soil at a site, one of the following actions shall be taken:

- (a) Document an exclusion from any further terrestrial ecological evaluation using the criteria in WAC 173-340-7491;
- (b) Conduct a simplified terrestrial ecological evaluation as set forth in WAC 173-340-7492; or,
- (c) Conduct a site-specific terrestrial ecological evaluation as set forth in WAC 173-340-7493.

An exclusion from further terrestrial ecological evaluation may be applicable at a site if Ecology determines that soil contaminated with hazardous substances is located below applicable POCs established under WAC 173-340-7490 (4). For sites with institutional controls to prevent excavation of deeper soil, a conditional POC may be set at the biologically active soil zone. This zone is assumed to extend from the surface to 6 ft bgs. An institutional control is not required for soil contamination that is more than 15 ft bgs (the standard POC). An exclusion may also be applicable if it is determined that all soil contaminated with hazardous substances is, or will be, covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination. To qualify for this exclusion, an institutional control shall be required by the department under WAC 173-340-440. Based upon our review, the site does not appear to currently qualify for an exclusion from terrestrial ecological evaluation using these criteria because all of the remaining impacted soil at the site is not covered with physical barriers which will prevent plant/wildlife exposure to the impacted soil.

The simplified terrestrial ecological evaluation process is intended to identify those sites which do not have a substantial potential for posing a threat of significant adverse effects to terrestrial

ecological receptors, and thus may be removed from further ecological consideration during the remedial investigation and cleanup process. The process is structured with an intent to protect terrestrial wildlife at industrial or commercial sites, and terrestrial plants, soil biota and terrestrial wildlife at other sites, as provided under WAC 173-340-7490 (3)(b). When a site does not qualify for an exclusion (discussed above), a site-specific terrestrial ecological evaluation should be performed if any of the criteria of WAC 173-340-7491 (2)(a) apply to a site. If any of the criteria of WAC 173-340-7491 (2)(a) do not apply to a site, either a simplified or a site-specific terrestrial ecological evaluation shall be conducted. Because it has not been demonstrated that the criteria of WAC 173-340-7491 (2)(a) do not apply to the site, particularly that the site is not used by a wildlife species classified by the Washington State Department of Fish and Wildlife as a “priority species” or “species of concern”, a site-specific terrestrial ecological evaluation appears most appropriate for the site.

The site-specific terrestrial ecological evaluation process is intended to be highly likely to be protective at any site. WAC 173-340-7493 sets forth the procedures for conducting a site-specific terrestrial ecological evaluation. In addition to the purposes specified in WAC 173-340-7490 (1)(a), the site-specific terrestrial ecological evaluation is intended to facilitate selection of a cleanup action by developing information necessary to conduct evaluations of cleanup action alternatives in the feasibility study. There are two elements in planning a site-specific terrestrial ecological evaluation. Both elements shall be done in consultation with Ecology and must be approved by Ecology. The two elements are: 1) completing the problem formulation step as required under WAC 173-340-7493 (2), and 2) selecting one or more methods under WAC 173-340-7493 (3) for addressing issues identified in the problem formulation step.

The problem formulation step is intended to define the focus of the site-specific terrestrial ecological evaluation, identify issues to be addressed in the evaluation, and specify the chemicals of ecological concern, exposure pathways, terrestrial ecological receptors of concern, and toxicological assessment. Hazardous substances may be eliminated from further consideration where the maximum or the ninety-five percent upper confidence limit (95% UCL) soil concentration found at the site does not exceed ecological indicator concentrations (hereafter

referred to as Ecological CULs) described in Table 749-3 and presented below.

	<u>Plants</u>	<u>Soil Biota</u>	<u>Wildlife</u>
Cadmium	4 mg/kg	20 mg/kg	14 mg/kg
Zinc	86 mg/kg	200 mg/kg	360 mg/kg

These values represent soil concentrations that are expected to be protective at any MTCA site.

WAC 173-340-7490 (3)(b) indicates that for industrial or commercial properties, current or future potential for exposure to soil contamination need only be evaluated for terrestrial wildlife protection. Plants and soil biota need not be considered at industrial or commercial properties unless the species is protected under the federal Endangered Species Act or the soil contamination is located on an area of an industrial or commercial property where vegetation must be maintained to comply with local government land use regulations. There are no known species of plants or soil biota protected under the federal Endangered Species Act and there is no requirement for maintenance of vegetation at the site. Therefore, if the site qualifies as an industrial or commercial property, only terrestrial wildlife protection needs to be evaluated.

WAC 173-340-7490(3)(c) indicates that "industrial property" means properties that are or have been characterized by, or are to be committed to, traditional industrial uses such as processing or manufacturing of materials, marine terminal and transportation areas and facilities, fabrication, assembly, treatment, or distribution of manufactured products, or storage of bulk materials, that are either:

- zoned for industrial use by a city or county conducting land use planning under chapter 36.70A RCW (Growth Management Act); or
- for counties not planning under chapter 36.70A RCW (Growth Management Act) and the cities within them, zoned for industrial use and adjacent to properties currently used or designated for industrial purposes.

"Commercial property" means properties that are currently zoned for commercial or industrial property use and that are characterized by or are committed to traditional commercial uses such as offices, retail and wholesale sales, professional services, consumer services, and, warehousing.

The site is located in a county not planning under chapter 36.70A RCW (Growth Management Act), and the property is zoned industrial. The site is bordered to the west by the Columbia River, and to the north, south, and the east by parcels which are zoned commercial and owned by the Port of Kalama. The parcels to the north and south of the site are undeveloped. The parcel to the east of the site is developed with Hendrickson Drive and the parcel to the east of Hendrickson Drive is owned by Burlington Northern, Inc. and is developed with a railroad. Based on the information presented above, we believe the site qualifies as industrial/commercial. Therefore, only the Wildlife Ecological CUL is applicable to site soil for terrestrial ecological evaluation purposes.

In the areas of the former settling basins (i.e., former settling basins 1 through 4), there were no detections of cadmium above Plant, Soil Biota, or Wildlife Ecological CULs in remaining soil samples collected to the standard POC of 15 ft bgs. In the areas of the former settling basins, zinc was detected above the Wildlife Ecological CUL (360 mg/kg) in three overburden samples (OB1 at 390 mg/kg, OB2 at 510 mg/kg, and OB4 at 930 mg/kg) and in two additional samples (B2 at 410 mg/kg and LG5 at 376 mg/kg). Note that the overburden samples were collected from soil removed from the top four feet of FSB2 during the 2003 excavation activities. This soil was used to backfill the bottom five feet of the 2003 FSB2 excavation (i.e., from 10 to 15 ft bgs), and approximately one-half of this soil was removed and disposed off-site during the 2010 excavation.

In the MPA, there were no detections of cadmium above the Wildlife Ecological CUL in remaining soil samples collected to the standard POC. In the MPA, zinc was detected at concentrations above the Wildlife Ecological CUL of 360 mg/kg in 19 of 65 remaining soil samples collected to the standard POC. Samples of soil used to backfill the excavations in the

MPA (which contained zinc concentrations below Ecological CULs) are not included in the total number of remaining soil samples. Note that 10 of the 19 samples which contained zinc above the Wildlife Ecological CUL were collected from locations covered with buildings or pavement.

The 95% UCL concentration for cadmium and zinc in remaining site soil was calculated for multiple scenarios using MTCASat 97 to further evaluate the potential threat to the terrestrial environment at the site. For each calculation:

- Data for samples collected from 15 ft bgs or deeper were not included in the evaluation because they are below the standard POC.
- The laboratory reporting limit concentration was used for samples in which cadmium or zinc was not detected above the reporting limit. Note that there were only two samples in which zinc was not detected above laboratory reporting limits.
- The average zinc concentration detected in the four overburden samples (488 mg/kg) collected from previously discussed backfill placed in the bottom five feet of the 2003 FSB2 excavation (i.e., from 10 to 15 ft bgs) was used as two data points in calculation because it is assumed the soil was mixed during backfilling and approximately one-half of the soil was removed during the 2010 excavation.
- Sample data for imported fill used to backfill the excavations was conservatively not used in the calculations despite the fact that excavation backfill accounts for a relatively large percentage of the volume of remaining soil at the site. Note that cadmium was not detected in backfill samples and zinc was detected at low levels (averaging 34 mg/kg).

Soil sample data used in the 95% UCL concentrations calculations are presented in Table 2. Note that the MTCASat 97 program indicated that the lognormal and normal distributions should be rejected for the data. Therefore, the approximate one-sided 95% UCL for the mean was calculated using the formula presented below.

$$UCL = \bar{x} + Z_{95} * [s / (n^{0.5})]; \text{ where}$$

x = sample mean

s = standard deviation

n = number of samples

This formula was obtained from Section 5.2.1.3 of the *Statistical Guidance for Ecology Site Managers*. This is a method providing one-sided UCLs for the mean for “sufficiently large sample sizes,” n, from any distribution. The 95% UCL concentration calculation results are presented below.

Site-Wide Cadmium 95% UCL

The 95% UCL cadmium concentration was calculated for remaining site-wide soil samples to the standard POC at the site. A 95% UCL cadmium concentration of approximately 1.0 mg/kg was calculated using the data. This concentration is significantly lower than the applicable Wildlife Ecological CUL (14 mg/kg) and is also lower than the Plant and Soil Biota Ecological CULs (4 mg/kg and 20 mg/kg, respectively) which should not be applicable to the site.

Site-Wide Zinc 95% UCL

The 95% UCL zinc concentration was calculated for remaining site-wide soil samples to the standard POC at the site. A 95% UCL zinc concentration of approximately 450 mg/kg was calculated using the data. This concentration is above the Wildlife Ecological CUL (360 mg/kg) which should be applicable to the site. Note that without including the SS7 sample data (19,100 mg/kg zinc), a 95% UCL zinc concentration of approximately 210 mg/kg was calculated using the remaining site-wide soil data. Soil sample SS7 was collected near the rail spur and near the 2003 excavation located to the east of the manufacturing plant in an area covered with pavement.

Exposed Soil - Zinc 95% UCL

The 95% UCL zinc concentration was calculated for remaining site-wide soil samples that are not covered by buildings or pavement (which would typically prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil) to the standard POC at the site. Note

that the sample data from covered portions of the MPA were not included in this calculation because the covering (i.e., building structures and pavement) are likely to reduce the potential use of the overall area by wildlife. Sample data from beneath the paved access road which is present over portions of FSB1 and FSB2 were included in the calculation because this pavement is not likely to reduce the potential use of the overall area by wildlife. A 95% UCL zinc concentration of approximately 150 mg/kg was calculated using the data. This concentration is significantly lower than the Wildlife Ecological CUL (360 mg/kg) which should be applicable to the site.

As previously mentioned, the site appears to qualify as industrial/commercial for the purposes of evaluating terrestrial wildlife protection and therefore, only the Wildlife Ecological CUL should be applicable to the site. Based on the information presented above, cadmium in remaining site soil to the standard POC does not pose potential threats to ecological receptors and may be excluded from further terrestrial ecological evaluation. The calculated 95% UCL zinc concentration for remaining site-wide soil to the standard POC exceeds the Wildlife Ecological CUL. Removal of the SS7 sample from the data set used in the calculation results in a 95% UCL zinc concentration for remaining site-wide soil to the standard POC which is significantly lower than the Wildlife Ecological CUL. In addition, the calculated 95% UCL zinc concentration for remaining site-wide soil samples that are not covered by buildings or pavement is significantly lower than the Wildlife Ecological CUL which should be applicable to the site.

Therefore, we believe that limited soil removal to reduce the 95% UCL zinc concentration in site-wide soils to less than the Wildlife Ecological CUL is appropriate under the MTCA rules to eliminate zinc from further consideration as a chemical of ecological concern. In addition, we believe that implementation of an institutional control to maintain the currently existing physical barriers present at the site is appropriate under the MTCA rules to prevent potential threats to wildlife from zinc concentrations in remaining site-wide soils (in which case no further ecological evaluation would be necessary). Although the 95% UCL concentrations will be updated after collection of additional soil samples in the MPA (Section 4.0), we do not expect the 95% UCL concentrations calculated for uncovered soil to change significantly because most

of the additional soil samples will be collected from areas covered by the manufacturing building or pavement.

3.2.3 Soil – Protection of Groundwater

Since 2010, depth-to-ground water measured during monitoring events has ranged from approximately 15.5 to 24 ft bgs, and the average depth-to-groundwater during these monitoring events is approximately 20 ft bgs. Note that the Columbia River is subject to tidal fluctuations at the location of the site and that river and historical ground water table elevations have varied significantly at the site. As such, the unsaturated soil – protection of groundwater POC is throughout the site from the ground surface to a proposed depth of 20 ft bgs, and the saturated soil – protection of groundwater POC is throughout the site at a proposed depth of greater than 20 ft bgs.

Per WAC 173-340-740 (3)(b)(iii)(A), the unrestricted land use Method B groundwater protection soil CULs are concentrations that will not cause impact to groundwater at levels which exceed groundwater CULs established under WAC 173-340-720 as determined using the methods described in WAC 173-340-747. Saturated and unsaturated soil – protection of groundwater CULs for cadmium and zinc were calculated using the three-phase partitioning model described by Equation 747-1 per WAC 173-340-747 (4)(b) through (e).

Unsaturated Soil – Protection of Groundwater

The calculated unrestricted land use Method B unsaturated soil – protection of groundwater CULs for cadmium and zinc are 0.69 mg/kg and 5,970 mg/kg, respectively. Cadmium was detected in 16 remaining soil samples (ranging from 0.78 to 8.5 mg/kg) collected at the proposed POC (0 to 20 ft bgs) above the unsaturated soil – protection of groundwater CUL. Of these 16 samples, 15 were collected from the MPA, nine were collected from locations covered by buildings or pavement, and five were collected from two borings (at different depth intervals). In addition, cadmium was not detected above the CUL in samples collected from the same boring below the depth interval of four of the samples with cadmium above the CUL.

Zinc was detected in one remaining soil sample (SS7 at 19,100 mg/kg) collected at the proposed POC above the unsaturated soil – protection of groundwater CUL. As previously mentioned, soil sample SS7 was collected from 0 to 0.5 ft bgs from a location near the rail spur and 2003 excavation located to the east of the manufacturing plant in an area covered with pavement. There were no other detections of zinc above the CUL at the proposed POC in remaining site soil samples.

Saturated Soil – Protection of Groundwater

The calculated unrestricted land use Method B saturated soil – protection of groundwater CULs for cadmium and zinc are 0.035 mg/kg and 299 mg/kg, respectively. Cadmium was detected in three remaining soil samples (ranging from 0.75 to 13 mg/kg) collected from the proposed POC (greater than 20 ft bgs) above the unsaturated soil – protection of groundwater CUL. Zinc was not detected in any remaining soil samples collected from the proposed POC (greater than 20 ft bgs) above the unsaturated soil – protection of groundwater CUL. Note that a total of only eight soil samples were collected from below 20 ft at the site. Therefore, it is possible that zinc concentrations above the saturated soil – protection of groundwater CUL are present in soil greater than 20 ft bgs in the FSB2 area.

The soil – protection of groundwater CULs discussed above are concentrations that are unlikely to cause impacts to groundwater at levels which exceed groundwater CULs established under WAC 173-340-720. Method B potable groundwater CULs consist of standard and modified CULs, either of which may be used at any site. Per WAC 173-340-720 (4)(c), modified Method B groundwater CULs for drinking water beneficial uses are standard Method B groundwater CULs modified with chemical-specific or site-specific data. Changes to exposure assumptions used to calculate modified Method B groundwater CULs must comply with WAC 173-340-708 (10).

Because drinking water ingestion rate can be controlled through an institutional control implemented to prohibit use of site groundwater for potable purposes, the drinking water ingestion rate parameter in the Method B formula used to calculate potable groundwater CULs

established for human health protection can be adjusted to zero, resulting in unlimited CULs for cadmium and zinc. Therefore, we believe that implementation of an institutional control to prohibit use of site groundwater for potable purposes is appropriate under the MTCA rules in lieu of the potable groundwater CULs established for human health protection and the groundwater soil – protection of groundwater CULs calculated to prevent impacts to groundwater at levels which exceed these groundwater CULs.

Potable groundwater CULs established for protection of surface water beneficial uses are also applicable to a site unless it can be demonstrated that the hazardous substances are not likely to reach surface water. Where the groundwater CUL is based on protection of surface water beneficial uses and the property containing the source of contamination directly abuts the surface water, Ecology may approve a conditional POC that is located within the surface water as close as technically possible to the point or points where groundwater flows into the surface water under certain conditions. Additional investigation at the site is planned to evaluate contaminant migration between groundwater and surface water and it is possible that a conditional POC may be approved for CULs established for protection of surface water beneficial uses in the future. Therefore, the applicability of soil – protection of groundwater CULs to prevent impact to groundwater at levels which exceed potable groundwater CULs established for protection of surface water beneficial uses will be evaluated at a later date following completion of the additional assessment.

3.3 Summary

Based on the information presented above, H&H makes the following conclusions regarding soil CULs for the site:

- The Method B soil – direct contact CULs applicable to the site are 80 mg/kg for cadmium and 24,000 mg/kg for zinc. There were no cadmium or zinc concentrations detected in remaining site soil samples above these Method B soil – direct contact CULs.

- The site appears to qualify as industrial/commercial for the purposes of evaluating terrestrial wildlife protection and, therefore only the Wildlife Ecological CULs (14 mg/kg for cadmium and 360 mg/kg for zinc) should be applicable to site soil for terrestrial ecological evaluation purposes. As part of the site-specific terrestrial ecological evaluation, and with Ecology approval, hazardous substances may be eliminated from further consideration where the 95% UCL soil concentration found at the site does not exceed Ecological CULs.

The 95% UCL cadmium concentration calculated for remaining site-wide soil samples to the standard POC at the site is significantly lower than the Wildlife Ecological CUL. The 95% UCL zinc concentration calculated for remaining site-wide soil samples to the standard POC is higher than the Wildlife Ecological CUL. However, exclusion of one sample (SS7 at 0 to 0.5 ft bgs) from the data set results in a calculated 95% UCL zinc concentration which is significantly lower than the Wildlife Ecological CUL in remaining site-wide soil data. The 95% UCL zinc concentration calculated for remaining site-wide soil samples that are not covered by buildings or pavement is significantly lower than the Wildlife Ecological CUL.

We believe that limited soil removal to reduce the 95% UCL zinc concentration in site-wide soils to less than the Wildlife Ecological CUL is appropriate under the MTCA rules to eliminate zinc from further consideration as a chemical of ecological concern. In addition, we believe that implementation of an institutional control to maintain the currently existing physical barriers present at the site is appropriate under the MTCA rules to prevent potential threats to wildlife from zinc concentrations in remaining site-wide soils (in which case no further ecological evaluation would be necessary for zinc).

- We believe that implementation of an institutional control to prohibit use of site groundwater for potable purposes is appropriate under the MTCA rules in lieu of the potable groundwater CULs established for human health protection and the soil – protection of groundwater CULs established to prevent impacts to groundwater at levels

which exceed these groundwater CULs.

The applicability of soil – protection of groundwater CULs established to prevent impacts to groundwater at levels which exceed potable groundwater CULs established for protection of surface water beneficial uses will be evaluated after evaluation of contaminant migration between groundwater and surface water at the site is completed, and after potential establishment of a conditional POC for CULs established for protection of surface water beneficial uses. A work plan for evaluating groundwater/surface water interaction has been prepared for this purpose and is being submitted under separate cover.

4.0 Soil Sampling Plan

In the February 9, 2017 opinion letter, Ecology notes that industrial processes which utilized zinc in the MPA through October 2016 may have been a potential continuing source of environmental impacts at the site. As such, Ecology recommended additional assessment to evaluate current conditions in the MPA in order to update the site CSM.

H&H proposes to collect soil samples from approximately 20 soil borings within the MPA where cadmium and zinc are known or suspected to have been used in manufacturing processes. Proposed sample locations are depicted in Figure 4. As shown in the figure, two boring locations are in the zinc oxide dryer room, two boring locations are in the formulation room, two boring locations are in the make tank room, and one boring location is adjacent to the baghouse. In addition, samples will be collected adjacent to floor drains in the manufacturing area which will be identified in the field. Several proposed borings are located outside of the manufacturing building to further evaluate zinc concentrations which were previously detected above the Wildlife Ecological CUL. The proposed boring locations may be adjusted based on observations made in the field or access limitations.

A core drill will be utilized to install a 3 to 4-inch diameter boring through the building floor slab at proposed sample locations inside the building and in paved areas outside the building. A soil boring will then be advanced to a depth of 6 ft bgs in each proposed sample location using a decontaminated stainless steel hand auger. Two samples will be collected from each boring. One sample will be collected from the 0 to 3 ft bgs interval and one sample will be collected from the 3 to 6 ft bgs interval. Soil from each interval will be homogenized in a stainless steel bowl prior to being placed into sample containers. The sample containers will be delivered under standard chain-of-custody protocols to a WA-certified laboratory for analysis of cadmium and zinc by EPA Method 6010. After sample collection, soil cuttings from a boring will be placed back into the same boring and boreholes through concrete and asphalt will be repaired to match the surrounding surface.

After receipt of analytical results for the samples, a brief report documenting the sample methods and results will be submitted to Ecology. The report will include a tabular summary of sample results, a figure depicting sample locations, photographs, and laboratory analytical reports.

As mentioned in Section 1.0, in addition to providing Ecology the opportunity to comment on the soil sampling scope of work, we are requesting that Ecology provide comment/technical assistance regarding the applicability of soil CULs and POCs we have presented in Section 3.2 and the methods we have proposed for evaluating data in comparison to the CULs. We are requesting comment/technical assistance regarding these items so that we can evaluate the potential need for modification to the proposed soil sampling scope of work prior to implementation, and for use in evaluating the potential need for additional assessment and/or remedial actions.

Table 1
Summary of Remaining Soil Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Sample ID	Sample Date	Sample Depth (ft bgs)	Cadmium (mg/kg)	Zinc (mg/kg)
Former Settling Basin Areas				
1	09/05/2003	5	<0.53	33
3	09/05/2003	3	<0.52	33
4	09/05/2003	5	<0.51	26
5	09/05/2003	1	<0.51	33
6	09/05/2003	3	<0.51	32
8	09/05/2003	1	0.56	280
9	09/09/2003	3	<0.53	31
10	09/09/2003	5	<0.54	33
11	09/09/2003	1	0.88	270
12	09/09/2003	3	<0.54	28
13	09/09/2003	3	<0.54	27
14	09/09/2003	5	<0.54	31
15	09/09/2003	1	<0.54	31
16	09/09/2003	3	<0.54	31
17	09/09/2003	1	<0.54	32
32	10/02/2003	1	<0.52	34
34	10/02/2003	5	<0.52	47
35	10/02/2003	7	<0.52	40
45	10/08/2003	7	<0.53	24
46	09/25/2003	5	<0.53	27
47	09/16/2003	9	<0.53	22
48	09/25/2003	3	<0.53	29
49	09/16/2003	7	<0.53	29
50	09/25/2003	1	<0.53	35
51	09/16/2003	5	<0.53	32
52	09/25/2003	3	<0.53	29
53	09/16/2003	9	<0.53	29
54	09/25/2003	1	<0.53	33
55	09/16/2003	7	<0.53	23
56	09/16/2003	5	<0.53	24
57	09/16/2003	5	<0.53	24
58	09/25/2003	1	<0.53	34
59	09/16/2003	7	<0.53	32
60	09/25/2003	3	<0.53	32
61	09/16/2003	9	<0.53	36
62	09/25/2003	5	<0.53	33
2R	09/12/2003	1	--	210
33R	10/02/2003	3	<0.52	36
63R	10/06/2003	7	<0.53	34
7R	09/12/2003	5	--	100
ARSW-1	09/16/2010	7-8	<2.16	91.5
ARSW-2	09/16/2010	7-8	<2.16	283
ARSW-3	09/16/2010	7-8	<2.07	141
ARSW-4	09/16/2010	7-8	<2.08	146
B1	09/16/2003	7-8	<5.3	32
B10	09/25/2003	15	<0.53	2,400
B11	09/25/2003	15	<0.53	4,500
B12	09/19/2003	15	<0.53	2,700
B13	09/19/2003	15	<0.53	2,100
B2	09/05/2003	9	<0.53	410
B3	09/12/2003	5.5	<0.52	27
B9	10/02/2003	15	<0.53	1,300
EB-1	08/20/2010	15	0.34	780
EB-10	09/16/2010	15	<2.12	950
EB-11	09/16/2010	15	<2.12	1,160
EB-12	09/16/2010	15	<2.14	1,220
EB-13	09/16/2010	15	<2.16	729
EB-2	08/20/2010	15	0.35	480
EB-3	08/20/2010	15	0.34	560
EB-4	09/02/2010	15	<0.534	462
EB-5	09/02/2010	15	<2.68	793
EB-6	09/02/2010	15	<2.63	738
EB-7	09/16/2010	15	<2.12	2,110
EB-8	09/16/2010	15	<2.16	1,380
EB-9	09/16/2010	15	<2.14	1,800
ESW-1	08/17/2010	7-8	<2.1	55.1
ESW-2B	08/23/2010	7-8	0.15	44
ESW-3A	08/20/2010	7-8	0.32	<46.7
ESW-4A	08/20/2010	7-8	0.30	<48.0
ESW-5A	08/27/2010	7-8	<0.532	37
ESW-6A	08/27/2010	7-8	<0.521	40.1
ESW-7	08/17/2010	7-8	<2.1	43.3
ESW-8	08/27/2010	7-8	<0.532	52.1
LG5	10/23/2002	5	<0.2	376
LG6	10/23/2002	5	<0.2	47.2
NSW-0A	08/31/2010	7-8	<0.531	169
NSW-1	08/17/2010	7-8	<2.11	48.8
NSW-2	08/17/2010	7-8	<2.00	62.7
NSW-3	08/17/2010	7-8	<2.04	126
NSW-4	08/17/2010	7-8	<2.08	79
NSW-5	08/17/2010	7-8	<2.15	48.7
NSW-6	08/17/2010	7-8	<2.15	47.8
OB1	09/16/2003	10-15	<0.52	390
OB2	09/16/2003	10-15	0.56	510
OB3	09/16/2003	10-15	<0.52	120
OB4	09/16/2003	10-15	<0.52	930
SB1-Surf-1	10/16/2003	0-0.5	<0.55	35
SB1-Surf-2	10/16/2003	0-0.5	<0.54	71
SB1-Surf-3	10/16/2003	0-0.5	<0.56	98
SB1-Surf-4	10/16/2003	0-0.5	<0.55	40
SB2-Surf-1	10/16/2003	0-0.5	<0.56	99
SB2-Surf-2	10/16/2003	0-0.5	<0.56	49
SB2-Surf-3	10/16/2003	0-0.5	<0.56	38
SB2-Surf-4	10/16/2003	0-0.5	<0.56	52
SS11A	03/11/2003	0-3	<0.50	76
SS12	04/16/2003	0.5-1	<0.50	27
SS13	04/16/2003	0.5-1	<0.50	220
SSW-1	08/17/2010	7-8	<2.12	84.9
SSW-2	08/17/2010	7-8	<2.13	47.9
SSW-3	08/17/2010	7-8	<2.1	53.5
SSW-4	08/17/2010	7-8	<2.16	48.7
SSW-5	08/17/2010	7-8	<2.14	50.4
SSW-6	08/30/2010	7-8	<0.52	80.3
SSW-7	08/30/2010	7-8	<0.516	44.2
TP1	03/11/2003	7	<0.50	30
TP1	03/11/2003	5	<0.50	49
TP1	03/11/2003	3	<0.50	34
TP1	03/11/2003	1	<0.50	34
TP10	03/11/2003	3	<0.50	46
TP11	03/11/2003	7	<0.50	38
TP11	03/11/2003	5	<0.50	48
TP11	03/11/2003	3	<0.50	62
TP11	03/11/2003	1	<0.50	38
TP12	03/11/2003	3	<0.50	65
TP2	03/11/2003	7	<0.50	22
TP2	03/11/2003	5	<0.50	28
TP2	03/11/2003	3	<0.50	23
TP2	03/11/2003	1	<0.50	49
TP3	03/11/2003	0-3	<0.50	34
TP4	03/11/2003	3	<0.50	26
TP5	03/11/2003	7	<0.50	27
TP5	03/11/2003	5	<0.50	31
TP5	03/11/2003	3	<0.50	37
TP5	03/11/2003	1	<0.50	37
TP7	03/11/2003	3	<0.50	31
TP8	03/11/2003	7	<0.50	28
TP8	03/11/2003	5	<0.50	42
TP8	03/11/2003	3	<0.50	31
TP8	03/11/2003	1	<0.50	38
W1	10/15/2003	0-0.2	<0.54	160
W2	10/15/2003	0-0.2	<0.56	140
W3	10/15/2003	0-0.2	<0.67	26
W4	10/15/2003	0-0.2	<0.51	71
WSW-1	08/17/2010	7-8	<2.15	45.6
WSW-2	08/17/2010	7-8	<2.14	41.7
WSW-3	08/17/2010	7-8	<2.12	44.4
WSW-4	08/17/2010	7-8	<2.12	48.3
WSW-5	08/17/2010	7-8	<2.12	61.0

**Table 1
Summary of Remaining Soil Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045**

Sample ID	Sample Date	Sample Depth (ft bgs)	Cadmium (mg/kg)	Zinc (mg/kg)
Manufacturing Plant Area				
E-1	10/08/2003	1.4	<0.56	120
E-2	10/08/2003	1.5	<0.56	250
E-3	10/08/2003	1.5	<0.56	140
E-4	10/08/2003	1	<0.56	340
E-5	10/08/2003	0-0.25	<0.56	63
E-6	10/08/2003	0-0.25	<0.56	100
E-7	10/08/2003	0-0.25	0.65	120
E-8	10/08/2003	0-0.25	<0.56	480
E-9	10/08/2003	0-0.25	<0.56	390
PZ3A	04/15/2003	1	1.5	1,300
PZ3A	04/15/2003	20	<0.50	700
PZ3A	04/15/2003	15	<0.50	370
PZ3A	04/15/2003	10	<0.50	220
PZ3A	04/15/2003	8	<0.50	230
PZ4	04/15/2003	1	0.78	270
PZ4	04/15/2003	20	1.0	280
PZ4	04/15/2003	25	5.2	250
PZ4	04/15/2003	15	<0.50	410
PZ4	04/15/2003	10	<0.50	80
PZ4	04/15/2003	5	<0.50	45
PZ5	04/15/2003	5	0.88	530
PZ5	04/15/2003	10	1.5	1,300
PZ5	04/15/2003	20	4.2	200
PZ5	04/15/2003	25	13	240
PZ5	04/15/2003	15	<0.50	180
PZ5	04/15/2003	1	<0.50	100
PZ6	04/15/2003	25	<0.50	110
PZ6	04/15/2003	20	<0.50	180
PZ6	04/15/2003	15	<0.50	190
PZ6	04/15/2003	10	<0.50	180
PZ6	04/15/2003	5	<0.50	360
PZ6	04/15/2003	1	<0.50	150
PZ7	04/15/2003	5	0.61	470
PZ7	04/15/2003	25	0.75	180
PZ7	04/15/2003	1	3.4	2,100
PZ7	04/15/2003	20	<0.50	86
PZ7	04/15/2003	15	<0.50	130
PZ7	04/15/2003	10	<0.50	530
PZ8	04/15/2003	25	<0.50	66
PZ8	04/15/2003	20	<0.50	29
PZ8	04/15/2003	15	<0.50	36
PZ8	04/15/2003	10	<0.50	61
PZ8	04/15/2003	5	<0.50	34
PZ8	04/15/2003	1	<0.50	84
PZ9	05/06/2003	20	<0.50	33
PZ9	05/06/2003	15	<0.50	32
PZ9	05/06/2003	10	<0.50	28
PZ9	05/06/2003	5	<0.50	26
PZ9	05/06/2003	1	<0.50	37
SS1	10/23/2002	0-0.5	0.60	400
SS10	04/16/2003	0.5-1	<0.50	170
SS11B	04/16/2003	0.5-1	0.78	1,200
SS2	10/23/2002	0.5-1	1.8	1,290
SS3	10/23/2002	0-0.5	1.7	868
SS4	10/24/2002	0-0.5	1.1	2,330
SS5	10/24/2002	0-0.5	<0.2	116
SS7	10/24/2002	0-0.5	8.5	19,100
W-1	10/02/2003	1.5	<0.53	210
W10	04/16/2003	1	0.65	280
W10	04/16/2003	20	<0.50	56
W10	04/16/2003	15	<0.50	510
W10	04/16/2003	10	<0.50	180
W10	04/16/2003	5	<0.50	88
W11	04/16/2003	20	<0.50	38
W11	04/16/2003	15	<0.50	30
W11	04/16/2003	10	<0.50	35
W11	04/16/2003	5	<0.50	22
W11	04/16/2003	1	<0.50	31
W12	04/16/2003	1	5.5	620
W12	04/16/2003	20	<0.50	360
W12	04/16/2003	15	<0.50	260
W12	04/16/2003	10	<0.50	330
W12	04/16/2003	5	<0.50	330
W-2	10/02/2003	1.5	<0.53	26
W-3	10/02/2003	1.5	<0.53	420
W-4	10/02/2003	1	<0.53	60
W6	04/16/2003	25	<0.50	150
W6	04/16/2003	20	<0.50	88
W6	04/16/2003	15	<0.50	89
W6	04/16/2003	10	<0.50	74
W6	04/16/2003	5	<0.50	160
W6	04/16/2003	1	<0.50	490
W7	04/16/2003	1	0.82	900
W7	04/16/2003	25	<0.50	160
W7	04/16/2003	20	<0.50	110
W7	04/16/2003	15	<0.50	91
W7	04/16/2003	10	<0.50	500
W7	04/16/2003	5	<0.50	170
W8	04/16/2003	10	2.3	61
W8	04/16/2003	25	<0.50	75
W8	04/16/2003	20	<0.50	180
W8	04/16/2003	15	<0.50	140
W8	04/16/2003	5	<0.50	350
W8	04/16/2003	1	<0.50	230
W9	04/16/2003	20	<0.50	110
W9	04/16/2003	15	<0.50	330
W9	04/16/2003	10	<0.50	45
W9	04/16/2003	5	<0.50	36
W9	04/16/2003	1	<0.50	37
Backfill and Background Samples				
Backfill	08/18/2010	0-15	<2.05	39.4
SP1	09/19/2003	0-15	<0.53	37
SP2	09/19/2003	0-15	<0.53	32
SP3	09/19/2003	0-15	<0.53	38
SP4	09/19/2003	0-15	<0.53	31
SP5	09/19/2003	0-15	<0.53	27
BG1	10/23/2002	0-0.5	<0.6	83
BG2	10/23/2002	0-0.5	<0.2	49.1
BG3	10/23/2002	0-0.5	0.30	43.3
Soil Cleanup Levels (CULs)¹				
Direct Contact²			80	24,000
Wildlife Ecological Indicator			14	360
Unsaturated Soil - Protection of Groundwater³			0.69	5,970
Saturated Soil - Protection of Groundwater³			0.035	299

Notes

bgs = below ground surface; mg/kg = milligrams per kilogram; -- indicates not analyzed

¹ Refer to the Section 3.2 of the Soil Sampling Plan for discussion of CULs

² There are no detections above soil-direct contact CULs

³ Concentrations above protection of groundwater CULs are not identified in table

Bold concentration exceeds Wildlife Ecological Indicator CUL (at standard point of compliance of 0-15 ft bgs)

Samples OB1 through OB4 were collected from overburden soil removed from the top of former settling basin #2 (FSB2) and used as backfill in the bottom 5 ft of FSB2 during 2003 excavation activities.

Approximately 1/2 of the soil was removed during 2010 excavation activities.

Table 2
95% UCL Calculation Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Sample ID	Sample Date	Sample Depth (ft bgs)	Cadmium (mg/kg)	Zinc (mg/kg)
Former Settling Basin Areas				
1	09/05/2003	5	0.53	33
3	09/05/2003	3	0.52	33
4	09/05/2003	5	0.51	26
5	09/05/2003	1	0.51	33
6	09/05/2003	3	0.51	32
8	09/05/2003	1	0.56	280
9	09/09/2003	3	0.53	31
10	09/09/2003	5	0.54	33
11	09/09/2003	1	0.88	270
12	09/09/2003	3	0.54	28
13	09/09/2003	3	0.54	27
14	09/09/2003	5	0.54	31
15	09/09/2003	1	0.54	31
16	09/09/2003	3	0.54	31
17	09/09/2003	1	0.54	32
32	10/02/2003	1	0.52	34
34	10/02/2003	5	0.52	47
35	10/02/2003	7	0.52	40
45	10/08/2003	7	0.53	24
46	09/25/2003	5	0.53	27
47	09/16/2003	9	0.53	22
48	09/25/2003	3	0.53	29
49	09/16/2003	7	0.53	29
50	09/25/2003	1	0.53	35
51	09/16/2003	5	0.53	32
52	09/25/2003	3	0.53	29
53	09/16/2003	9	0.53	29
54	09/25/2003	1	0.53	33
55	09/16/2003	7	0.53	23
56	09/16/2003	5	0.53	24
57	09/16/2003	5	0.53	24
58	09/25/2003	1	0.53	34
59	09/16/2003	7	0.53	32
60	09/25/2003	3	0.53	32
61	09/16/2003	9	0.53	36
62	09/25/2003	5	0.53	33
2R	09/12/2003	1	--	210
33R	10/02/2003	3	0.52	36
63R	10/06/2003	7	0.53	34
7R	09/12/2003	5	--	100
ARSW-1	09/16/2010	7-8	2.2	91.5
ARSW-2	09/16/2010	7-8	2.2	283
ARSW-3	09/16/2010	7-8	2.1	141
ARSW-4	09/16/2010	7-8	2.1	146
B1	09/16/2003	7-8	5.3	32
B2	09/05/2003	9	0.5	410
B3	09/12/2003	5.5	0.52	27
ESW-1	08/17/2010	7-8	2.1	55.1
ESW-2B	08/23/2010	7-8	0.15	44
ESW-3A	08/20/2010	7-8	0.32	46.7
ESW-4A	08/20/2010	7-8	0.30	48.0
ESW-5A	08/27/2010	7-8	0.532	37
ESW-6A	08/27/2010	7-8	0.52	40.1
ESW-7	08/17/2010	7-8	2.1	43.3
ESW-8	08/27/2010	7-8	0.5	52.1
LG5	10/23/2002	5	0.2	376
LG6	10/23/2002	5	0.2	47.2
NSW-0A	08/31/2010	7-8	0.5	169
NSW-1	08/17/2010	7-8	2.1	48.8
NSW-2	08/17/2010	7-8	2.0	62.7
NSW-3	08/17/2010	7-8	2.0	126
NSW-4	08/17/2010	7-8	2.1	79
NSW-5	08/17/2010	7-8	2.2	48.7
NSW-6	08/17/2010	7-8	2.2	47.8
OB1*	09/16/2003	10-15	0.52	390
OB2*	09/16/2003	10-15	0.56	510
OB3*	09/16/2003	10-15	0.52	120
OB4*	09/16/2003	10-15	0.52	930
SB1-Surf-1	10/16/2003	0-0.5	0.55	35
SB1-Surf-2	10/16/2003	0-0.5	0.54	71
SB1-Surf-3	10/16/2003	0-0.5	0.56	98
SB1-Surf-4	10/16/2003	0-0.5	0.55	40
SB2-Surf-1	10/16/2003	0-0.5	0.56	99
SB2-Surf-2	10/16/2003	0-0.5	0.56	49
SB2-Surf-3	10/16/2003	0-0.5	0.56	38
SB2-Surf-4	10/16/2003	0-0.5	0.56	52
SS11A	03/11/2003	0-3	0.50	76
SS12	04/16/2003	0.5-1	0.50	27
SS13	04/16/2003	0.5-1	0.50	220
SSW-1	08/17/2010	7-8	2.1	84.9
SSW-2	08/17/2010	7-8	2.1	47.9
SSW-3	08/17/2010	7-8	2.1	53.5
SSW-4	08/17/2010	7-8	2.2	48.7
SSW-5	08/17/2010	7-8	2.1	50.4
SSW-6	08/30/2010	7-8	0.52	80.3
SSW-7	08/30/2010	7-8	0.5	44.2
TP1	03/11/2003	5	0.50	49
TP1	03/11/2003	1	0.50	34
TP1	03/11/2003	3	0.50	34
TP1	03/11/2003	7	0.50	30
TP10	03/11/2003	3	0.50	46
TP11	03/11/2003	3	0.50	62
TP11	03/11/2003	5	0.50	48
TP11	03/11/2003	1	0.50	38
TP11	03/11/2003	7	0.50	38
TP12	03/11/2003	3	0.50	65
TP2	03/11/2003	1	0.50	49
TP2	03/11/2003	5	0.50	28

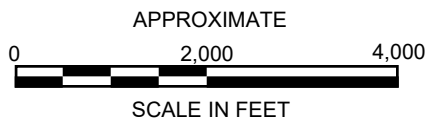
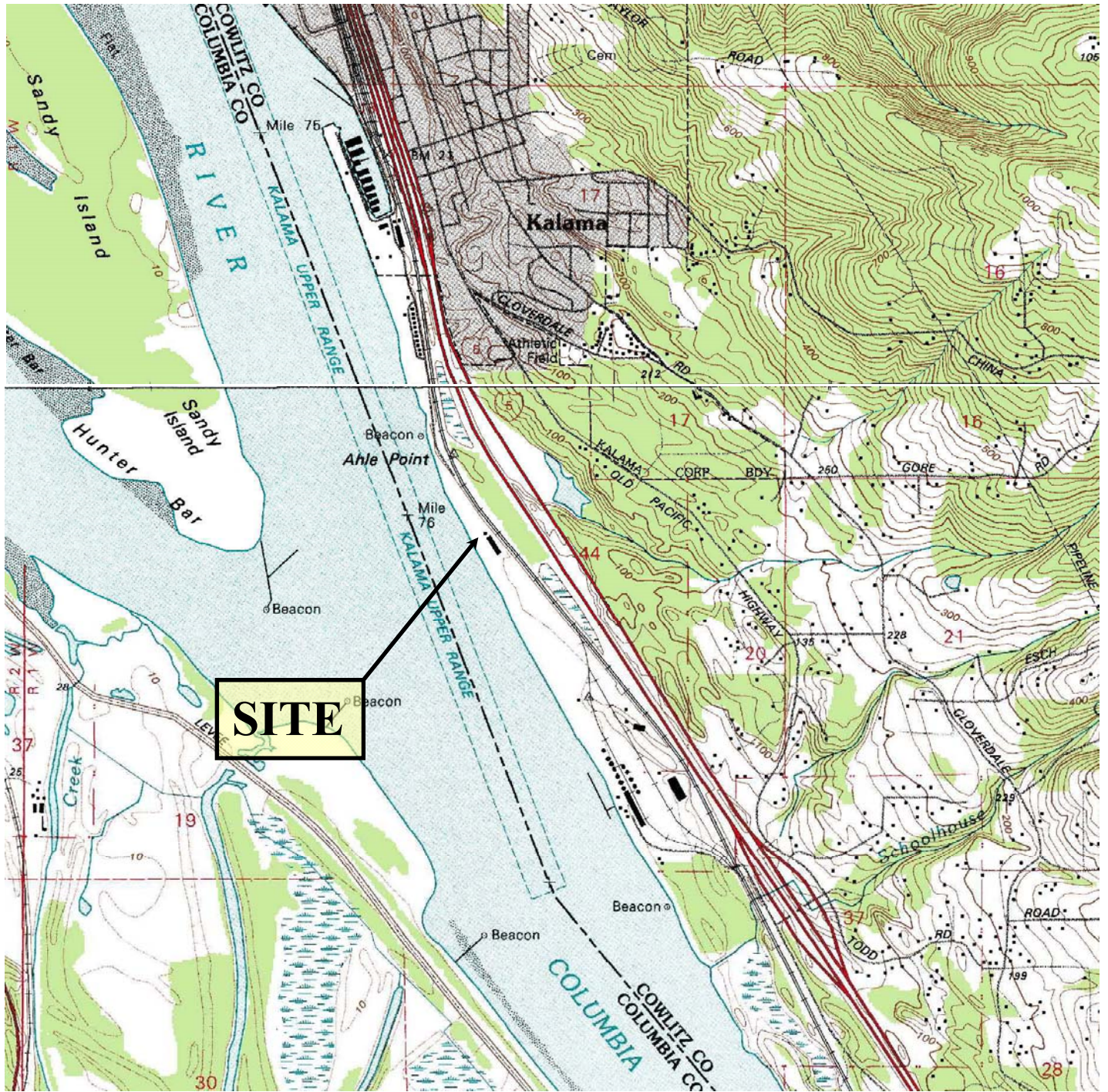
Table 2
95% UCL Calculation Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Sample ID	Sample Date	Sample Depth (ft bgs)	Cadmium (mg/kg)	Zinc (mg/kg)
TP2	03/11/2003	3	0.50	23
TP2	03/11/2003	7	0.50	22
TP3	03/11/2003	0-3	0.50	34
TP4	03/11/2003	3	0.50	26
TP5	03/11/2003	1	0.50	37
TP5	03/11/2003	3	0.50	37
TP5	03/11/2003	5	0.50	31
TP5	03/11/2003	7	0.50	27
TP7	03/11/2003	3	0.50	31
TP8	03/11/2003	5	0.50	42
TP8	03/11/2003	1	0.50	38
TP8	03/11/2003	3	0.50	31
TP8	03/11/2003	7	0.50	28
W1	10/15/2003	0-0.2	0.5	160
W2	10/15/2003	0-0.2	0.6	140
W3	10/15/2003	0-0.2	0.67	26
W4	10/15/2003	0-0.2	0.51	71
WSW-1	08/17/2010	7-8	2.2	45.6
WSW-2	08/17/2010	7-8	2.14	41.7
WSW-3	08/17/2010	7-8	2.1	44.4
WSW-4	08/17/2010	7-8	2.1	48.3
WSW-5	08/17/2010	7-8	2.1	61.0
Manufacturing Plant Area - Exposed Soil Samples				
E-5	10/08/2003	0-0.25	0.56	63
E-6	10/08/2003	0-0.25	0.56	100
E-7	10/08/2003	0-0.25	0.65	120
E-8	10/08/2003	0-0.25	0.56	480
E-9	10/08/2003	0-0.25	0.56	390
PZ3A	04/15/2003	1	1.5	1,300
PZ3A	04/15/2003	8	0.50	230
PZ3A	04/15/2003	10	0.50	220
PZ5	04/15/2003	10	1.5	1,300
PZ5	04/15/2003	5	0.88	530
PZ5	04/15/2003	1	0.50	100
SS1	10/23/2002	0-0.5	0.60	400
SS2	10/23/2002	0.5-1	1.8	1,290
SS3	10/23/2002	0-0.5	1.7	868
W-1	10/02/2003	1.5	0.53	210
W10	04/16/2003	1	0.65	280
W10	04/16/2003	10	0.50	180
W10	04/16/2003	5	0.50	88
W-2	10/02/2003	1.5	0.53	26
W-3	10/02/2003	1.5	0.53	420
W-4	10/02/2003	1	0.53	60
W9	04/16/2003	10	0.50	45
W9	04/16/2003	1	0.50	37
W9	04/16/2003	5	0.50	36
Manufacturing Plant Area - Covered Soil Samples				
E-1	10/08/2003	1.4	0.56	120
E-2	10/08/2003	1.5	0.56	250
E-3	10/08/2003	1.5	0.56	140
E-4	10/08/2003	1	0.56	340
PZ4	04/15/2003	1	0.78	270
PZ4	04/15/2003	10	0.50	80
PZ4	04/15/2003	5	0.50	45
PZ6	04/15/2003	5	0.50	360
PZ6	04/15/2003	10	0.50	180
PZ6	04/15/2003	1	0.50	150
PZ7	04/15/2003	1	3.4	2,100
PZ7	04/15/2003	10	0.50	530
PZ7	04/15/2003	5	0.61	470
PZ8	04/15/2003	1	0.50	84
PZ8	04/15/2003	10	0.50	61
PZ8	04/15/2003	5	0.50	34
PZ9	05/06/2003	1	0.50	37
PZ9	05/06/2003	10	0.50	28
PZ9	05/06/2003	5	0.50	26
SS10	04/16/2003	0.5-1	0.50	170
SS11B	04/16/2003	0.5-1	0.78	1,200
SS4	10/24/2002	0-0.5	1.1	2,330
SS5	10/24/2002	0-0.5	0.2	116
SS7	10/24/2002	0-0.5	8.5	19,100
W11	04/16/2003	10	0.50	35
W11	04/16/2003	1	0.50	31
W11	04/16/2003	5	0.50	22
W12	04/16/2003	1	5.5	620
W12	04/16/2003	5	0.50	330
W12	04/16/2003	10	0.50	330
W6	04/16/2003	1	0.50	490
W6	04/16/2003	5	0.50	160
W6	04/16/2003	10	0.50	74
W7	04/16/2003	1	0.82	900
W7	04/16/2003	10	0.50	500
W7	04/16/2003	5	0.50	170
W8	04/16/2003	5	0.50	350
W8	04/16/2003	1	0.50	230
W8	04/16/2003	10	2.3	61


Notes

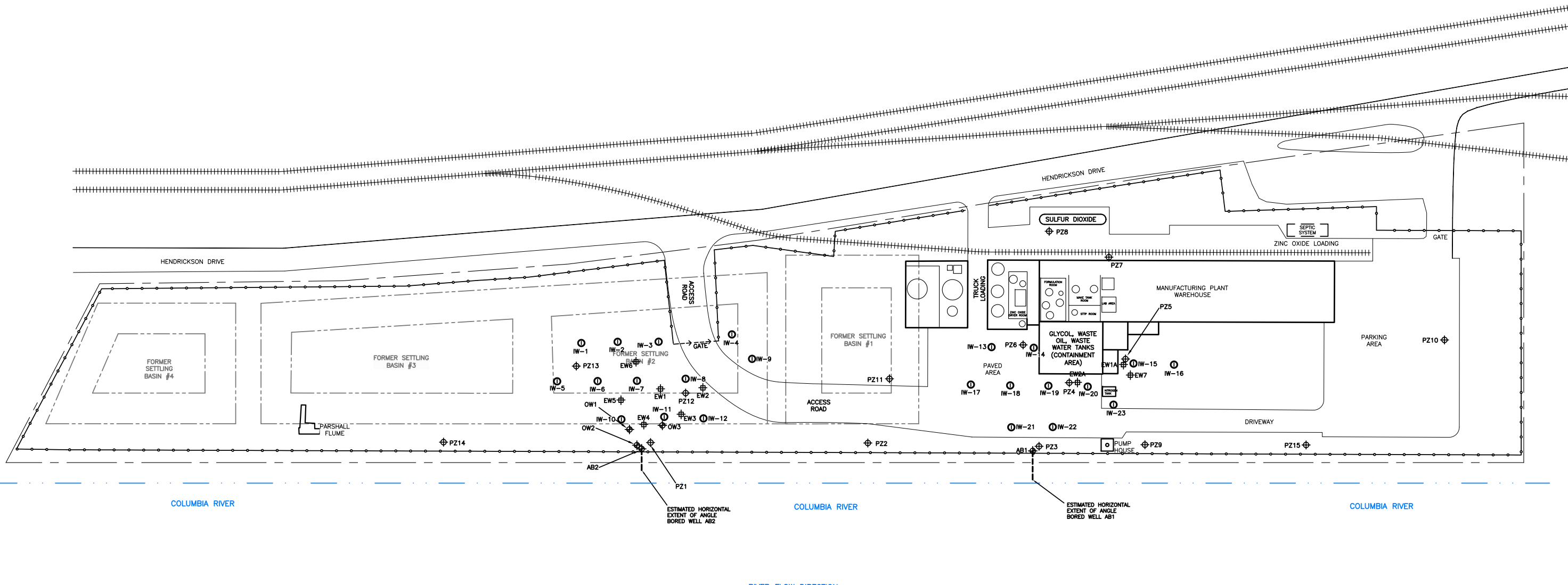
bgs = below ground surface; mg/kg = milligrams per kilogram; -- indicates not analyzed
italicized gray value is the laboratory minimum reporting limit

*OB1 through OB4 concentration averages used as two data points in 95% Upper Confidence Limit (UCL) calculations (see Section 3.2.2 of the Soil Sampling Plan)



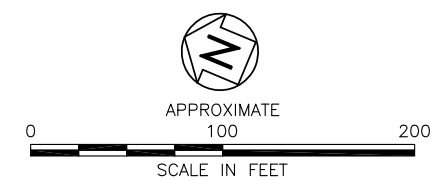
U.S.G.S. QUADRANGLE MAP
DEER ISLAND & KALAMA, WA 7.5 MIN.
TOPOGRAPHIC QUADRANGLES
 QUADRANGLE
 7.5 MINUTE SERIES (TOPOGRAPHIC)

TITLE		SITE LOCATION MAP	
PROJECT		CHEMTRADE PERFORMANCE CHEMICALS SITE FACILITY/SITE ID No. 24634187 KALAMA, WASHINGTON	
		2923 South Tryon Street – Suite 100 Charlotte, North Carolina 28203 704-586-0007 (p) 704-586-0373 (f)	
DATE: 05/12/17		REVISION NO. 0	
JOB NO: CLR-045		FIGURE NO. 1	

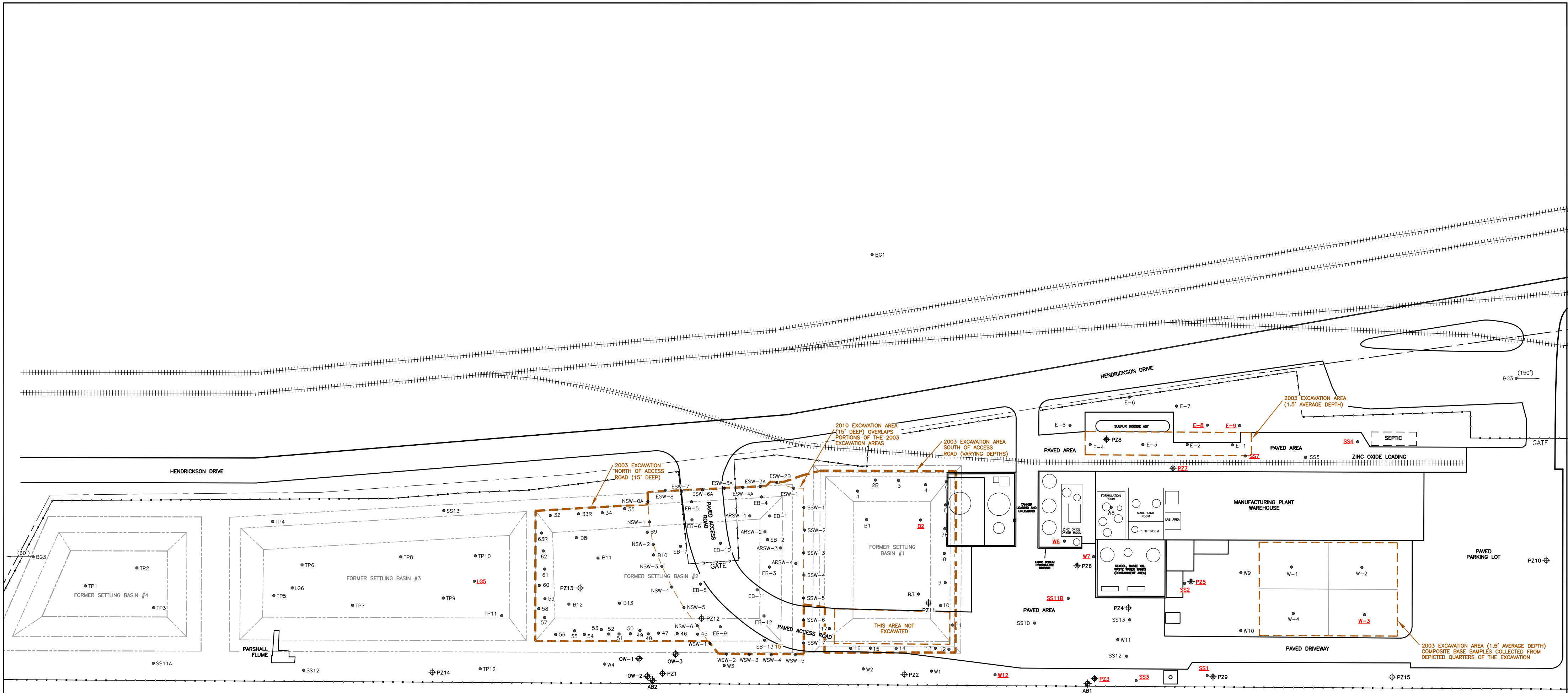


- LEGEND:**
- — — — — PROPERTY LINE
 - ○ — ○ — FENCE LINE
 - + + + + + RAILROAD TRACK
 - · · · — APPROXIMATE EAST EDGE OF COLUMBIA RIVER
 - - - - - EXTENT OF FORMER SETTLING BASIN
 - ⊕ MONITORING/OBSERVATION WELL
 - ⊕ PIEZOMETER
 - ⊙ INJECTION WELL
 - ⊕ RECOVERY WELL

← RIVER FLOW DIRECTION



TITLE SITE MAP	
PROJECT CHEMTRADE PERFORMANCE CHEMICALS SITE FACILITY/SITE No. 24634187 KALAMA, WA	
 2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology	
DATE: 05-12-17	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 2

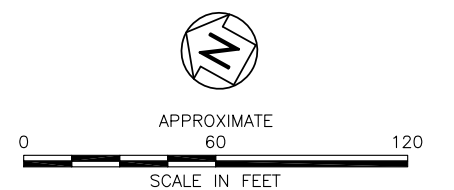


COLUMBIA RIVER

COLUMBIA RIVER

COLUMBIA RIVER

← RIVER FLOW DIRECTION

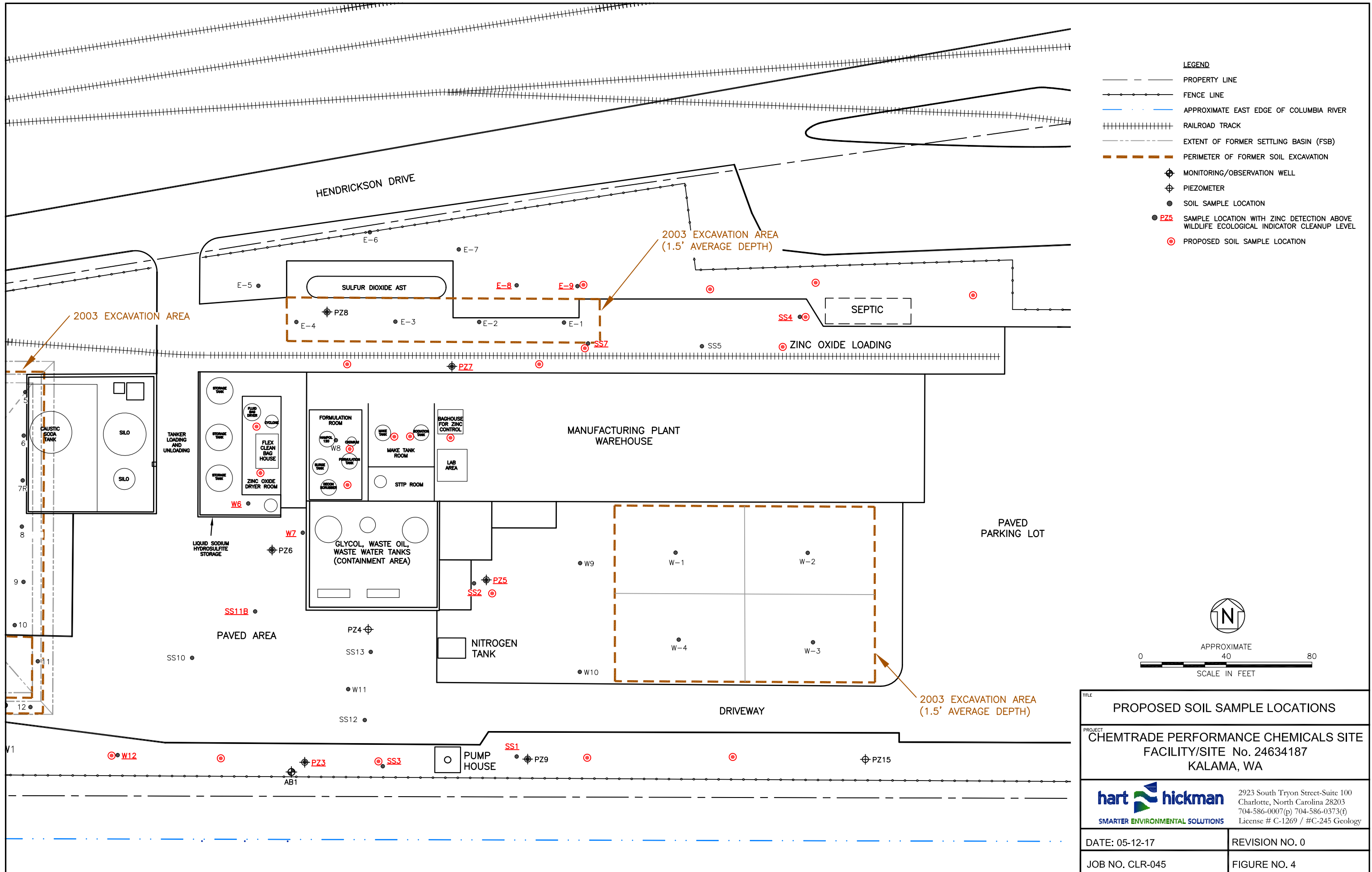


LEGEND

- PROPERTY LINE
- FENCE LINE
- APPROXIMATE EAST EDGE OF COLUMBIA RIVER
- ||||| RAILROAD TRACK
- - - - - EXTENT OF FORMER SETTLING BASIN (FSB)
- - - - - PERIMETER OF FORMER SOIL EXCAVATION
- ⊕ MONITORING/OBSERVATION WELL
- ⊕ PIEZOMETER
- SOIL SAMPLE LOCATION
- **PZ5** SAMPLE LOCATION WITH ZINC DETECTION ABOVE WILDLIFE ECOLOGICAL INDICATOR CLEANUP LEVEL

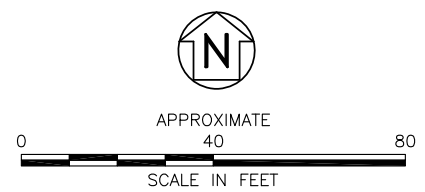
NOTES
 1. SOIL SAMPLE LOCATIONS ARE FROM SOIL WHICH REMAINS IN PLACE AT THE SITE AFTER COMPLETION OF EXCAVATION ACTIVITIES. SOIL SAMPLE LOCATIONS WHICH WERE REMOVED BY EXCAVATION ACTIVITIES ARE NOT DEPICTED.
 2. IMPORTED COLUMBIA RIVER DREDGE SPOILS OBTAINED FROM ADJACENT PROPERTY SOUTH OF THE SITE WERE USED TO BACKFILL EXCAVATIONS.
 3. SAMPLES OB1 THROUGH OB4, SB1-SURF-1/2/3/4, AND SB2-SURF-1/2/3/4 REPRESENT SOIL WITHIN THE EXTENTS OF FSB1 AND FSB2, BUT EXACT LOCATIONS ARE NOT KNOWN AND THE SAMPLES ARE NOT DEPICTED.


REMAINING SOIL SAMPLE LOCATIONS	
PROJECT CHEMTRADE PERFORMANCE CHEMICALS SITE FACILITY/SITE No. 24634187 KALAMA, WA	
2923 South Tryon Street Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology	
DATE: 05-12-17	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 3



LEGEND

- PROPERTY LINE
- - - - - FENCE LINE
- APPROXIMATE EAST EDGE OF COLUMBIA RIVER
- ++++ RAILROAD TRACK
- - - - - EXTENT OF FORMER SETTLING BASIN (FSB)
- - - - - PERIMETER OF FORMER SOIL EXCAVATION
- ⊕ MONITORING/OBSERVATION WELL
- ⊕ PIEZOMETER
- SOIL SAMPLE LOCATION
- PZ5 SAMPLE LOCATION WITH ZINC DETECTION ABOVE WILDLIFE ECOLOGICAL INDICATOR CLEANUP LEVEL
- PROPOSED SOIL SAMPLE LOCATION



TITLE PROPOSED SOIL SAMPLE LOCATIONS	
PROJECT CHEMTRADE PERFORMANCE CHEMICALS SITE FACILITY/SITE No. 24634187 KALAMA, WA	
 2923 South Tryon Street-Suite 100 Charlotte, North Carolina 28203 704-586-0007(p) 704-586-0373(f) License # C-1269 / #C-245 Geology	
DATE: 05-12-17	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 4