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Memorandum

To: John Mefford, Washington State Department of Ecology

Copies: Arthur Buchan and Mary Monahan, Washington State Department of Ecology
Jeff Gaarder, GHD
Andrea Wing, Shell Oil Products US

From: Emily Jones, PE, Floyd|Snider

Date: November 6, 2020

Project No: PKG-SmithKem

Re: **Review of Site COPC Data to Identify Data Gaps to be Addressed in the Remedial Investigation Report**

This memorandum describes the process that took place in summer 2020 to identify and address potential data gaps for chemicals of potential concern (COPCs) at the Smith-Kem Site (Site) relative to preliminary cleanup levels (PCULs) and leaching cleanup levels (CULs) for soil and groundwater. PCULs were developed in spring and summer 2020 under direction from the Washington State Department of Ecology (Ecology), as described in the Floyd|Snider memorandum *Development of PCULs and Identification of COPCs for Evaluation in the Remedial Investigation Report* (PCUL and COPC Memo; Floyd|Snider 2020).

The results of this data gap evaluation will facilitate a revised discussion of the nature and extent of contamination at the Site using these revised COPCs and PCULs. This memorandum describes Site data gaps and how they will be addressed in the revised Ecology Draft Remedial Investigation (RI), which will be incorporated into a combined Ecology Draft RI/Feasibility Study (FS).

1.0 DATA GAP EVALUATION

In summer 2020, under direction from Ecology, Floyd|Snider assisted in evaluating data gaps for the Site in a series of meetings with Floyd|Snider, Shell Oil Products US, and Ecology attendees. Groundwater data gaps were evaluated in meetings that took place on May 4 and June 8, 2020. Soil data gaps were evaluated in meetings that took place on June 8 and August 24, 2020. Table 1 summarizes groundwater PCULs, COPCs, and the results of the data gap evaluation for groundwater, including information about the location and depth of contamination near property boundaries and the overall frequency of exceedance information for each COPC relative to its PCUL. Table 2 provides the same information for soil. Soil and groundwater sampling locations included in the data gap evaluation are shown on Figure 1. More information on the data gap evaluation process is provided in the following sections.

1.1.1 Groundwater

Groundwater data gaps were evaluated relative to the PCULs presented in Table 1. The data gap evaluation for 10 organochlorine pesticides included results from the Phase 2 groundwater sampling events as well as an evaluation of groundwater data collected in March 2020. COPC status and nature and extent of contamination for these chemicals were determined using the March 2020 data, supplemented by any detected results from Phase 2 groundwater sampling events collected to support the Remedial Investigation. Phase 2 groundwater data were used to evaluate data gaps for the remaining COPCs in groundwater. The results of the data gap evaluation are summarized for each COPC in Table 1.

In groundwater, contamination is vertically and laterally bounded within the property boundary for all COPCs, except as listed below.

- Dieldrin and toxaphene both have a small halo of contamination that extends off-property in the vicinity of monitoring well MW-4. When coupled with groundwater flow direction, which flows to the southwest, and chemical properties for these COPCs, the decline in concentrations between MW-4 and off-property well MW-16 is sufficient to show that contamination is laterally bounded.
- Nitrate samples collected from temporary well FS-30 indicate that contamination in the southwest corner of the property is greater in the deeper (15 feet below ground surface [bgs]) groundwater sample than in the shallow (7 feet bgs) groundwater sample. These results indicate that nitrate contamination may extend deeper than 15 feet bgs in this area of the property.

Ecology and Floyd|Snider agreed that no additional sampling was required to fill these data gaps and that Floyd|Snider could proceed with updating its discussion of groundwater PCULs, COPCs, and nature and extent of contamination in the RI. In addition, based on Ecology input, the RI will contain specific arsenic and nitrate analysis and discussion, as summarized in Table 1.

1.1.2 Soil

Soil data gaps were evaluated relative to the PCULs presented in Table 2. For chemicals where the previously described groundwater data demonstrate compliance for the leaching pathway, the soil PCUL was adjusted to remove the leaching pathway criterion such that only criteria protective of direct contact exposure were considered. For the remaining chemicals, data gaps were evaluated relative to the leaching pathway and, if widespread exceedances of the leaching pathway were present, relative to direct contact exposure criteria. The results of this evaluation are summarized for each COPC in Table 1.

In soil, contamination is vertically and laterally bounded within the property boundary for all COPCs, except as listed below.

- Dieldrin. Existing samples do not vertically bound the depth of contamination relative to residential criteria (0.063 milligrams per kilogram [mg/kg]). Contamination is

assumed to be present throughout the point of compliance (0 to 15 feet bgs). Dieldrin results exceed residential criteria at one off-property location (Surface-1 in the southeastern sampling extent) with a low magnitude of exceedance (less than 2 times the PCUL). The location between the southwestern property boundary and this sample (FS-34) is clean, indicating that Surface-1 represents localized contamination, possibly related to the culvert daylighting here and/or a low spot that collects runoff.

- Toxaphene. Toxaphene results exceed residential criteria (0.91 mg/kg) at one off-property soil sample location (MW-17, on the BNSF property) with a low magnitude of exceedance (1.25 times the PCUL). This sample result represents the eastern limit of contamination and is sufficient to show contamination is laterally bounded.
- Dioxins/furans. Contamination is assumed to be limited within surface soil but is not laterally bounded in the southeast corner of the property relative to residential criteria (13 nanograms per kilogram). The extent of off-site contamination is a data gap that will be filled prior to selection and design of the final remedy and may be achieved with additional sampling prior to submittal of the Engineering Design Report.

Groundwater data provide an empirical demonstration that soil contamination that exceeds leaching criteria is laterally bounded within the property boundary: Groundwater wells along the western, southwestern, and southern property boundaries are in compliance with groundwater PCULs. A hotspot of contamination exists for many COPCs in both soil and groundwater in the vicinity of MW-4. The FS may evaluate a Remedial Action Level for soil contamination contributing to groundwater exceedances at MW-4.

Ecology and Floyd|Snider agreed that no additional sampling was required to fill these data gaps prior to revision of the RI and that Floyd|Snider could proceed with updating the RI's discussion of soil PCULs, COPCs, and nature and extent of contamination. For select COPCs, Table 2 summarizes specific agreements that will be incorporated into the revised Draft RI/FS.

2.0 REFERENCES

Floyd|Snider. 2020. *Development of PCULs and Identification of COPCs for Evaluation in the Remedial Investigation Report.* Memorandum from Emily Jones, Floyd|Snider, to John Mefford, Washington State Department of Ecology. 30 October.

Washington State Department of Ecology (Ecology). 1992. *Statistical Guidance for Ecology Site Managers.* August.

3.0 LIST OF ATTACHMENTS

Table 1 Data Gap Evaluation Summary for Groundwater COPCs Relative to PCULs

Table 2 Data Gap Evaluation Summary for Soil COPCs Relative to Leaching and Direct Contact PCULs

Figure 1 Soil and Groundwater Sample Locations

Tables

Table 1
Data Gap Evaluation Summary for Groundwater COPCs Relative to PCULs

Chemical	Final PCUL (µg/L)	Maximum Detected Result *(Maximum Detected Well Result)* (µg/L) [(1)]	Percent of Detected Results That Exceed	Groundwater COPC?	Floyd|Snider and Ecology Data Gap Evaluation		Action Items
					Summary	Supporting Information	
Chemicals Identified as COPCs and Pending COPCs							
Metals							
Arsenic	5.0	23 / ***(14)***	1.7%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within property. The single elevated sample at MW-4 could be a sampling artifact related to redox conditions or variation in background; there was elevated turbidity in the sample that exceeds.	In the RI, Floyd|Snider will evaluate possible causes for elevated arsenic in the sample with elevated results, including discussion of dissolved versus total arsenic results, as appropriate.
Miscellaneous Substances							
Nitrate	10,000	210,000	57%	**Yes**	Data gap with respect to depth of contamination within property boundary; contamination is laterally bounded.	Contamination is greatest at MW-4 and extends off-property near MW-4, at MW-16. Release in this area is shallow/more recent and results collected after January 1, 2016, show improvement relative to historical results. Plume is bounded. A second, older source exists in southwestern portion of property, which is bounded laterally by wells MW-18, MW-19, and MW-20. Depth may not be bounded based on results that increase with depth at temporary well FS-30. However, collection of deeper data is not required for completion of the Remedial Investigation report or Feasibility Study.	The Feasibility Study will evaluate paving as an alternative to address ongoing nitrate/nitrite source control; trends in data collected from wells screened at depths up to 15 feet bgs will be evaluated to determine if groundwater quality is improving or if additional action needs to be taken as part of remedy design.
Nitrite	1,000	6,800	8.2%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within property.	None.
Organochlorine Pesticides							
HCH-alpha (a-BHC)	0.014	Not Detected in Groundwater	NA	No	No data gaps: Not a COPC.	No exceedances in March 2020 data; max result meets PCUL.	None.
HCH-beta (b-BHC)	0.049	0.087	3.2%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	No exceedances in March 2020 data; max result meets PCUL. Contamination at MW-4 is bounded.	None.
Aldrin	0.0026	0.0059	NA	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Results at MW-4 exceed the PCUL. All other results meet PCUL. Contamination is bounded within property.	None.
Heptachlor epoxide	0.048	Not Detected in Groundwater	NA	No	No data gaps: Not a COPC.	No exceedances in March 2020 data; max result meets PCUL.	None.
Chlordane	2.0	22	2.4%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Detected exceedances at MW-4 in PAL dataset; no exceedances in March 2020 data. Plume is bounded to the southeast by results at MW-12, MW-2, and MW-10.	None.
Dieldrin	0.0055	10	24%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Results exceed at MW-4 with a halo of contamination at MW-16. Contamination extends to the southwest property boundary (MW-14) but is bounded by MW-18, MW-19, and MW-20.	None.

Table 1
Data Gap Evaluation Summary for Groundwater COPCs Relative to PCULs

Chemical	Final PCUL (µg/L)	Maximum Detected Result *(Maximum Detected Well Result)* (µg/L) [(1)]	Percent of Detected Results That Exceed	Groundwater COPC?	Floyd|Snider and Ecology Data Gap Evaluation		Action Items
					Summary	Supporting Information	
Chemicals Identified as COPCs and Pending COPCs (cont.)							
Organochlorine Pesticides (cont.)							
4,4'-DDE / Sum DDE	0.26	0.76	0.81%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within the central portion of the property.	None.
4,4'-DDT / Sum DDT	0.26	1.5	0.81%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within the central portion of the property.	None.
Toxaphene	0.80	26	8.1%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is greatest at MW-4 and extends off-property near MW-4, at MW-16. Plume is bounded to the southeast by results at MW-12, MW-2, and MW-10.	None.
Chlorinated Herbicides							
2,4-D	70	260	1.6%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within property.	None.
Dicamba	480	550	1.6%	**Yes**			
MCPA	8.0	88	3.2%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within property. Historical samples (pre-2016) had elevated reporting limits at some property boundary wells; data collected between 2016–2018 at these wells is in compliance with PCUL.	None.
Other Chlorinated/Halogenated Pesticides							
Atrazine	3.0	33	13%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within property.	None.
Chlordane-alpha	2.0	3.3	0.80%	**Yes**			
Total Petroleum Hydrocarbons (TPH)							
Diesel-Range TPH	500	24,000 / ***(1,000)***	8.2%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded within property.	None.
Oil-Range TPH	500	24,000 / ***(1,100)***	2.1%	**Yes**			

Notes:

All analytical results are reported to two significant figures.

RED/BOLD Chemical retained as COPC.

PCUL includes state and federal MCLs, MTCA Method B, and MTCA Method A groundwater criteria.

1 The value in plain text includes all groundwater results, including data from test pits and temporary well screens at soil boring locations, which are typically used for field screening purposes. These data should not be considered representative of site conditions. Nearby proximate groundwater well data collected over the course of multiple events demonstrate that these results meet the definition of an outlier, as described in Ecology statistical guidance (Ecology 1992). In areas without a nearby well, groundwater samples collected from collocated soil borings indicate that historical data collected from test pits are not representative of groundwater quality.

Abbreviations:

BHC Benzene hexachloride
COPC Chemical of Potential Concern
DDE Dichlorodiphenyldichloroethylene
DDT Dichlorodiphenyltrichloroethane
Ecology Washington State Department of Ecology
FS Feasibility Study
HCH Hexachlorocyclohexane
MCL Maximum Contaminant Level
µg/L Micrograms per liter
MTCA Model Toxics Control Act
NA Not analyzed; PAL does not perform analysis for this analyte in the indicated media.
PAL Pacific Agricultural Laboratory
PCUL Preliminary cleanup level
PQL Practical quantitation limit
QC Quality control

Table 2
Data Gap Evaluation Summary for Soil COPCs Relative to Leaching and Direct Contact PCULs

	Chemical	Contact PCUL If Groundwater Demonstrates Compliance (mg/kg) [1]	Considers Pathways	Max Detection in Soil (mg/kg)	Percent of Detected Results That Exceed	Is It a Soil COPC?	Floyd|Snider and Ecology Data Gap Evaluation		Action Items
							Summary	Supporting Information	
	Chemicals Identified as COPCs and Pending COPCs								
Groundwater Demonstrates Compliance for Leaching Pathway	**Metals**								
	Lead	220	Direct Contact	990	3.6%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination limited to the upper 2 feet; contamination bounded within property boundary.	None.
	Zinc	270	Direct Contact	470	6.7%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination limited to the upper 2 feet; contamination bounded within property boundary. Samples in two areas exceed near property line (FS-05 and FS-06; and FS-12), with exceedance factors of 1.0 and 1.2 times the PCUL.	None.
	Organochlorine Pesticides								
	Heptachlor	0.22	Direct Contact	0.43	1.3%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Low-level contamination is present in the top 4 feet of soil. Contamination is bounded within the property.	None.
	Total DDx	1.0	TEE Direct Contact	25	9.3%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is present in the top 4 feet of soil and is bounded within the property.	The RI will contain text describing site-specific lines of evidence used to confirm that current levels of Total DDx in soil are protective of terrestrial exposure and do not cause a decrease in habitat quality using a weight of evidence approach.
	4,4'-DDD / Sum DDD [2]	2.4	HH Direct Contact	3.2	0.66%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is present in the top 4 feet of soil and is bounded within the property.	None.
	HCH-alpha (a-BHC)	0.16	Direct Contact	0.017	None	No	No data gaps: Contamination is vertically and laterally bounded.	Groundwater demonstrates compliance (all March 2020 groundwater results meet the PCUL); no exceedances of soil direct contact PCUL.	None.
Other Chemicals	**Organochlorine Pesticides (cont.)**								
	HCH-beta (b-BHC)	0.0067	Direct Contact, Leaching	0.052	6.0%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded laterally within the property boundary and vertically to the top 4 feet of soil. Along the southwestern property boundary, one location (FS-29) has a detected low-level exceedance (1.8 times the PCUL). Along the eastern property boundary near BNSF, a cluster of results in the top 4 feet of soil exceeds the PCUL at locations FS-27, FS-28, and FS-42. Exceedance factors at these locations range between 1 and 7.8. Samples collected on BNSF property and at FS-34, FS-35, and MW-13 meet the soil PCUL. A hotspot exists near MW-4, where contamination is present in soil and groundwater. Elsewhere, groundwater results collocated with soil results (e.g., FS-22 and MW-11) meet the groundwater CUL, providing empirical demonstration that current soil concentrations do not cause groundwater impacts except at the MW-4 hotspot.	The FS may evaluate a RAL for soil contamination contributing to groundwater exceedances at MW-4.
	Aldrin	0.0067	Direct Contact, Leaching	20	8.6%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded laterally within the property boundary and vertically to the top 4 feet of soil. Along the southwestern property boundary, one location (FS-29) has a detected low-level exceedance (1.1 times the PCUL). Contamination along the eastern property boundary near BNSF exceeds the PCUL with exceedance factors between 3.2 and 4.4 at locations FS-27 and FS-28. Samples collected on BNSF property and at FS-34, FS-35, and MW-13 meet the soil PCUL. A hotspot exists near MW-4, where contamination is present in soil and groundwater. Elsewhere, groundwater results collocated with soil results with similar magnitude exceedances (e.g. MW-1, MW-11, and MW-3) meet the groundwater CUL, providing empirical demonstration that current soil concentrations do not cause groundwater impacts except at the MW-4 hotspot.	
	Chlordane	1.0	Direct Contact, Leaching	84	12%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded laterally within the property boundary and vertically to the top 4 feet of soil. Samples along the eastern property boundary near BNSF (FS-27 and FS-28) and along the southwestern property boundary (FS-12 and FS-29) exceeds the PCUL with exceedance factors between 4.6 and 13. Samples collected on BNSF property and at FS-34, FS-35, and MW-13 meet the soil PCUL. A hotspot exists near MW-4. Elsewhere, groundwater results collocated with soil results with similar magnitude exceedances (FS-22, MW-11, and MW-3) or collected from wells downgradient of elevated soil results (e.g., MW-14, MW-18, MW-19) meet the CUL, providing empirical demonstration that current soil concentrations do not cause groundwater impacts except at the MW-4 hotspot. Downgradient groundwater well results outside the western and southwestern property boundary empirically demonstrate groundwater quality and are sufficient to bound soil contamination within the property, despite soil sample results that exceed the PCUL along the western property boundary.	

Table 2
Data Gap Evaluation Summary for Soil COPCs Relative to Leaching and Direct Contact PCULs

	Chemical	Contact PCUL If Groundwater Demonstrates Compliance (mg/kg) [1]	Considers Pathways	Max Detection in Soil (mg/kg)	Percent of Detected Results That Exceed	Is It a Soil COPC?	Floyd|Snider and Ecology Data Gap Evaluation		Action Items
							Summary	Supporting Information	
	Chemicals Identified as COPCs and Pending COPCs								
Other Chemicals (cont.)	**Organochlorine Pesticides**								
	Dieldrin	0.0067	Direct Contact, Leaching	46	46%	**Yes**	Data gap relative to depth of contamination. Contamination is laterally bounded.	Contamination is present across the site. Existing samples may not be sufficient to vertically bound the depth of contamination. Soil results across the site, including near the eastern and western property boundaries, exceed the leaching PCUL with maximum exceedance factors of more than 100. Soil samples in the southeastern corner of the property (FS-34) meet the CUL and are sufficient to bound contamination along the eastern/southern property boundary extent. Groundwater wells along the western property line and downgradient of the property boundary are sufficient to empirically demonstrate that groundwater contamination does not extend off-site, and soil contamination is bounded to within the property. Relative to residential criteria (0.063 mg/kg), contamination is appropriately bounded. The only off-property exceedance (Surface-1 in the southeastern sampling extent) exceeds the soil PCUL by a factor of less than 2. The location between the southwestern property boundary and this sample (FS-34) meets the CUL, indicating that any contamination between here and this location would be low level and this is a localized area of contamination, possibly related to a ground surface depression or the culvert daylighting here.	The FS may evaluate a RAL for soil contamination contributing to on-property groundwater exceedances. The FS will consider alternatives ranging from evaluating capping and institutional controls to widespread excavation down to 15 feet (standard point of compliance for the human health pathway) relative to the residential criteria to eliminate risk from the direct contact pathway. The FS will contain the disproportionate cost/cost-benefit analysis to determine the preferred alternative.
	4,4'-DDE / Sum DDE	0.25	HH Direct Contact, Leaching	5.4	7.9%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is present in the top 4 feet of soil and is bounded within the property. A soil hotspot exists in samples collected near MW-4, where groundwater also exceeds the PCUL. Sampled locations along the western property boundary meet the CUL except for FS-29 and FS-12 near the southwestern property boundary. The maximum results at these locations are less than 1.6 times the PCUL. One sample at location FS-27 along the eastern property boundary near the BNSF loading area has an exceedance factor of 2.2 without a sample further east to bound contamination. All other samples representing the eastern-most sampling extent meet the PCUL. All other groundwater results meet the PCUL, providing empirical demonstration that soil contamination is bounded within the property.	The FS may evaluate a RAL for soil contamination contributing to groundwater exceedances at MW-4.
	4,4'-DDT / Sum DDT	2.9	HH Direct Contact, Leaching	20	1.4%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is present in the top 4 feet of soil and is bounded within the property. Soil and groundwater contamination is present only in the vicinity of MW-4.	None.
	Toxaphene	0.84	Direct Contact, Leaching	120	18%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination is bounded, generally within the property boundary and limited to the top 4 feet of soil. At two locations, the deepest sample does not meet the PCUL; however, contamination depth is inferred to be less than 6-7 feet bgs at these locations: Concentrations in the 4-5 feet bgs interval are an order of magnitude less than more shallow soil results in each sample and are <2.5 times the PCUL. A hotspot exists near MW-4. Soil results at other locations, including near the eastern and western property boundaries, exceed the leaching PCUL with maximum exceedance factors of up to approximately 80. Collocated/proximate downgradient groundwater results along the property boundary (MW-11, MW-13, MW-17, and FS-30) meet the CUL. These groundwater results provide empirical demonstration that soil contamination is bounded within the property for the leaching pathway. Relative to residential criteria (0.91 mg/kg), results exceed at one off-site soil sample location (MW-17) with a low magnitude of exceedance (1.25 times the PCUL). This sample result represents the eastern limit of contamination; no additional samples are needed to delineate the site.	The FS may evaluate a RAL for soil contamination contributing to groundwater exceedances at MW-4. The FS will consider alternatives ranging from evaluate capping and institutional controls to widespread excavation to a clean surface relative to the residential criteria to eliminate risk from the direct contact pathway. The FS will contain the disproportionate cost/cost-benefit analysis to determine the preferred alternative.
	Other Chlorinated/Halogenated Pesticides								
	Atrazine	4.3	Direct Contact [3]	710	0.66%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination limited to the upper 4 feet; contamination bounded within property boundary.	None.
	Chlordane-alpha	1.0	Direct Contact, Leaching	9.9	5.6%	**Yes**			
	Simazine	8.3	Direct Contact [3]	110	0.66%	**Yes**			

Table 2
Data Gap Evaluation Summary for Soil COPCs Relative to Leaching and Direct Contact PCULs

	Chemical	Contact PCUL If Groundwater Demonstrates Compliance (mg/kg) [1]	Considers Pathways	Max Detection in Soil (mg/kg)	Percent of Detected Results That Exceed	Is It a Soil COPC?	Floyd|Snider and Ecology Data Gap Evaluation		Action Items
							Summary	Supporting Information	
	Chemicals Identified as COPCs and Pending COPCs								
Other Chemicals (cont.)	**Total Petroleum Hydrocarbons (TPH)**								
	Total Diesel- and Oil-Range TPH	460	Direct Contact [3]	21,000	25%	**Yes**	No data gaps: Contamination is vertically and laterally bounded.	Contamination present across the site, generally near buildings and fuel pad at depths up to 9 feet bgs. Along eastern/western property boundary, shallow samples exceed at concentrations between 2 and 2.5 times the PCUL at three locations: Culvert, FS-01, and FS-12. Vertical depth is bounded throughout the site, except near BNSF loading area along the eastern property boundary where contamination is present at depths of 10 feet bgs at locations FS-10 and MW-5. This is deeper than the biologically active zone.	The RI will contain text describing rationale supporting the determination that contamination is bounded along property lines based on the following lines of evidence: - There is no reason to suspect TPH contamination is present outside of the western property boundary based on what is known about the nature of current and historical activities; - The road is a permanent physical barrier; site activities did not take place on or west of the road; - No indications of the presence of TPH were observed outside of the western property boundary when performing off-property permanent and temporary well installation.
	Dioxins								
	Dioxins	0.00000300	Direct Contact [3]	0.0000924	78%	**Yes**	Data gap exists relative to TEE criteria adjusted for PQL, and relative to residential criteria (13 ng/kg): Results exceed both criteria along southern property boundary, south of FS-44.	Contamination is present in the southeast corner of the site. The greatest dioxin/furan concentration (0.92 mg/kg) was measured in FS-44. Based on current and historical activities at the property, contamination is expected to be limited to surface soil. The ecological exposure pathway at the site is unlikely to be active based on physical properties of site soil and ground surface that make the site unsuitable for terrestrial life; current levels of dioxins/furans in soil are not contributing to loss in habitat quality. A data gap remains relative to residential criteria.	Relative to the TEE pathway, the RI will contain text describing site-specific lines of evidence used to confirm that current levels of dioxins in soil are protective of terrestrial exposure and do not cause a decrease in habitat quality using a weight of evidence approach. Relative to residential criteria, the extent of off-site contamination is a data gap that must be filled prior to selection and design of the final remedy. This may be achieved with additional sampling prior to submittal of the Engineering Design Report.

Notes:

Criteria and results are rounded to two significant figures, with the exception of dioxin criteria and results. Dioxin citeria and results are rounded to three significant figures.

RED/BOLD Chemical retained as COPC.

Soil PCUL has been adjusted to the PQL.

Soil PCUL includes TEE, HH, and leaching pathway as appropriate for the chemical.

Soil PCUL includes only direct contact criteria; the leaching pathway is not active.

1 If groundwater meets the CUL (i.e., chemical is not a groundwater COPC), the PCUL presented in this table is the most conservative soil direct contact criterion for that chemical. This "direct contact PCUL" was used to determine exceedance information and COPC status.

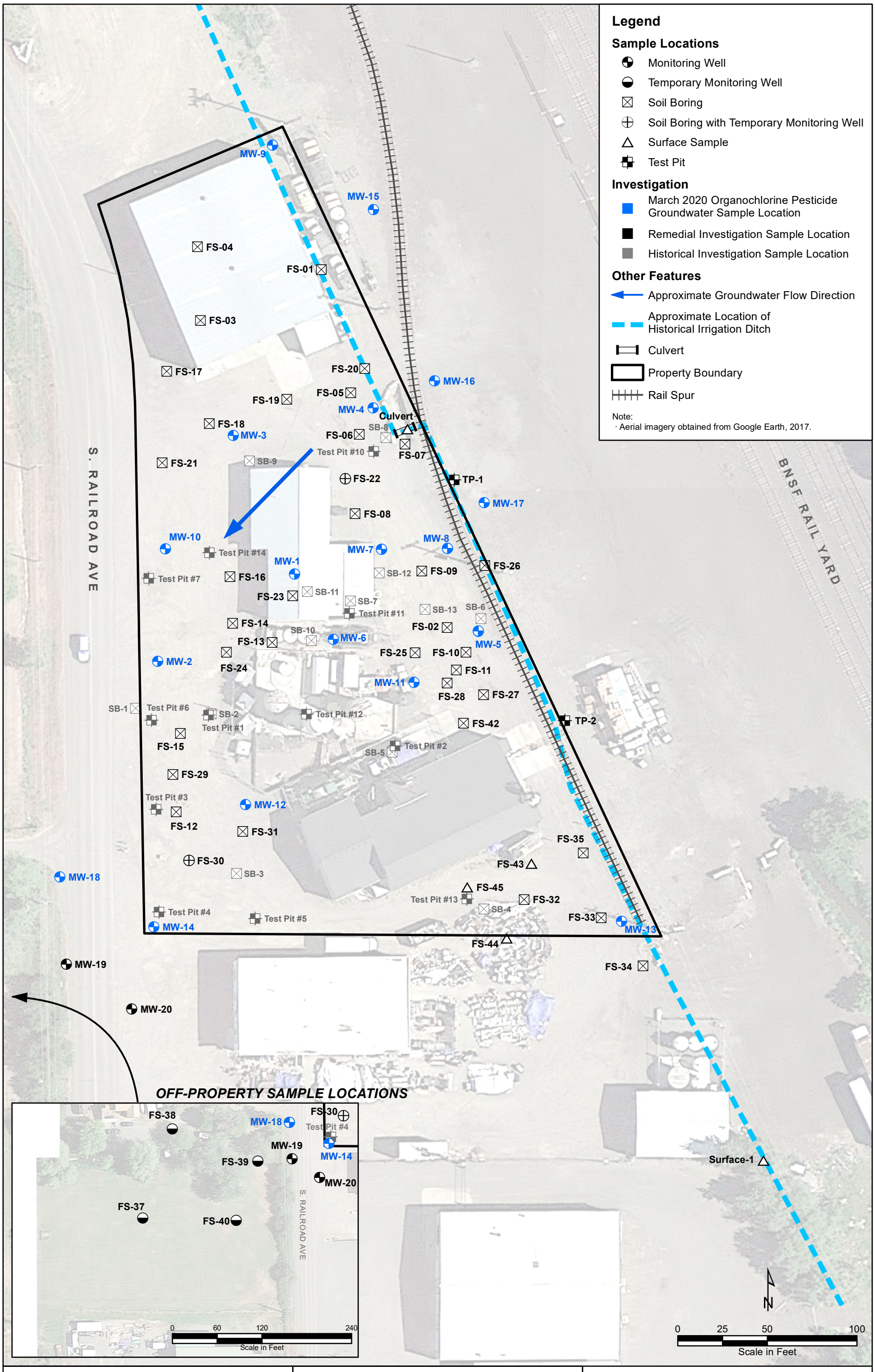
2 Total DDx (calculated as the sum of DDD, DDE, and DDT) is compared to the TEE criteria for total DDx. Individual totals for DDT and its derivatives are compared to HH direct contact criteria and leaching criteria, as appropriate.

3 No three-phase leaching pathway criteria.

Abbreviations:

bgs	Below ground surface	DDE	Dichlorodiphenyldichloroethylene	HCH	Hexachlorocyclohexane	PQL	Practical quantitation limit
BHC	Benzene hexachloride	DDT	Dichlorodiphenyltrichloroethane	HH	Human health	RAL	Remedial Action Level
BNSF	BNSF Railway	DDx	Calculated as sum of DDD, DDE, and DDT	mg/kg	Milligrams per kilogram	RI	Remedial Investigation
COPC	Chemical of potential concern	Ecology	Washington State Department of Ecology	ng/kg	Nanograms per kilogram	TEE	Terrestrial Ecological Evaluation
DDD	Dichlorodiphenyldichloroethane	FS	Feasibility Study	PCUL	Preliminary cleanup level		

Figure



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Data Gaps Evaluation Memorandum
Smith-Kem Site
Ellensburg, Washington

Figure 1
Soil and Groundwater Sample Locations

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11/2/2020